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Exploring the Knowledge, Attitudes, and Practices of Libyan Community Pharmacists in Relation to Vitamin Supplements in Tripoli/Libya: A Cross-Sectional Study

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Abstract: Vitamins are essential for many bodily functions and must be obtained through food or supplements. Community pharmacists play an active role in educating patients about vitamins and supplements, guiding them on safe use, and helping to avoid potential drug-vitamin interactions. This study followed a cross-sectional design, targeting Libyan community pharmacists between August and November 2024 in Tripoli city; to determine Libyan pharmacists' knowledge, attitudes, practices and opinions towards vitamin supplements. The selected participants completed a self-administered questionnaire and data collected was entered and analyze in SPSS version 27. Pearson's correlation was used to assess the relationship between knowledge, attitude practice and opinion. A p-value of less than 0.05 was considered statistically significant. Of the 200 pharmacists who participated, more than half of the participants were female 118 (59%), more than third 139 (69.5%) had Bachelor, s degree in Pharmaceutical sciences as their highest qualification and almost third 130 (65%) of the participants had less than five years of working experience. Based on their self-assessment 95 (47.5%) of pharmacists felt they had moderate confidence in their knowledge towards vitamin supplements. Notably, the majority of community pharmacists have above average score in all four domains: knowledge 122 (61%), attitude 142 (71%), 126 practice (63%) and opinion 150 (75%). A negative correlation was significant association between knowledge and attitude of the community pharmacists ($P < 0.05$). Regarding frequency of vitamins dispensing without a prescription 71 (35.5%) of community pharmacists usually dispense them 50% of their patients, with adult patients 136 (68%) being the highest age category and 78 (39%) of pharmacists rely on laboratory test results before dispensing. Focused educational initiatives aimed at enhancing pharmacists' understanding and improving their dispensing practices is necessary.

Introduction

According to the United States Food and Drug Administration (FDA), dietary supplements are products designed to enhance the nutritional content of standard foods. They help prevent and manage chronic diseases, including osteoporosis, cardiovascular disease, cancer, and neural tube defects. (1-3). The word vitamin on the other hand, is used to describe any of a heterogeneous group of organic molecules that are required in small amounts for normal growth, reproduction, and homeostasis, but that the human body cannot synthesize in sufficient quantities for survival and must therefore obtain through the diet (4).

Vitamin deficiencies are widespread worldwide and, unless severe, often go unrecognized clinically, but even mild deficiency can have serious consequences. Such deficiencies often coexist with mineral

deficiencies and can affect all ages (4, 5). The population groups most at risk for vitamin deficiencies are young children and pregnant and lactating women, because of their relatively high requirements for these compounds and their susceptibility to their absence (6, 7). In addition, the effects of vitamin deficiencies are related to the biochemical roles they play. In contrast to vitamin deficiencies, some individuals may be at risk of vitamin toxicity (6, 7).

The availability of these supplements has led to their widespread consumption. Although the efficacy of multivitamins and minerals is unclear, the use of these supplements is increasing in many developed countries. The concern here is that consumption of some vitamins has continued to increase and has become so high in some individuals that they are at risk for long-term adverse effects (8).

Taking vitamins is generally a safe and effective way to maintain a healthy body, however, vitamins have the potential to interact with prescription medications. Risk factors for poor outcomes from drug interactions include use of multiple medications and/or supplements, advanced age, poor kidney or liver function, and use of medications with narrow therapeutic indexes [9]. Patients with these risk factors should be targeted for interventions to prevent drug-vitamin interactions (10). There are many different types of drug-vitamin interactions, ranging in severity and importance. Several factors that pharmacists must consider in managing drug-vitamin interactions include determining the need for a supplement during treatment and alternatives must be identified (9.10).

