








Original Research

A systematic review of community pharmacist practices in complementary medicine

Su Myat Thin , Daylia Thet , Jia Yu Li , Tulakarn Nakpun , Sujin Nitadpakorn , Chamipa Phanudulkitti , Bernard A Sorofman, Suntaree Watcharadamrongkun, Tanattha Kittisopee 

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Abstract

Background: The people who use complementary medicines (CMs) believe that these medicines are safe and harmless. They could easily access CMs like herbal or traditional medicines in community pharmacies. Therefore, community pharmacists are important professionals in advising the safe choices of CMs and providing evidence-based information for customers to decrease adverse effects of CMs. **Objectives:** To systematically review knowledge, attitude, and practices of community pharmacists about CMs, and the factors associated with CM practices of dispensing, recommending and counseling patients, and answering the patients' queries. **Method:** An electronic search was performed with four databases: PubMed, Scopus, SpringerLink and ScienceDirect, from 1990 to 19th May 2022. The inclusion criteria were studies 1) about knowledge, attitude, and/or practices of community pharmacists about CMs, 2) written in English, 3) conducted with quantitative methods, and 4) able to retrieve full text. **Results:** Twenty-three studies were included in this systematic review. Some studies showed that less than half of the pharmacists asked or counselled about CMs to their patients and answered the patients' queries about CMs. Only 20% of the pharmacists did report CM side-effects. Training or education about CMs was a common factor associated with the CM practice of dispensing, recommending, counseling, and answering the patients' queries about CMs. CMs recommended most by community pharmacists were vitamins & minerals, food or dietary supplements, fish oil and probiotics. The most common dispensed CMs were vitamins & minerals, herbs, food or dietary supplements, fish oil and essential oils. Lacks of reliable information sources and scientific evidence were common barriers for the CM practices. Being less expensive than conventional medicines motivated the pharmacists to recommend and discuss about CMs. The community pharmacists that participated in included studies suggested strengthening CM trainings and highlight the pharmacist role in CM therapy. **Conclusion:** A high percentage of community pharmacists did dispense CMs to their patients, while a low percentage of the pharmacists did report CM side effects. Pharmacists were most comfortable recommending and responding the patients' CM queries. Training or education about CMs associated with CM dispensing, recommending, discussing, and answering the patients' queries about CMs was recommended.

Keywords: knowledge; attitude; practice; community pharmacy; complementary medicine

Su Myat THIN. Faculty of Pharmaceutical Sciences, Chulalongkorn University, 254 Phayathai Road, Pathumwan, Bangkok, 10330, Thailand. sumyatthin.cherry@gmail.com

Daylia THET. Faculty of Pharmaceutical Sciences, Chulalongkorn University, 254 Phayathai Road, Pathumwan, Bangkok, 10330, Thailand. daliathet@gmail.com

Jiayu LI. Faculty of Medicine, Chulalongkorn University, Pathumwan, Bangkok, Thailand. Jiayu93@outlook.com

Tulakarn NAKPUN. Faculty of Pharmacy, Srinakharinwirot University, Ongkharak, Nakhon Nayok, 26120, Thailand. tulakarn@g.swu.ac.th

Sujin NITADPAKORN. Faculty of Pharmacy, Thammasat University, Khlong Nueng, Khlong Luang District, Pathum Thani, 12120, Thailand. sujin.ni@tu.ac.th

Chamipa PHANUDULKITTI. Faculty of Pharmaceutical Sciences, Burapha University, Thailand. chamipa@go.buu.ac.th

Bernard A SOROFMAN. College of Pharmacy, The University of Iowa, 115 South Grand Avenue, Iowa City, IA, 52242, USA. Bernard-sorofman@uiowa.edu

Suntaree WATCHARADAMRONGKUN. Faculty of Pharmaceutical Sciences, Chulalongkorn University, 254 Phayathai Road, Pathumwan, Bangkok, 10330, Thailand. Suntaree.W@pharm.chula.ac.th

Tanattha KITTISOPEE*. Faculty of Pharmaceutical Sciences, Chulalongkorn University, 254 Phayathai Road, Pathumwan, Bangkok, 10330, Thailand. kittisopee@pharm.chula.ac.th

INTRODUCTION

Complementary medicines (CMs) are a group of medicines, therapies, or treatments outside conventional medical practice, which included naturopathy, herbal medicines, anthroposophical medicines, traditional medicines, and homeopathy.^{1,2} Most people who used CMs believed that these medicines were safe and harmless. Based on the estimation of the Australian Bureau of Statistics, 1.8 to 4.07 million Australians were at risk for CM adverse reactions.³ A Belgian study investigated that an herb used by the people for weight loss and their subsequent renal disease were possibly related.⁴ The study described that in Belgium, at least 100 cases of renal interstitial fibrosis had been observed in women who used a weight-loss regimen containing Chinese herbs.⁴ Among Asian countries, liver injury related to complementary and alternative medicines is one main cause for the high incidence of hepatotoxicity including acute liver failure.⁵ One study described that about 70% of the patients were hospitalized for management of drug-induced liver injury related to CMs,



of whom 9% died.⁵ In Japan, hepatocellular liver injury was common and symptoms like nausea, anorexia and general malaise were frequently found in the users of CMs.⁵ In Korea, liver enzyme elevation was higher in patients who used CMs and 3 among 5 patients who died in hepatocellular liver injury had drug-related liver injury due to CMs.⁵ In India, 68% of 1666 patients with cirrhosis had used CMs and approximately 36% presented with liver injury related to CMs which could lead to acute or chronic liver failure. Among these patients with CM-related liver failure, 63% reported as self-medicated and 53% died with 194 days of the median survival time.⁵

People use CMs worldwide with or without prescriptions by professional practitioners or healthcare providers. CMs were commonly used in promoting general health care, treating specific diseases, and caring for chronic conditions like depression, anxiety, headaches, and cancer.¹ The global market of CMs was over U.S \$ 100 billion in 2017.¹ People could easily access CMs like herbal or traditional medicines in community pharmacies.^{6,7} A U.S study showed that 72% of the participants using the complementary and alternative medicines had not reported their uses to their medical doctors.⁸ This study estimated that nearly 20 million people in the U.S were estimated to have no supervision of complementary and alternative medicine uses by any healthcare providers.⁸ Health Product Association (HPA) in South Africa found that 50% of complementary medicinal sales turnover appeared in pharmacies.⁹ The herbal product sales in pharmacies grew 34% in U.S during the year 1995. Community pharmacies became one of the primary outlets for complementary or alternative medicines.^{6,9,10} Community pharmacists are well-placed experts to undertake a professional role to advise the people for medication and healthcare services in community pharmacies. Community pharmacists, therefore, are important persons in advising the safe choices and usages of CMs and evidence-based information for customers or patients and to assist in decreasing the adverse effects of CMs.^{11,12} Professional practice behavior of the community pharmacists towards CMs is influenced by not only the CM knowledge and trainings but also their attitude towards these medicines.¹³ Regarding the Knowledge-Attitude-Practice (KAP) model, knowledge and attitude of the pharmacists are important factors influencing the pharmacists' practice behavior.¹⁴

Therefore, this study aimed to systematically review knowledge, attitude, and practice of community pharmacists about CMs and the factors affecting the CM practice. This review intended to highlight the practice of CM in the community pharmacies including dispensing, advising, discussing, or referring to other healthcare practitioners done by the community pharmacists. This systematic review also aimed to describe barriers and motivators of CM practicing behavior of the community pharmacists and to summarize the facilitators which had been suggested for CM practice improvement by community pharmacists participated in included studies. This study is useful in guiding the interventions or the systematic development of CM practice in community pharmacies.