Community pharmacists can play an important role in increasing patients' awareness, regarding the use of vitamin supplements. In addition, they can help patients make informed and safe choices about dietary supplements (11). The therapeutic nature of vitamin and nutritional deficiencies means that the success of complementary therapy depends on the findings of researchers, which vary from individual to individual. This means that community pharmacists must have knowledge of vitamin and nutritional supplement products to effectively advise consumers on vitamin and nutritional deficiencies (12). Consequently, they must have the right attitude and counseling skills to carry out their duties effectively (13). Previous studies have shown that consumers routinely ask pharmacists for information about vitamins and nutritional choices and seek advice on these products as part of their pharmacy practice (11-14). A survey conducted in Australia found that approximately 87% of consumers expect pharmacists to provide them with adequate information about the nutrition and effectiveness of vitamin products and 92% expect to receive safety information about these products (15, 16). A study by Abadel *et al*., found that most community pharmacists do not feel confident answering patients' questions about food and nutrition choices (17). However, the majority of pharmacists have inadequate knowledge about dietary supplements and less confidence in themselves to answer patients' questions (17). Several other studies have also shown a lack of knowledge or inadequate education about dietary supplement products among pharmacists and this lack of knowledge prevents pharmacists from providing informative advice about food and vitamin choices to consumers (18-19). Lack of counseling skills has also been cited as one of the major challenges faced by many pharmacists while providing care (20-21).

In addition, vitamins and dietary supplements are primarily available through community pharmacies and require informed counselling with pharmacists, who act as a key link between products and consumers (22). However, shortcomings in pharmacist education and training can hinder their ability to provide comprehensive advice on prescription medications. Many pharmacists rely on their academic background, which may not adequately address the complexities of advising patients on their prescriptions (23). This concern is increasingly important in today's healthcare environment, where pharmacists must be aware of potential drug interactions and contraindications, especially as self-prescribing becomes more common among consumers. Several studies therefore point to a global need to improve educational and training resources (24).

According to a study conducted in Benghazi, Libya, which examined the prevalence of dietary supplement use at the University of Benghazi Medical Campus, it revealed that the dietary supplement market has grown in Libya along with the increasing demand for them. Poor guidance and lack of regulations regarding these dietary supplements creates doubt about the consumption of such products. The most common reason for using vitamin supplements in this study was to improve general health and regular awareness should be provided by healthcare providers and the Ministry of Health. (25).

Evidence from various studies indicates that pharmacists are inconsistent in their provision of important information on vitamins and dietary supplements, underscoring the need for improved educational resources and training on a global scale (15, 26). The topic of pharmacists' roles in relation to vitamin supplements has been widely examined in developed western countries. However, there is a relative scarcity of such research in developing regions like Libya, pointing to a clear necessity for additional investigation. Thus, this study was performed to assess knowledge, attitude, practice and opinion of community pharmacists in toward vitamin and dietary supplements in Tripoli/Libya.

Experimental Design

Ethical Approval and Consent to Participate

This study obtained ethical approval before distributing the questionnaire to pharmacists from the Scientific Research Ethics Committee of the University of Tripoli/Tripoli-Libya (registered under reference number: SREC-UOT 010/79). An oral consent form was obtained from all participants before filling out the questionnaires. Participants names and personal identifiers were not used to ensure confidentiality and they were also informed that their participation was completely voluntary and that they were free to decline participation in the study at any time without any consequences.

Study Design and Period

A cross-sectional descriptive study was conducted to assess the knowledge, attitudes, and practices of Libyan community pharmacists towards vitamin supplements. This study design was chosen because it is cost-effective and less time-consuming compared to other types of studies. It also provides valuable insights into the characteristics of the population included in the study and helps identify associations that can be explored in future research. The study was conducted in the Libyan capital, Tripoli, between August and November 2024.

Sample Size Calculation and Sampling

A formal sample size calculation was not conducted in this study. This is mainly because the study relied on convenience sampling in choosing the community pharmacists (using easily accessible participants). And even if the sample size had been calculated, it would not have been representative of the broader population, as the sample was limited to community pharmacists from a single city (Tripoli) and no other Libyan cities.

Eligibility Criteria

All pharmacists recruited for this study were qualified and had to have at least a Diploma degree in pharmacy or higher, work directly with consumers in any community pharmacies in Tripoli city. These pharmacists should provide a verbal consent, are willing to participate and should complete and answer all questions to be included in this study. Pharmacists working in industrial, clinical, and/or academic settings and those without retail experience were all excluded.