METHOD

Data sources and searches

This systematic review was conducted following PRISMA (the Preferred Reporting Items for Systematic reviews and Meta-Analysis) review guidelines.¹⁵ There were four databases: PubMed, Scopus, SpringerLink and ScienceDirect. The search string used to search in these databases was: (knowledge OR attitude OR practice) AND (community pharmacist OR retail pharmacist) AND (complementary medicine OR traditional medicine OR alternative medicine OR natural medicine). This review is limited to studies about only community pharmacists, not including multi-types of healthcare professionals and other types of pharmacists. This systematic review included articles published between 1990 and 19th May 2022. The search data details are shown in Appendix A.

Study selection

The titles and abstracts of the obtained articles from 4 databases were screened by three researchers (S.M.T, D.T and L.J.Y) according to the inclusion criteria which were 1) written in English, 2) conducted with quantitative methods, 3) able to retrieve full text and 4) evaluated the knowledge, attitude, and/or practice of community pharmacists towards CM use. The research studies were excluded if the studies included pharmacists who practice other than in community settings or with diverse healthcare professionals and did not distinguish between the types of pharmacists in the results (e.g., specifically identify community pharmacist practices and opinions). Duplicate studies were deleted.

Quality assessment of articles

The included studies were read entirely, and their methodology quality scores were assessed by using the QualSyst tool by Kmet, Lee, and Cook which includes 14 criteria for all characteristics of study design (in Appendix B).¹⁶ The total average score ranged between 0 and 1. According to the previous study which used with this tool,¹⁷ a score equal to or above 0.75 indicated the appropriate quality of studies. This quality assessment was performed by five researchers (S.M.T, D.T, L.J.Y, S.N, T.N) on each study to reduce the risk of bias and average scores of each criterion from all reviewers was computed.

Data extraction

Initially, the information about knowledge, attitude, and practice of the community pharmacists towards CMs and the factors affecting the pharmacists practicing CMs were extracted. Other study characteristics such as authors, published year, age of the participants, sample size, and response rate of the study were also extracted. CMs recommended and dispensed by community pharmacists and CMs required by the customers were extracted. Content analysis suggested themes which were knowledge, attitude, and practice of community pharmacists towards CMs, the factors associated with their CM practices, and barriers, motivators and facilitators affecting the CM practices.



Secondly, similarities of the results related to knowledge, attitude, and practice of community pharmacists towards CMs were identified. Under the theme of knowledge, there were five sub-themes: actual knowledge, perceived knowledge, sources of CM knowledge, CM information, and educational suggestion from the pharmacists. Attitude themes included attitudes towards effectiveness and safety of CMs, and favorableness of CMs. In the practice theme category, the sub-themes were CM dispensing, recommending CMs to patients, counseling or discussing about CMs, and answering the queries about CM by the patients, other documenting practices about patients' CM use, referring the patients to other practitioners/experts, and using CM as self-treatment. Intention to practice CMs was also included in the practice theme. Additionally, the factors associated with the pharmacists' CM practices were also observed while the barriers and motivators of their CM practices and the facilitators for improvement of the CM practices were classified and grouped.

Finally, all extracted data showing the knowledge, attitude, CM practice of the community pharmacists and the factors associated with CM practices were descriptively summarized. Most of the results were reported as a percentage. Correlation coefficient effect size (r) or standardized mean-difference effect size (d) was calculated using a Practice Meta-analysis Effect Size Calculator by David B. Wilson in order to describe the magnitude of relationship among factors affecting CM practice.¹⁸ The results about the barriers, motivators, and facilitators for community pharmacists' CM practices in their pharmacies were also displayed with the average percentages. The data were extracted and analyzed by three researchers (S.M.T, S.N and T.N) and reviewed by another researcher (T.K*). Disagreements were resolved by consensus among authors. All the analyses were performed using Microsoft Excel (MS office 365).

RESULT

There were 696 articles from 6 databases identified as in Figure 1. After removing the 75 duplicates, 621 articles were remained to screen their titles and abstracts. Of these 621 articles, 581 articles were discarded because they were not related to CMs and community pharmacists. Fourteen from 40 articles assessed for eligibility were further discarded because 2 studies did not show the specific data about the community pharmacists and 12 studies did not include the quantitative data (shown in Appendix D). Using 14 quality criteria of the QualSyst tool, 23 out of 26 eligible studies had quality assessment score above 0.75 and they were totally appropriate in all applicable criteria (in Appendix C). Thus, these 23 studies were included in this systematic review. Among these studies, five studies had the total average assessment score equal to 1, 9 studies had the score between 0.9 to 0.95, and 5 studies had the score between 0.75 and 0.85. Nine studies did not report the estimate of variance for the main results.

A total of 6,870 participants were found in the 21 reviewed studies. The range of study participant numbers was from

31 to 1392. The studies were conducted in 11 countries, namely in U.S, Australia, Saudi Arabia, China, Lebanon, South Africa, Palestine, U.K, Egypt, Jordan, and Malaysia. The study characteristics are shown in Table 1. Out of 23 studies, 21 reported knowledge of pharmacists about CM information and 17 reported pharmacists' attitude towards CMs. Twenty-one studies reported the results about the pharmacists practicing or intending to practice CMs in their community pharmacy.

Knowledge

Two aspects of knowledge were conceptualized from all included studies in our systematic review, which included actual and perceived knowledge of CMs. Other issues related to knowledge were sources of CM knowledge, knowledge delivery methods, CM information resources and CM educational suggestions by community pharmacists (in Table 1).

Actual knowledge

Eight studies had tested the pharmacist knowledge with the questions about the indications, contraindications, drug interactions, and safety or side effects of herbal, nutritional, traditional, or dietary products.^{1,6,19-24} In 6 out of the 8 studies, more than 50% of community pharmacists correctly answered knowledge of omega-3, ginkgo, echinacea, St. John's wort, arnica, ginger, chamomile, saw palmetto, herb feverfew, and glucosamine & chondroitin while few pharmacists (10-17%) correctly answered about garcinia, green tea, and