Data Collection and Questionnaire

An anonymous self-administered questionnaire with closed-ended questions was designed based on previous studies (27-28) with some modifications to address Libyan situation. The questionnaire consisted of 38 questions divided into five main sections. Section one gathered information about the demographic data of pharmacists (such as gender, age, education level, years of experience, position in pharmacy, and the source of information used). Section two assessed pharmacists' knowledge (5 items) regarding vitamin supplements in three scales (yes, no, or I don't know) and one self-assessment question. Pharmacists' attitude was measured in section three by asking 7 questions on an agree -disagree scale. In section four, practice of the community pharmacists was assessed (6 items) on two scale (do, or do not). The second part of this section asked pharmacists questions on frequency of vitamins dispensing and information they relied upon when deciding which vitamins to dispense since these activities are identified as essential elements of community pharmacist practice in performing their duties. Sections five was dedicated to investigate pharmacists' opinion (9 items) towards over-the-counter vitamin dispensing for different clinical conditions on a (can, or cannot) scale.

The questionnaire was prepared and distributed to the participants in the English language. It was attached to an introductory letters containing the title, purpose the anticipated benefits of the study and contact information of the researchers. The pharmacists completed the questionnaire in an average time of 5-10 minutes.

Quality Assurance and Data Measurement

The questionnaire was validated at two levels (29), and content validity of the questionnaire was reviewed by three faculty members from the Faculty of Pharmacy, University of Tripoli who are experts in this field through non-face validity. They were asked to confirm the comprehensibility, correctness and integrity of the questionnaire. A pilot test was conducted on ten community pharmacists and were not incorporated into the statistical analysis of the overall study. These ten pharmacists were asked to check readability, clarity of items and acceptability of the questionnaire length. Their comments were considered before distributing the final version of the questionnaire.

Since there was no consistency in scaling knowledge, attitude, practice and opinion in the current study, the median was used to categorize the pharmacists into good and poor knowledge, positive and negative attitude, good and poor practice, good and poor opinion. For each participant, the overall knowledge, attitude, practice and opinion was calculated by dividing the summation of the correct answers over the total question numbers in each section.

Data Entry and Analysis

The collected data were analyzed using SPSS version 27. Frequencies and percentages described the

variables, while Pearson's correlation assessed the relationships between knowledge, attitude, practice, and opinion. A *p*-value of <0.05 was considered statistically significant.

Results

Response Rate

Of the total 220 questionnaires distributed, only 200 were answered, representing a success rate of 90.9%. Therefore, the sample size required to have sufficient power for the analysis was met. There were only five incomplete questionnaires and fifteen missing questionnaires, all of them were excluded from the study.

Demographic Characteristics

Table 1 summarizes the demographic characteristics of community pharmacists (frequencies and percentages). More than half of the participants (118, 59%) were female, and the majority (130, 65%) were aged between 25 and 35 years. A bachelor's degree in pharmaceutical sciences was the highest qualification for 139 pharmacists (69.5%).

Nearly a third (130, 65%) had less than five years of work experience, while only 4 (2%) had over 20 years of experience. Most pharmacists (180, 90%) were employees. Regarding information sources for vitamin product guidance, pharmacists primarily relied on online databases (61, 30.5%), continuing education (50, 25%), and professional organizations (29, 14.5%). Fewer pharmacists used medical journals or other sources (15, 7.5%).

Community Pharmacists' Knowledge Towards Vitamins Supplements

Out of 200 pharmacists enrolled in the study, the total knowledge score was 3.69 ± 1.01 out of a maximum of 5. Although more than half (122, 61%) had good knowledge of vitamin supplements, 95 (47.5%) reported moderate confidence in their knowledge based on self-assessment.

More than three-quarters (158, 79%) believed excessive vitamin intake has no toxicity. The majority (164, 82%) correctly identified dry eyes or skin as a sign of vitamin A deficiency. Regarding the risk of hemorrhagic stroke from excessive vitamin E intake, responses varied: 95 (47.5%) answered "yes," while 73 (36.5%) were unsure. About two-thirds (132, 66%) recognized that excessive vitamin D intake can cause loss of appetite and vomiting. Most participants (163, 81.5%) correctly identified vitamin K as interacting with warfarin (see **Table 2**).

Table 1. Demographic characteristics of community pharmacists.

Variable	Category	Frequency (n [%])
Gender	Male	82 [41.0]
	Female	118 [59.0]
Age [years]	<25	53 [26.5]
	25-35	130 [65.0]
	36-45	15 [7.5]
	>45	2 [1.0]
Education level	Diploma	53 [26.5]
	Bachelor degree	139 [69.5]
	Master degree	8 [4.0]
Years of Experience	<5	130 [65.0]
	5-10	51 [25.5]
	11-20	15 [7.5]
	>20	4 [2.0]
Position in pharmacy	Employee	180 [90.0]
	Owner	20 [10.0]
Sources of Information	Professional organization	29 [14.5]
	Continuing education	50 [25.0]
	Online database	61 [30.5]
	Manufacturer leaflet	30 [15.0]
	Medical journals	15 [7.5]
	Others	15 [7.5]

Table 2. Community pharmacists' knowledge towards vitamin supplements.

Statements	Category	Frequency (n [%])
There is no toxicity related to large consumption of vitamin and dietary supplements	Yes	30 [15]
	No	158 [79]
	I do not know	12 [6]
Dry eye or skin could indicate vitamin A deficiency	Yes	164 [82]
	No	22 [11]
	I do not know	14 [7]
Excessive intake of vitamin E increases the possibility of hemorrhagic stroke	Yes	95 [47.5]
	No	32 [16]
	I do not know	73 [36.5]
Excessive intake of vitamin D more than the recommended dose can cause poor appetite and /or vomiting	Yes	132 [66]
	No	40 [20]
	I do not know	28 [14]
Which of the following vitamins can interact with warfarin	Vit A	6 [3]
	Vit E	25 [12.5]
	Vit K	163 [81.5]
	Multivitamins	5 [2.5]
	B complex	--
	Vit C	1 [5]
	Vit D	--
How confident are you in your knowledge on vitamins and their benefit	Not confident	16 [8]
	Slightly confident	39 [19.5]
	Moderately confident	95 [47.5]
	Very confident	30 [15]
	Extremely confident	20 [10]

Table 3. Community pharmacists' attitude and beliefs towards vitamins supplements

Statements	Frequency (n [%])	
	Agree	Disagree
Vitamin considered an important source of profit for pharmacists	182 [91]	18 [9]
Price is an important factor in recommending supplements to customer	155 [77.5]	45 [22.5]
Vitamins and dietary supplements should only be prescribed by nutritionist or physicians' prescription	84 [42]	166 [58]
Providing information about vitamins to the general public is a part of a pharmacist's professional responsibility in pharmaceutical care	173 [86.5]	27 [13.5]
It is safer for patients to take vitamins and supplements to prevent or cure illnesses as compared to taking conventional medications	128 [64]	72 [36]
Vitamins and dietary supplements can replace certain medications such as cholesterol-lowering medications	76 [38]	124 [62]
Pharmacists must provide updated information and seminars to other health care professionals.	175 [87.5]	25 [12.5]

Community Pharmacists' Attitude and Beliefs Towards Vitamins Supplements

The overall attitude score among participating pharmacists was 5.03 ± 1.289 out of a maximum of 7. Almost three-quarters (142, 71%) had a positive attitude toward vitamin supplements.

As shown in **Table 3**, the majority (182, 91%) agreed that vitamins are an important source of profit for pharmacists and that they should provide up-to-date information and seminars to other healthcare providers (182, 91% and 175, 87.5%, respectively). In contrast, more than half (124, 62%) disagreed with the

statement that vitamins and dietary supplements can replace certain medications, such as cholesterol-lowering drugs. Additionally, 166 (58%) believed these supplements should only be prescribed by a dietitian or physician.

Community Pharmacists' Counselling Practice Towards Vitamins Supplements

Among the 200 participating pharmacists, the total practice score was 5.8 ± 1.118 out of a maximum of 6. Nearly one-third (126, 63%) demonstrated good counseling practices regarding vitamin supplements.

Table 4 presents pharmacists' counseling practices assessed in this study. The majority reported adherence to key pharmaceutical care practices, including counseling on vitamin side effects (177, 88.5%), the use of vitamins for prevention or treatment (176, 88%), drug interactions, and assessing signs and symptoms of vitamin deficiency (173, 86.5% and 172, 86%, respectively). However, only 109 (54.5%) followed up with patients to document any positive or negative effects of their chosen vitamin supplement.