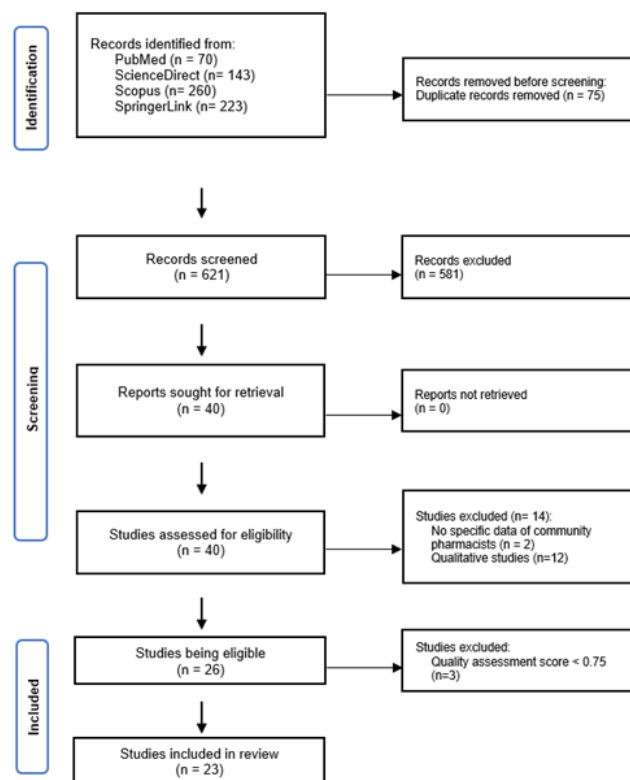


Figure 1. PRISMA flowchart of the included articles in the systematic review



Table 1. The characteristics of included studies					
Author, Year, study location	Sample size (response rate)	CM products in the study	CM knowledge and information sources	Attitude towards CM	CM practice/ intention to practice
Kanjanaratch et al, 2011, Australia ⁶	262 (42%)	CM products in general	<p>Perceived knowledge</p> <ul style="list-style-type: none"> 64.4%, 47.4%, 41.2%, 37.5%, 34.8%, 33.6%, 30.9%, 30.3% and 19.3% of community pharmacists had confidence in how to take CM, how long the products should be taken, knowledge about CM contents, drug interaction of CM, CM effectiveness, side-effect, quality, precautions, and mechanism of action, respectively. Approximately 60% of the pharmacists had trainings for CMs. <p>Sources of CM knowledge</p> <ul style="list-style-type: none"> Approximately 60% of the pharmacists had trainings for CMs. 	<ul style="list-style-type: none"> 61.6%, 60%, 53.1% and 44.6% of the pharmacists agreed that most CMs had over-stated benefits, had therapeutic benefits, were safe and were good quality, respectively. 34.6% and 7.1% of the pharmacists agreed that CMs were worth taking and cost-effective. 	<ul style="list-style-type: none"> 4.7% of the pharmacists decided to sell CMs to cases which were not considered appropriate.
Taing et al, 2017, Australia ³⁶	99 (51%)	Garcinia, green tea & chromium for weight loss	<p>Actual knowledge</p> <ul style="list-style-type: none"> 10%, 17% and 17% of the pharmacists had selected correct answers for efficacies of chromium, garcinia and green tea, respectively. 46.5%, 61.6% and 62.6% of the pharmacists were not sure about side effects of green tea, garcinia and chromium. 68.7%, 69.7% and 76.8% of the pharmacists were not sure about drug interactions of green tea, chromium and garcinia. <p>Perceived knowledge</p> <ul style="list-style-type: none"> 6%, 11% and 13% of the pharmacists perceived having a good working knowledge of garcinia, green tea and chromium. 	<ul style="list-style-type: none"> About 50% of the pharmacists incorrectly believed that green tea, chromium, and garcinia were possibly effective in weight loss. Less than 5% of the pharmacists incorrectly believed that there was no side effect or drug interaction of green tea, chromium, and garcinia. 	<p>Intention</p> <ul style="list-style-type: none"> 46%, 43% and 35% of the pharmacists would recommend chromium, garcinia and green tea, respectively, to customers for weight loss.
Al-Arifi et al, 2013, Saudi Arabia ³⁴	1392 (82.4%)	Herbal medicines in general	<p>Sources of CM knowledge</p> <ul style="list-style-type: none"> 62.6% of the pharmacists had received previous continuing education about herbal medicines. <p>CM information</p> <ul style="list-style-type: none"> 44.8%, 39%, 32.9% and 13.3% of the pharmacists got CM information from internet websites, package inserts, books, and computer databases, respectively. 47.5%, 38.4%, 28%, 17.4% and 14.3% of the pharmacists reported internet websites; books, package inserts, consultation services by pharmacists, and computer databases, respectively, as helpful resources in caring for their patients. <p>Actual knowledge</p> <ul style="list-style-type: none"> 93.5%, 83.2%, and 81.9% of the pharmacists correctly answered about indications of omega-3, ginkgo, and echinacea, respectively. 24.5% of the pharmacists correctly answered about contraindication of echinacea. 78.4%, 61.3%, 19.4% and 19% of the pharmacists correctly answered about drug interactions of vitamin C, ginkgo, valerian, and omega 3, respectively. 21.9% and 49.7% of the pharmacists correctly answered about side effect of ginseng and vitamin B, respectively. <p>Sources of CM knowledge</p> <ul style="list-style-type: none"> 73.2% of the pharmacists had received previous education/ training on CM products during university and 17.7% had received postgraduate education/ training on CM products. 	<ul style="list-style-type: none"> 63.8%, 52.5%, 25.8% and 16.1% of the pharmacists believed that CM products were effective, had less side effect, were of good quality, and were well regulated, respectively. 	<ul style="list-style-type: none"> 44.3% of the pharmacists reported that the patients initiated the discussion of herbal issues. 20.8% of the pharmacists initiated the conversation of herbal medicine use to the patients. 76.1% of the pharmacists sold herbal medicines at their pharmacy. 9.4% and 20.3% of the pharmacists never and rarely recorded patients' herbal medicine use.
Hijazi et al, 2019, Lebanon ¹	341 (86.1%)	CM products in general	<p>Actual knowledge</p> <ul style="list-style-type: none"> 93.5%, 83.2%, and 81.9% of the pharmacists correctly answered about indications of omega-3, ginkgo, and echinacea, respectively. 24.5% of the pharmacists correctly answered about contraindication of echinacea. 78.4%, 61.3%, 19.4% and 19% of the pharmacists correctly answered about drug interactions of vitamin C, ginkgo, valerian, and omega 3, respectively. 21.9% and 49.7% of the pharmacists correctly answered about side effect of ginseng and vitamin B, respectively. <p>Sources of CM knowledge</p> <ul style="list-style-type: none"> 73.2% of the pharmacists had received previous education/ training on CM products during university and 17.7% had received postgraduate education/ training on CM products. 	<ul style="list-style-type: none"> 63.8%, 52.5%, 25.8% and 16.1% of the pharmacists believed that CM products were effective, had less side effect, were of good quality, and were well regulated, respectively. 	<ul style="list-style-type: none"> 29.7% and 29.7% of the pharmacists always and often got inquiries about the use of CM products from the patients. 40.6% and 23.9% of the pharmacists always and often advised the patients about safe uses. 43.9% and 18.4% of the pharmacists always and often asked their patients about the feedback after using CM products. 35.2% and 33.5% of the pharmacists always and often sold CM products in their pharmacies. 9.7% and 7.4% of the pharmacists always and often reported any side-effect occurred with patients using CM products. 39% and 21.3% of the pharmacists always and often checked for CM product interaction with any drug.