Although more than half (122, 61%) of the participants had good knowledge of vitamin supplements, 95 (47.5%) reported moderate confidence in their knowledge based on self-assessment. Additionally, nearly three-quarters (142, 71%) had a positive attitude toward vitamin supplements, while 126 (63%) demonstrated good counseling practices.

Community pharmacists' dispensing practices were also assessed. Results showed that 71 (35.5%) regularly dispensed vitamins without a prescription to at least half of their patients, while only 15 (7.5%) always dispensed them without a prescription.

Table 4. Community pharmacists' practice and beliefs towards vitamins supplements.

Statement	Frequency (n [%])	
	Do	Do not
I frequently check the indications of vitamins for prophylactic or therapeutic purposes if prescription is available	176 [88]	24 [12]
I usually evaluate potential drug interaction with concomitant medications	173 [86]	27 [14]
I counsel the patient /consumer about the side effects of vitamins consumption in large doses	177 [88.5	23 [11.5]
I routinely recheck the prescribed dose according to specific Recommended dietary allowance before dispensing a prescription	151 [75.5]	49 [24.5]
I ask consumers questions to re-evaluate the signs and symptoms of vitamin deficiency to ensure correct vitamin supplement choice	172 [86]	28 [14]
I follow up the patients who are continually using vitamins to record any bad or beneficial effects	109 [54.5]	91 [45.5]

Table 5. Frequency of community pharmacists' vitamin dispensing without prescriptions.

Variable	Category	Frequency (n [%])
Frequency of vitamin dispensing without a prescription	Always [100% of patients]	15 [7.5]
	Mostly [80% of patients]	67 [33.5]
	Usually [50% of patients]	71 [35.5]
	Sometimes [30% of patients]	32 [16]
	Rarely [20% of the patients]	15 [7.5]
Number of patients that purchase vitamins	≤10	119 [59.5]
	>10	81 [40.5]
Age group	Children [8 to 11 years]	38 [19]
	Teens [12 to 17 years]	15 [7.5]
	Adult [18 to 60 years]	136 [68]
	Geriatrics [> 60 Years]	11 [5.5]
Patient assessment	Patient medical history	23 [11.5]
	Dietary habits	26 [13]
	Symptoms reported by the patient	73 [36.5]
	Laboratory test results	78 [39]

To determine the most common age group for vitamin use, pharmacists selected from four options: children, teens, adults, and geriatrics. More than half (136, 68%) identified adults as the primary consumers, whereas only 11 (5.5%) selected geriatrics. Additionally, 119 (59.5%) reported that fewer than ten customers purchased vitamin supplements during their daily practice. When asked how they assessed the need for vitamin supplements, 78 (39%) relied on laboratory test results, while 73 (36.5%) based their decisions on patient-reported symptoms (see **Table 5**).

Community Pharmacists' Opinion Towards Over-The-Counter Vitamin Dispensing for Different Clinical Conditions

The overall opinion score among participating pharmacists was 5.5 ± 1.582 out of a maximum of 9. Three-quarters (150, 75%) expressed a favorable opinion toward over-the-counter (OTC) vitamin dispensing for various clinical conditions.

According to pharmacists, the most common conditions for which vitamins were dispensed as OTC medications included hair and nail loss (191, 95%), the common cold (178, 89%), and weight gain (161, 80.5%). Additionally, more than half believed vitamins could be dispensed OTC for diabetes or hypertension (127, 63.5%) and pregnancy (124, 62%) (see **Table 6**).

Table 6. Community pharmacists' opinion towards OTC vitamin dispensing for different clinical conditions.

Clinical conditions	Frequency (n [%])	
	Can	Can not
Hair and nail loss	191 [95.5]	9 [4.5]
Pregnancy	76 [38]	124 [62]
Anemia	127 [63.5]	73 [36.5]
Elderly condition	128 [64]	72 [36]
Breastfeeding	107 [53.5]	93 [46.5]
Prophylactic antioxidant	122 [61]	78 [39]
Weight gain	161 [80.5]	39 [19.5]
Common cold	178 [89]	22 [11]
Diabetes/hypertension	73 [36.5]	127 [63.5]

Correlation Between Knowledge, Attitude, and Practice

A significant negative correlation was observed between knowledge and attitude among community pharmacists ($p < 0.05$). Additionally, although not statistically significant, negative correlations were found between attitude, opinion, and practice, suggesting that a negative attitude and poor opinion may adversely affect pharmacists' practice and overall professional performance, potentially impacting patient outcomes (see **Table 7**).

Table 7. Correlation among knowledge, attitude, and practice.

Variables	Correlation *r*	Significance *P*
Knowledge-Attitude	-0.195	0.006*
Knowledge-Practice	0.003	0.967
Knowledge-Opinion	0.107	0.133
Attitude-Practice	-0.033	0.639
Attitude-Opinion	0.013	0.858
Practice-Opinion	-0.012	0.867
Note: *Correlation is significant at $p < 0.05$		

Discussion

The dearth of research in exploring the role of community pharmacists in the realm of vitamins still exists in the Libyan context. This study addressed this deficiency by assessing the preparedness of community pharmacists in Libya to meet the complex needs of the Libyan population regarding the use of vitamins and dietary supplements. The study was able to determine the knowledge, attitudes, practices, and opinions of community pharmacists in relation to vitamin supplements in Tripoli, Libya.

In Libya, the dynamic between modern medicine and traditional health practices emphasizes the critical role of pharmacists in effectively advising on the use of vitamin and dietary supplements. The cultural diversity present in Libya further complicates the situation, as it affects health behaviors and practices, thereby rendering the role of pharmacists increasingly complex and vital. Furthermore, the pattern of vitamin consumption in Libya indicates a high prevalence of use (25), which warrants targeted educational initiatives to ensure appropriate dispensing by pharmacists and safe use by the public.

It is widely recognized today that community pharmacists are more likely to prescribe medications, a shift from their traditional role of dispensing medications. The responsibilities associated with community pharmacies require pharmacists to demonstrate competence in their knowledge, perform their duties effectively, and maintain appropriate attitudes when providing advice (15). However, even with the high expectations that individuals seeking vitamins and dietary supplements place on community pharmacists, many pharmacists consider their understanding of nutritional supplements to be inadequate (18). As seen in the current study, 95 (47.5%) of pharmacists felt they had moderate confidence in their knowledge based on their self-assessment.

Nearly three-quarters of community pharmacists surveyed were aware of the toxicity associated with vitamin overuse. These findings were supported by

pharmacists' responses to the vitamin E and vitamin D overuse question, which stated that pharmacists had good knowledge of the toxic effects of vitamin supplements when used in excess of the recommended daily dose. In contrast, results were obtained from pharmacists in India, where community pharmacists surveyed appeared to lack knowledge about the toxic effects of vitamin supplements when used beyond the recommended daily dose (3). Furthermore, pharmacists' scores on perceived knowledge of vitamin-drug interactions, the majority (81.5%) of them selected vitamin K as a vitamin that interacts with warfarin. Similar findings were obtained by Tan C. S. *et al*., who stated that the interaction between warfarin and vitamin K has a significant effect of decreased anticoagulant effect (30). More than half of the surveyed population of community pharmacists had accurate knowledge about the best time to take vitamins. Only (95%) of pharmacists had moderate confidence in their knowledge of vitamins. Abadel conducted similar findings, finding that most community pharmacists did not feel confident in answering patients' questions about vitamins and dietary choices (17).

Pharmacists in Libya according to the current study exhibit a favorable positive attitude towards vitamin supplements. They recognize their responsibility in promoting the safe usage of these products. It was noted that the attitude of responsibility among the participants towards providing information to the general public and other health care professionals was high. More than half (62%) of the pharmacists participating in this study showed a disagreeable attitude towards substituting vitamins with conventional medicines. This aligns with other studies that reveal pharmacists' eagerness to advise on these products as part of their professional roles (12, 31). The positive attitude may be influenced by a prevalent belief among the Libyan population in the health benefits associated with these products (25). Nevertheless, pharmacists often display reservations about selling vitamins and dietary supplements without substantial scientific validation of their safety and efficacy, which is reflected in the literature (24).