Brown et al, 2005, U.S. ³¹	130 (33%)	CM products in general	Sources of CM knowledge <ul style="list-style-type: none"> 10.3% of the pharmacists had training or certificate in CM. 	<ul style="list-style-type: none"> Pharmacists agreed with the importance of having sufficient knowledge about CM therapies (3.7 ± 1.0: 5-point Likert scale). 	<ul style="list-style-type: none"> Pharmacists rarely to sometimes got inquiries from the patients in a day. (2.4 ± 2.4: 5-point Likert scale) Pharmacists rarely to sometimes asked their patients about their CM use (2.5 ± 0.9: 5-point Likert scale). Beside encouraging CM therapies, pharmacists sometimes took other actions such as suggesting the patients check with physicians or recommend alternations in CM dosage (3.1 ± 1.5: 5-point Likert scale). Pharmacists rarely to sometimes recommended other CM therapies that they deemed appropriate. (2.4 ± 0.9: 5-point Likert scale) 71% of the pharmacists had patients using CM.
Thandar et al, 2019, South Africa ²⁸	82 (51.9%)	CM products for Atopic Eczema	Perceived knowledge <ul style="list-style-type: none"> 87%, 83%, 78%, 59% and 16% of the pharmacists reported being slightly to very familiar with dietary supplements, herbal products, probiotics, homeopathy, and Chinese herbal medicines. 30% and 12% of the pharmacists rarely and never had confidence discussing CM therapies with patients. 55% of the pharmacists did not have any training on CMs. 20%, 6% and 4% of the pharmacists frequently used internet, medical journals, and congresses to access CM information, respectively. 35%, 44% and 82% of the pharmacists did not access CM information from internet, medical journals, and congresses, respectively. Educational suggestion from the pharmacists <ul style="list-style-type: none"> 94% of the pharmacists agreed that universities should include CM as part of the curriculum. 	<ul style="list-style-type: none"> 15%, 11% and 10% of the pharmacists had negative attitudes that CM products interfered with standard medical care; had placebo effect; and made fraudulent or quackery; respectively. 37%, 35%, 29% and 11% of the pharmacists had positive attitudes that CMs were safe with less side effects; benefited more than conventional medicines; provided more holistic approach to health than conventional medicines; and produced more complete clinical results than conventional medicines, respectively. 	<ul style="list-style-type: none"> 68%, 57% and 45% of the pharmacists sometimes to always had a discussion when their patients requested CMs; referred patients to CM practitioners for CM treatment; and advised patients about CMs for atopic eczema; respectively.
Alsayari et al, 2018, Saudi Arabia ²⁰	233 (100%)	Herbal medicines in general	Actual knowledge <ul style="list-style-type: none"> Most of the pharmacists had correct answers about indications of echinacea (96.1%), St. John's wort (96.6%), arnica (85%), ginger (66.5%), ginkgo (85.8%), and chamomile (74.7%). 77.3% of the pharmacists correctly answered about the contraindication of Maca-root. Majority of the pharmacists correctly answered about drug interaction of ginkgo (95.3%) and Valerian (82.8%), and St. John's wort (21.5%). 88.8% correctly answered about the side effect/safety of Ginseng. Educational suggestion from the pharmacists <ul style="list-style-type: none"> 74.2% agreed that continuing education on herbal medicines should be mandatory. 	<ul style="list-style-type: none"> 71.6% of the pharmacists had a positive attitude towards the efficacy of herbal medicines. 18.4% of the pharmacists had a negative attitude towards limited use of herbal medicines for only the patients failed traditional prescription therapies. 	<ul style="list-style-type: none"> 87.6% of the pharmacists sometimes to always got inquiries about herbal medicines from patients. 94.9% of the pharmacists sometimes to always counselled their patients about herbal uses. 94.9% of the pharmacists sometimes to always used herbal medicines for self-treatment. 89.3% of the pharmacists sometimes to always dispensed herbal medicines in their pharmacies.



<p>Shraim et al. 2017, Palestine²⁴</p>	<p>284 (90.7%)</p>	<p>CM products in general</p>	<p>Actual knowledge</p> <ul style="list-style-type: none"> 52% and 34% of the pharmacists reported the correct answers concerning the indications of ginger and echinacea, respectively. 86.8%, 66.9% and 59.4% of the pharmacists correctly answered about the contraindications of semna, spinach and fenugreek. 58% and 20% of the pharmacists correctly answered about drug interactions of garlic and bran. 55.5% of the pharmacists correctly answered about the safety/ side effect of caffeine. <p>Perceived knowledge</p> <ul style="list-style-type: none"> 57.3% of the pharmacists had confidence to discuss about CMs with customers. <p>CM information</p> <ul style="list-style-type: none"> 67%, 46%, 39%, 36% and 32% of the pharmacists got the CM information from internet, specific website, product package instructions, formal pharmacy education, and industry magazine or materials, respectively. Most community pharmacists required CM information about drug interaction (71.2%), CM use in pregnancy (70.8%), side effect (64.8%), evidence-based efficacy (63.7%), caution of CM use (63%), CM use in children (59.8%), CM dose (45.9%), CM usage (36.3%), choice of product (24.6%) and supplier (16%). 	<ul style="list-style-type: none"> 62%, and 38.4% of the pharmacists had positive attitudes that CMs improved general health and cured diseases; and were with less side effects. 36% of the pharmacists had a negative attitude that CMs' results were mainly due to placebo effect. 			<ul style="list-style-type: none"> 98% of the pharmacists sold TM products in their pharmacy. 97.3% of the pharmacists discussed or advised about TM products with the customers.
<p>Chen et al, 2016, China²¹</p>	<p>252 (93.3%)</p>	<p>Traditional medicines in general</p>	<p>Actual knowledge</p> <ul style="list-style-type: none"> 36.4% and 33.3% of the pharmacists correctly answered about the contraindications of licorice and honeysuckle. 56.3% of the pharmacists correctly answered about drug interaction of honeysuckle. 78.8% of the pharmacists correctly answered about drug interaction of ginkgo and garlic. <p>Sources of CM knowledge</p> <ul style="list-style-type: none"> 94.4% of the community pharmacists had learned about traditional medicines (TM). 58%, 52% and 49% of the pharmacists learned about TM in pharmacy school, through continuing professional education and self-learning. 27.1% of the pharmacists got TM knowledge from employer-sponsored or manufacturer-provided trainings. <p>CM information</p> <ul style="list-style-type: none"> The community pharmacists got TM information from reference books (67%), medical journal (57%), databases (43.7%), professional seminars or lectures (38.1%), word of mouth (friends or family) (33.3%) and internet (30.3%). 				



Alkharfy et al, 2010, Saudi Arabia ³⁹	115 (100%)	Herbal products in general	<p>Actual knowledge</p> <ul style="list-style-type: none"> 78%, 82% and 91% of the pharmacists correctly answered about the indications of ginkgo, St. John's wort, and echinacea. 90% of the pharmacists correctly answered about contraindication of ginseng. 60%, 30% and 28% of the pharmacists correctly answered about the interactions of ginkgo, St. John's wort and valerian. 90% of the pharmacists correctly answered about side effect of ginseng. <p>Perceived knowledge</p> <ul style="list-style-type: none"> 81% of the pharmacists self-rated as good to excellent for their herbal knowledge. <p>CM information</p> <ul style="list-style-type: none"> 40%, 33%, 21% and 6% of the pharmacists got herbal knowledge from product package instructions, product representatives, formal pharmacy education and internet. 	<ul style="list-style-type: none"> 53% and 30% of the pharmacists believed that herbal products were effective and harmless, respectively. 56% of the pharmacists concerned about the safety of herbal products. 	<ul style="list-style-type: none"> 63%, 32% and 5% of the pharmacists received requests for herbal products daily, weekly, and monthly, respectively.
Song et al, 2017, China ³⁵	317 (78%)	Traditional medicines in general	<p>Educational suggestion from the pharmacists</p> <ul style="list-style-type: none"> 57.9% of the pharmacists suggested to strengthen TM trainings. 	<ul style="list-style-type: none"> 94.6% of the pharmacists recommended TM to the customers. 	
Tiralongo et al, 2010, Australia ²⁷	736 (16.8%)	CM products in general	<p>Perceived knowledge</p> <ul style="list-style-type: none"> 86% of the pharmacists had confidence to discuss CMs. 48% of the pharmacists perceived that they had sufficient knowledge to recommend CMs. <p>Sources of CM knowledge</p> <ul style="list-style-type: none"> 73%, 42%, 30% and 28% of the pharmacists obtained their knowledge through self-directed learning, from manufacturer seminars, in professional seminars and in undergraduate courses. Only 10% of the respondents had a formal degree, certificate, or diploma in CM. <p>CM information</p> <ul style="list-style-type: none"> 56%, 48%, and 43% of the pharmacists used the professional reference texts, CM textbooks or the internet to access the CM information. <p>Knowledge delivery methods</p> <ul style="list-style-type: none"> Most of the pharmacists preferred short online courses (53%), face to face seminars (45%), self-directed learning through journals (43%), electronic newsletter (34%), weekend workshops (23%), and online postgraduate courses (22%), to access CM information. 	<ul style="list-style-type: none"> 68% and 88% of the pharmacists believed that CMs were effective, and the quality was not sub-standard. 60% of the pharmacists had confident about the quality of CM products made in Australia. 	<ul style="list-style-type: none"> 40% of the pharmacists got queries from the customers. 51% of the pharmacists discussed about CM uses with customers. 27% of the pharmacists noted the information of adverse reaction in the patients' profiles.