Although, there was a positive attitude shown from these participants, still educational interventions should be well-received by Libyan pharmacists if they are accessible and help them with the supply of these products. More than half of the pharmacists (91%) in this study recommended selling vitamins and dietary supplements in pharmacies because it is seen as a major source of profit in community pharmacies. A previous study conducted in Saudi Arabia showed that the most influential factors when recommending vitamins and dietary supplements by community pharmacists were effectiveness and cost (28.5%) (11).

Furthermore, only quarter of the pharmacists (25%) had undergone continues educational training on vitamins and dietary supplements. In consistence with another study, 30.5% 0f pharmacists have been shown to turn to online and media sources, including product advertisements to learn about the products (32). Lack of knowledge on these products has been shown to affect pharmacists' willingness to counsel patients on these products (33). Future investigations might explore the integration of training on vitamins and dietary supplements into the registration renewal process, reflecting a successful approach utilized in Singapore (34).

It was found the current study that 71 (35.5%) of community pharmacists usually dispensed vitamins to 50% of their patients without a prescription. In contrast, only 15 (7.5%) of them always dispensed vitamins without a prescription. Participants were also asked to indicate how they would assess whether a patient needed vitamin supplements. 78 (39%) rely on laboratory test results before dispensing and 73 (36.5%) rely on patient-reported symptoms. According to pharmacists' opinion, the most common clinical conditions for which vitamins were dispensed as over-the-counter medications (OTC) were hair and nail loss (191, 95%). This was in line with a previous study conducted on community pharmacists in Jordan (16). Similar to the study conducted in Saudi Arabia (15), the present study revealed that most pharmacists evaluate potential drug interaction with concomitant medications, counsel the patient /consumer about the side effects of vitamins consumption in large doses and follow up the patients who are continually using vitamins to record any bad or beneficial effects.

A negative correlation was significant association between knowledge and attitude of the community pharmacists ($p < 0.05$). There was also a negative correlation between attitude, opinion, and practice, although not significant, indicating that pharmacists with poor or insufficient knowledge may develop a negative attitude, which in turn leads to poor opinions and suboptimal dispensing practices of vitamin supplements The knowledge of community pharmacists selling vitamins and dietary supplements can eventually not match the increasing sales. Especially after the COVID-19 out-break, where the sales of these supplements have increased significantly (33). Therefore, pharmacists must continuously enhance their knowledge regarding newly introduced vitamins and dietary supplements. This involves educational initiatives that address dosage considerations for specific patient demographics, guidelines on when to cease product usage, assessment of the evidence-based effectiveness of these products for various health conditions, and the development of a referral framework to support pharmacists in their practice. Implementing specialized

training on interactions between vitamins and drugs is also useful.

Conclusion and Recommendations

The current research revealed that pharmacists possess above average level of knowledge, attitudes, and practices regarding the nonprescription dispensing of vitamins and dietary supplements. This indicates a significant lack of awareness about their appropriate use among many pharmacists. The results highlight the necessity for focused educational initiatives aimed at enhancing pharmacists' understanding and improving their dispensing practices. The study advocates for the regular authorities of continuing education and professional development programs for community pharmacists, which could be effectively facilitated by professional and regulatory bodies, with an emphasis on collaboration with pharmacy schools and professionals to conduct refresher courses.

Study Limitations

This study has a few limitations. First, although validation procedures were employed for the survey questionnaire, self-reported data collection methods may introduce biases. Second, the pharmacists recruited in this study were from only one city in Libya, Tripoli, which limits the generalizability of the findings to community pharmacists in other cities. Future studies with a more diverse and geographically varied sample would be necessary to provide more comprehensive insights.

Declarations

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Conflict of Interest

There are no financial, personal or professional conflicts of interest to declare.

Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Ethics Statement

This study obtained ethical approval before distributing the questionnaire to pharmacists from the Scientific Research Ethics Committee of the University of Tripoli/Tripoli-Libya; (Registered under reference number: SREC-UOT 010/79). An oral consent form was obtained from all participants before filling out the questionnaires. Participants names and personal identifiers were not used to ensure confidentiality and they were also informed that their participation was completely voluntary and that they were free to decline participation in the study at any time without any consequences.

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