<p>Herbal and nutrient CMs for weight loss</p>	<p>Perceived knowledge</p> <ul style="list-style-type: none"> 43% of pharmacists had confidence in providing CMs for weight loss. Sources of CM knowledge 59% of the pharmacists accessed learning modules during continuing professional development. CM information 51%, 47% and 8% of the pharmacists obtained CM information from company representatives, industry, and continuing professional development (CPD) lectures or workshops, respectively. The most used information resources by pharmacists were a tertiary resource such as MIMs/ AusDI (91%), internet (89%), Australian Medicines Handbook and APF Handbook (76%), and colleagues (71%). The most useful resources perceived by pharmacists were internet (90%), CM textbook (87%), online databases (87%), colleagues (85%), and specific websites (83%). Most of the pharmacists sought information about drug interaction (85%), evidence of efficacy (81%), contraindication (76%), ADR (71%), dose (62%), mechanism of action (59%), use while breastfeeding (55%), use in pregnancy (50%), product selection (34%), supplier/ wholesaler (29%), and use in children (27%). 85% of the pharmacists had desire to learn WLCM education further and believed that it would benefit their professional practice. Knowledge delivery methods 83%, 81%, 46% and 37% of the pharmacists preferred CM information delivering via learning modules, CPD, lectures/ workshops, and company representatives, respectively. 	<p>Herbal and nutrient CMs for weight loss</p>	<ul style="list-style-type: none"> 30.3% and 22% of the pharmacists reported that CMs for weight loss were safe and had less side effect; and had more benefits than conventional medicines, respectively. 37% of the pharmacists reported that patients sought pharmacist advice about weight-loss CMs. 10% of the pharmacists recommended CMs for weight loss to patients.
<p>Herbal products in general</p>	<p>Sources of CM knowledge</p> <ul style="list-style-type: none"> 8.6% of the pharmacists had CM training. The pharmacists were definitive about the importance of having adequate CM knowledge (4.1 ± 0.8 in 5-point Likert scale) 	<p>CM products in general</p>	<ul style="list-style-type: none"> Pharmacists rarely to sometimes asked their patients about CAM use (2.6 ± 1.2 in 5-point Likert scale). Pharmacists sometimes to usually checked with their physician (3.4 ± 1.4 in 5-point Likert scale).
<p>Herbal medicines in general</p>	<p>Herbal medicines in general</p>	<p>Herbal medicines in general</p>	<ul style="list-style-type: none"> 67.7% of the pharmacists recommended herbal medicines to their patients. 28% of the pharmacists reported using herbal medicines by themselves. 7% of the pharmacists agreed to usually adding herbal medicines to the patients' medication profiles.

Taing et al, 2016, Australia²⁹

Brown et al, 2011, U.S.³²

Bouldin et al, 1999, U.S.³⁰



Barnes et al, 2007, U.K. ³⁰	818 (66.5%)	CM products in general	Sources of CM knowledge <ul style="list-style-type: none"> 39.8% of the pharmacists received CM trainings. 8.4% of the pharmacists received CM training as part of their undergraduate pharmacy degree program. 	<ul style="list-style-type: none"> 76.4% of the pharmacists received requests for specific CMs from patients. 54.3% of the pharmacists recommended CMs to their patients. 4.5% of the pharmacists recorded CM uses on patient medication records.
Coon et al, 2015, U.S. ²²	31	Dietary supplement products	Actual knowledge <ul style="list-style-type: none"> 87%, 84%, 84%, and 68% of the pharmacists correctly answered about indications of echinacea, saw palmetto, glucosamine and chondroitin, and herb feverfew. 74%, 48%, and 13% of the pharmacists correctly answered about drug interactions of St. John's wort, Glucosamine and chondroitin, and feverfew. 84%, 35%, 32% and 23% of the pharmacists correctly answered about side effect of echinacea, saw palmetto, feverfew, and St. John's wort 	<ul style="list-style-type: none"> The pharmacists were neither confident nor hesitate about CM efficacy. The pharmacists were confident in CM safety. When the pharmacists took CMs by themselves, they were confident in CM effects.
Medhat et al, 2020, Egypt ²⁵	368 (73.6%)	Dietary supplements	Perceived knowledge <ul style="list-style-type: none"> 70.6%, 40.3%, 23.9%, 20.9% and 15.7% of the pharmacists perceived having good to excellent knowledge about indications, contraindications, adverse effects, efficacy, and drug interactions of the dietary supplements, respectively. Sources of CM information <ul style="list-style-type: none"> 65.5% of the pharmacists had nutritional information in graduation study but only 6% had nutritional training in post-graduation study. 64.1%, 58.4%, and 2.7% of the pharmacists got the nutritional information from journals, internet, and the past experiences. CM information <ul style="list-style-type: none"> 96.7%, 28.5% and 13.6% of the pharmacists used nutritional information from products' labels, internet, and medical representatives, respectively. 	<ul style="list-style-type: none"> 88.6% of the pharmacists provided the nutritional advice only upon customer request. 34% of the pharmacists initiated nutritional advice based on their observations even without customer request. 53% of the pharmacists referred their patients to their physician or dietician.



<p>Shilbayeh et al, 2011, Jordan ²³</p> <p>388 (97%)</p>	<p>Vitamin supplements</p>	<p>Actual knowledge</p> <ul style="list-style-type: none"> 80.7%, 77.8%, 33.8% and 20.9% of the pharmacists correctly responded to the knowledge questions about unlabeled toxic ingredients in multivitamin supplements, less achievable balanced diet by multivitamin supplements than eating healthily, shortening lifespan by chronic consumption of vitamins, and causality of cancers by multivitamins, respectively. 76.8% and 74.5% of the pharmacists correctly answered about the depletion of vitamins by chronic consumption of some drugs, and serious drug interaction potentiated by vitamin supplement consumptions. <p>Perceived knowledge</p> <ul style="list-style-type: none"> 67% of the pharmacists perceived that they had sufficient information about the manifestations of vitamin deficiency but 25% believed that they had sufficient education of vitamins. <p>Sources of CM knowledge</p> <ul style="list-style-type: none"> 10% and 15% of the pharmacists had vitamin education in undergraduate courses and through company seminars during their pharmacy practice, respectively. <p>CM information</p> <ul style="list-style-type: none"> The pharmacists referred leaflets/ package inserts (40%), sales promoters (25%), unspecified sites on internet (16%), reference books (3-10%) as the information sources. 	<p>6.4% of the pharmacists thought that selling vitamin supplements in pharmacy was safer.</p>	<ul style="list-style-type: none"> 80% of the pharmacists recommended vitamin supplements very often and even without prescription. 60.6% of the pharmacists evaluated the potential vitamin and other medication interactions. 75.3% of the pharmacists reviewed the patient profile for the contraindications of vitamin supplements. 50.3% of the pharmacists rechecked the prescribed dose of the supplements according to specific recommended dietary allowance (RDA) before dispensing a prescription. 55.9% of the pharmacists were keen to follow up the consumers using vitamins to record their side effects. <p>Intention</p> <ul style="list-style-type: none"> 58.2% of the respondents would dispense all vitamins without prescription.
<p>Tahir et al, 2020, Malaysia ²⁶</p> <p>103 (100%)</p>	<p>Herbal medicines in general</p>	<p>Perceived knowledge</p> <ul style="list-style-type: none"> 92.2% of the pharmacists self-evaluated having good knowledge about the herbal medicine uses. 	<p>Most of the respondents assumed that herbal medicines were safer to use and had less or no side effects.</p>	<ul style="list-style-type: none"> 81.1% of the Chinese community pharmacists had recommended TM to family and friends. 70.5% of the pharmacists estimated that 20% of their daily practice involved the TMs. 79.5% of the pharmacists had taken traditional Chinese medicines. The pharmacists agreed with the responsibilities of assisting consumers in making informed decisions regarding the TM uses; advising consumers on the risks of rejecting or delaying treatments for safety and effectiveness; providing information about TM uses to consumers; documenting TM use in consumers' record upon their consent; and reporting any suspected adverse reaction related to TMs.
<p>Yao et al, 2020, China ³³</p> <p>190 (68.1%)</p>	<p>Traditional and CMs in general</p>	<p>Sources of CM knowledge</p> <ul style="list-style-type: none"> 23.7% of the Chinese community pharmacists had a TM related degree. 81.6% of the pharmacists had studied about integrative medicine in the previous training or education. 		
<p>Lee et al, 2021, Australia ³⁸</p> <p>51 (100%)</p>	<p>St. John's Wort</p>			<ul style="list-style-type: none"> 24.5% of community pharmacists asked the patients about their disease conditions and CMs used. 31.4% of the pharmacists advised the patients about safety or potential harm of St. John's Wort. 60.8% of the pharmacists would sell St. John's Wort to the patients.



<ul style="list-style-type: none"> 51.6% of the pharmacists often to always received the queries from the patients about herbal medicines. 74.2% of the pharmacists often to always provided consultation about using herbal medicines to their customers. 66.1% of the pharmacists often to always dispensed herbal medicines in their pharmacy. 37.1% of the pharmacists often to always used herbal medicines for self-treatment. 	
<ul style="list-style-type: none"> 63.6% of the pharmacists agreed that herbal medicines were safe and effective. 24.2% of the pharmacists agreed that herbal medicines should be used only by the patients who did not benefit from conventional medicines. 	
<p>Actual knowledge</p> <ul style="list-style-type: none"> Community pharmacists had the correct answers about indications of ginseng (93.5%), ginger (75.8%), arnica (85.8%), maca root (75.8%), garlic (24.2%), ginkgo (96.8%), and valerian (98.4%). 75.8% of community pharmacists correctly answered about the safety of valerian. 45.2% of the pharmacists correctly answered about contraindication of ginkgo. 80.6%, 62.9% and 53.2% of the pharmacists correctly answered about drug interaction of St. John's Wort, chamomile, and ginseng. 61.3% of community pharmacists had 1-5 years of experiences related to herbal medicines Educational suggestion from the pharmacists 90.3% of the pharmacists agreed that herbal medicine should be a part of pharmacy school education program. 	
<p>Herbal medicines in general</p>	
<p>62 (100%)</p>	
<p>Mahnashi et al., 2021, Saudi Arabia ³⁷</p>	

chromium.^{1,6,19,20,22,24} Five studies reported that more than 60% of community pharmacists correctly answered questions about the contraindications of maca-root, senna, spinach, ginseng, and fenugreek, whereas about 25% to 36% of the pharmacists correctly answered about echinacea, licorices and honeysuckle.^{1,19-21,24}

Seven studies tested the pharmacist knowledge about drug interactions of valerian, ginkgo, omega-3, vitamins, St. John's wort, bran, garlic, feverfew, glucosamine & chondroitin, and honeysuckle.^{1,19-24} In one out of those 7 studies, 76.8% and 74.5% of the pharmacists correctly answered about the depletion of vitamins by chronic consumption of some drugs, and serious drug interaction potentiated by vitamin supplement consumptions.²³ Six studies tested the pharmacist knowledge about the safety or side effects of ginseng, vitamins, caffeine, St. John's wort, saw palmetto, echinacea and feverfew.^{1,19-24} Among those 6 studies, one study showed that 80.7%, 77.8%, 33.8% and 20.9% of the pharmacists correctly responded to the knowledge questions about unlabeled toxic ingredients in multivitamin supplements, less achievable balanced diet by multivitamin supplements than eating healthily, shortening lifespan by chronic consumption of vitamins, and causality of cancers by multivitamins, respectively.²³

Perceived knowledge

Perceived knowledge meant that pharmacists self-evaluated their own knowledge about CMs. One study had asked the pharmacists' perceived knowledge in terms of how to take the products, how long the selected CMs should be taken, perceived working knowledge, knowing about the quality, contents, mechanism of action, and precaution related to CMs,⁶ whereas another study asked their perceived knowledge in terms of knowing about contraindications and indications of CMs.²⁵ One study asked the perceived knowledge about indicating vitamin deficiency.²³ Two studies asked the pharmacists' perceived knowledge in terms of knowing interactions, side effects, and effectiveness of CMs.^{6,25} There were two studies asking about self-evaluated good CM knowledge,^{19,26} and other two studies asking perception of sufficient knowledge for recommending CMs.^{23,27}

Only 16% of pharmacists in studies from South Africa reported being slightly to very familiar with Chinese herbal medicines but 87%, 83%, 78%, and 59% of the pharmacists reported being slightly to very familiar with dietary supplements, herbal products, probiotics, and homeopathy, respectively.²⁸

There were 4 studies measuring pharmacist confidence about CMs practices. The results showed that 86%,²⁷ 58%²⁸ and 57.3%²⁴ of pharmacists in Australia, South Africa, and Palestine were confident in discussing about CMs with patients, respectively; and 43% of pharmacists in Australia were confident in providing CMs for weight loss.²⁹

Sources of CM knowledge

Community pharmacists in Australia (59%),⁶ South Africa (45%),²⁸ and U.K (39.8%)³⁰ had some training about CMs,



but only 9-10% of community pharmacists in U.S had CM training.^{31,32} About 82% of community pharmacists in China had studied about integrative medicines and 94% had learned about traditional medicines.^{21,33}

A study in Saudi Arabia showed that about 63% of community pharmacists had received previous continuing education about herbal medicines,³⁴ and an Australian study also presented that 59% of community pharmacists had accessed learning modules about herbal and nutrient CMs during continuing professional development.²⁹ In a Chinese study, 52% of community pharmacists had learned traditional medicines through continuing professional education.²¹ An Australian study reported that 30% of community pharmacists had obtained their knowledge in professional seminars.²⁷

Community pharmacists in Lebanon, U.K, Egypt, Jordan, and China had received CM education or training in undergraduate courses or during university.^{1,21,23,25,27,30,33} Only 6% and 17.7% of community pharmacists in Egypt and Lebanon had acquired CM training in postgraduation study.^{1,25} Ten percent of Australian community pharmacists had a formal degree, certificate, or diploma in CM.²⁷ CM manufacturers and companies had provided seminars related to CMs for community pharmacist. Only 15%, 27.1% and 42% of pharmacists in Jordan, China and Australia attended the seminars.^{21,23,27} Two studies also showed that 73% and 49% of Australian and Chinese community pharmacists acquired CM knowledge through self-directed learning.^{21,27} A study in Egypt reported that 64.1% and 58.4% of the community pharmacists got the nutritional information from journals and internet. Only 2.7% of them got the nutritional information through the past experiences.²⁵

CM information resources

The first and second choices to get CM information by community pharmacists in Australia, Palestine, Saudi Arabia, and South Africa were internet websites and product package instruction.^{24,28,29,34} But other studies in Egypt, Saudi Arabia and Jordan showed that product package instruction was the most used information resource for CMs.^{19,23,25} Two studies in Australia and China reported reference books as the pharmacists' first choice to access CM information.^{21,27} In contrast, a study in Jordan reported that community pharmacists chose reference books as the last choice to access CM information.²³

Synthesizing information from the 2 studies in Australia and Palestine, it was found that the most required CM information was drug interaction (78.1%).^{24,29} Other required CM information were contraindication (76%), evidence of efficacy (72.35%), side effect (67.9%), caution of CM use (63%), CM use in pregnancy (60.8%), mechanism of action (59%), CM use while breastfeeding (55%), CM doses (53.95%), CM use in children (43.4%), CM usage (36.3%), product selection (29.3%) and supplier/ wholesaler (22.5%).

CM knowledge delivery methods preferred by community pharmacists

In an Australian study, community pharmacists preferred

short online courses (53%), face to face seminars (45%), self-directed learning through journals (43%), electronic newsletter (34%), weekend workshops (23%), and online postgraduate courses (22%) as the delivery method for CMs.²⁷ Another Australian study specifically for weight-loss CMs showed that 83%, 81%, 46% and 37% of community pharmacists preferred CM information delivering via learning modules, continuing professional development, lectures/ workshops, and company representatives, respectively.²⁹ In Jordan, community pharmacists used leaflets/ package inserts (40%), sales promoters (25%), unspecified sites on internet (16%), reference books (3-10%) as the information sources.²³

Educational suggestions from community pharmacists

In terms of strengthening knowledge about CMs and herbal and traditional medicines, 94% of community pharmacists in South Africa agreed that CMs should be included as a part of university curriculum;²⁸ 74.2% of Saudi Arabian community pharmacists agreed that herbal medicines should be mandatory in continuing education;²⁰ and 57.9% of Chinese community pharmacists suggested to reinforce traditional medicine trainings.³⁵

Attitude

The pharmacists' attitudes towards CM products and CM practices had been evaluated in sixteen studies from nine countries which were four studies from U.S, four studies from Australia, two studies from Saudi Arabia and other remaining studies individually from Lebanon, Jordan, Palestine, Malaysia, Egypt, and South Africa (shown in table 1).^{1,6,10,19,20,22-29,31,32,36}

Majority of community pharmacists (53%-71.6%) in Lebanon, Saudi Arabia and Australia were positive with CM effectiveness.^{1,19,20,27} However, only 27% of community pharmacists in U.S were positive towards CM effectiveness. Numerous studies also showed community pharmacists have a positive attitude toward side effects or safety,^{1,6,19,24,26,28,29,36} quality,^{1,6,27} impact on health,^{24,25} holistic approach,²⁸ and therapeutic benefits.^{6,25,28,29} Australian community pharmacists were more likely to believe that CMs were harmless or had fewer side effects and had good quality and therapeutic benefit than the pharmacists in Lebanon, Saudi Arabia, Palestine, Egypt, and South Africa.^{1,6,19,24,25,27-29} This might be because 60% of Australian pharmacists had confidence about the quality of CM products made in Australia.²⁷

However, some studies described pharmacists' negative attitudes towards CMs.^{1,6,10,20,24,28} A majority of pharmacists in Australia (92.9%) and US (73%) did not agree that CMs were more cost effective than any conventional medicine.^{6,10} Less than half of community pharmacists in Australia (41%) and Palestine (36%) believed that CMs had a placebo effect.^{10,24} Few pharmacists in U.S (15%) and South Africa (10%) perceived that CMs were quackery.^{10,28} Only 18.4% of Saudi Arabian community pharmacists agreed that CMs should be used only for patients who had failed traditional prescription therapy.²⁰ Fifteen percent of community pharmacists in South Africa believed that CMs would interfere with standard medical care.²⁸



Moreover, 19% of them believed that CMs created a negative image for their pharmacy.¹⁰ About half of them reported that CMs were not accepted by colleagues.¹⁰ However, only 5% of U.S community pharmacists reported that CMs were well accepted by the food and drug administration (FDA).¹⁰ In addition, only 8% and 16% of community pharmacists in U.S and Lebanon perceived that CMs were well standardized and regulated.^{1,10} Regarding the attitude towards CMs, approximately 28% of community pharmacists in Egypt suggested that combination of nutritional and pharmacological therapies should be offered to patients in the majority cases.²⁵

Practice of complementary medicines

Four common pharmacists' practices related to CMs included answering CM queries from customers or patients,^{1,19,20,25,27-29,30,31,34,35} CM asking or counseling,^{1,20,25,31,32,34,38} CM recommending or advising,^{1,10,21,23,27,28,29,30,31,33,35,37,38} and CM dispensing in their pharmacies^{1,6,20,21,34,37,38} (in Table 1). A majority of community pharmacists in China (98%),²¹ Lebanon (91.3%)¹ and Saudi Arabia (89.3% & 76.1%)^{20,34} had dispensed CMs to customers or patients. Most of community pharmacists in Egypt (88.6%),²⁵ Saudi Arabia (87.6%),²⁰ Lebanon (81.7%)¹ and U.K (76.4%)³⁰ got and answered the CM queries from the patients but only 37% to 40% of Australian community pharmacists^{27,29} reported that CM queries associated with their patients. In two U.S studies, the community pharmacists rarely to sometimes got inquiries from the patients on an average day (mean± SD = 2.4±2.4 and 2.5± 3.0).^{31,32} Community pharmacists in U.S studies had rarely to sometimes asked their patients about their CM use.^{31,32} Community pharmacists in U.S (67.7%),¹⁰ U.K (54%),³⁰ Australia (51%)²⁷ and South Africa (45%)²⁸ were less likely to recommend, discuss and counsel about CMs to their patients than the pharmacists in China (97.3%, 94.6% & 81%),^{21,33,35} Saudi Arabia (94.9%),²⁰ Lebanon (87.7%),¹ and Jordan (80%).²³ Vitamins & minerals, herbs and food or dietary supplements were reported as the most common recommended and dispensed CM products, shown in table 2.

Some studies described other practices related to CMs, shown in Table 3. About one-fourth of community pharmacists in Lebanon and Australia had reported CM side effects.^{1,27} Two studies in U.S and U.K showed very low number of pharmacists who recorded or added CM use into the patients' profiles (Table 3).^{10,30} In two studies, pharmacists in U.S. tended to sometimes suggest patients check with physicians or other CM practitioners (mean± SD = 3.1± 1.5 and 3.4± 1.4).^{31,32} In a Chinese study, community pharmacists agreed with the responsibilities of assisting consumers in making informed decisions regarding the CM uses; advising consumers on the risks of rejecting or delaying treatments for safety and effectiveness; providing information about traditional medicines uses to consumers; documenting CM use in consumers' record upon their consent; and reporting any suspected adverse reaction related to CMs.³³

In terms of pharmacist intention to practice, 58.2% of community pharmacists in a Jordanian study would dispense all

vitamins without prescription.²³ Less than 50% of community pharmacists in an Australian study would recommend garcinia, green tea, and chromium to their patients for weight loss.³⁶

Factors associated with CM practices

Training or education about CMs had significantly positive correlations with CM recommendation, dispensing and response to patients' queries (Table 4).^{27,30-32,34} Information accessibility, the highest pharmacy education level and stocking CMs in pharmacy were significantly associated with recommending and dispensing CMs.^{21,31,32,34} Female community pharmacists recommended and dispensed CMs more than male pharmacists.^{21,30} However, there was no difference between gender of community pharmacists in terms of response to patients' queries about CMs.^{21,30} Comfort level to respond CM queries and having places to document CM use in medication profiles were positively associated with CM recommending and responding to patients' queries.^{31,32} Having CM information resources and pharmacists' CM self-use were positively associated with CM recommendations whereas pharmacists' attitude towards CM effectiveness and reviewing potential interactions were also positively associated with responses to patients' queries about CMs.^{29,31,32}

Barriers of the CM practice

There were seven studies describing the barriers of the CM practice for the community pharmacists.^{21,24,25,27,29,34,35} Lack of scientific testing, trained personnel in CM use, scientific knowledge and pharmacists' interest were the major barriers to CM dispensing practice.²⁴ Pharmacists forgetting to ask, their thinking of CMs were not relevant and of customers would ask by themselves, and lack of confidence made the pharmacists not discuss about CMs with the customers.²⁷ Pharmacists would not recommend CMs to the patients when they were concerned about product safety, ingredients or had limited opportunities to discuss CM uses.^{27,29} Being time-consuming treatment was a barrier for both dispensing and discussing about CMs.^{24,27} Lack of reliable sources of information, scientific evidence, professional knowledge, time or opportunity to discuss about CM uses, and reimbursement were obstacles for CM dispensing, discussing, and recommending.^{21,24,25,27,29,34,35} Ambiguity of the professional role of pharmacists and customers' unwillingness to seek pharmaceutical care from pharmacists were also barriers for those three CM practices (in figure 2).^{21,35}

Motivators inducing the pharmacists' CM practice in pharmacies

Three studies had showed motivators inducing the community pharmacists' CM practice in pharmacies.²³⁻²⁵ The positive responses from customers and fewer side effects greatly motivated the pharmacists to recommend CMs to their patients.²⁴ Doctors' recommendation and publicity of the CM products were also motivators for pharmacists recommending CMs to customers.²⁴ Being safer and better for general health than conventional medicines made pharmacists discuss about



CM products	Recommending				Dispensing						Responding Patients' queries	
	Australia ^{27,29}	UK ³⁰	Palestine ²⁴	US ³¹	US ³²	UK ³⁰	Palestine ²⁴	Saudi Arabia ¹⁹	Egypt ²⁵	Jordan ²³		Saudi Arabia ³⁷
Vitamin/mineral	88% ²⁷	16.1%				97.7%	85.4% multivitamins 93.2% vitamin B12 81.9% calcium 74% vitamin C 69% vitamin D 28% vitamin A			86.9% multivitamin 63.9% vitamin C 39.9% vitamin E 31.4% Fish oil 29.4% vitamin A		
Herbs		35.7%	57.7%	77.6%	89.6%	76.3%	50% ginseng 43% garlic 34% ginger	47% Ginseng 23% Gingko 17% Valerian 4% St. John's wort	100%		3.2% maca root 16.1% garlic 12.9% ginkgo 4.8% valerian 1.6% ginger 54.8% ginseng 3.2% arnica 3.2% chamomile	35.2%
Food/dietary supplements			82.6%			79.3%			99.7% complementary food supplements 99.7% infant milk formulas and baby foods 99.2% sugar alternatives 84.8% Sugar-free products 13% Sport foods 10.6% gluten-free food replacements			14.5%
Home remedies			16%									
Homeopathic		25.3%		42.1% (Homeopathic, naturopathic, Chinese medicines or Ayurveda)	37.3% (Homeopathic, naturopathic, Chinese medicines or Ayurveda)	66.2%						21.2%
Glucosamine	25.3% ²⁷											
Fish oil	82% ²⁷											
Probiotics	73% ²⁷											
Honey			61.2%									
Essential Oil						73.2%						10.9%
Gingko biloba												
Natural weight loss product												
							45% chromium 43% garcinia 40% green coffee bean 35% green tea 27% L-carnitine 23% Guarana 20% ginseng 13% ginger 12% chitosan ³⁹					



Table 3. Percentage of the pharmacists providing different pharmacy practices related to CMs

CM Practice	Egypt, 2020 ²⁵	China, 2020 ³³	Lebanon, 2019 ¹	South Africa, 2019 ⁴⁸	Saudi Arabia, 2018 ²⁰	US, 2015 ²²	Saudi Arabia, 2013 ³⁴	Jordan, 2011 ¹³	Australia, 2010 ²⁷	U.K, 2007 ³⁰	U.S, 1999 ¹⁰	China, 2016 ²¹	China, 2017 ³⁵	Saudi Arabia, 2010 ¹⁹	Saudi Arabia, 2021 ³⁷
Recommending		81%	87.7%					80%		54%	67.7%		94.6%		
Asking or counseling about CM	34%			45%	94.9%		20.8%		51%			97.3%			96.8%
Dispensing			91.3%		89.3%		76.1%					98%			96.7%
Answering the patient's queries	88.6%		81.7%	68%	87.6%		44.3%		40%	76.4%				63%	93.5%
Recording or adding CM use into the patient's profile							70.3%			4.5%	7%				
Reporting CM side-effect			26%						27%						
Checking for drug interaction			74.5%					60.6%							
Reviewing the patient profile								75.3%							
Rechecking CM dose								50.3%							
Follow-up								55.9%							
Referring patients to other practitioners	53%			57%											
Using CM as self-treatment		79.5%			94.9%	61%					28%				88.7%

Table 4. correlation between CM practices and other factors

Factors affecting CM practice manners	Recommending CMs	Asking & conversation about CM	Dispensing CMs	response to patients' queries
Training or education about CMs ^{27,30-32,34}	r= 0.33 ³⁰	r= 0.14 ³⁴ r= 0.30 ³¹ r= 0.15 ²⁷	r= 0.15 ³⁴	r= 0.15 ²⁷ r= 0.25 ³² r= 0.25 ³⁰
Gender (female) ^{21,30}	r= 0.13 ³⁰	NS ²¹	r= 0.21 ²¹	NS ³⁰
Information accessibility ³⁴	NA	r= 0.20 ³⁴	r= 0.22 ³⁴	NA
Highest pharmacy education level ²¹	NA	r= 0.27 ²¹	r= 0.29 ²¹	NA
Stocking CM in pharmacy ^{31,32}	r= 0.22 ³¹ r= 0.31 ³²	NA	r= 0.2 ³¹	NA
Comfort level to respond CM queries ³²	r= 0.33 ³²	NA	NA	r= 0.27 ³²
Having a place to document patients' use of CM in medication profiles ^{31,32}	NA	d= 0.32 ³¹	NA	d= 0.40 ³²
Having information resources ³¹	r= 0.24 ³¹	NA	NA	NA
Pharmacists' CM self-use ²⁹	r= 0.26 ²⁹	NA	NA	NA
Attitude towards CM effectiveness ³²	NA	NA	NA	r= 0.31 ³²
Reviewing potential interactions ³²	NA	NA	NA	r= 0.37 ³²

Note: r= correlation coefficient effect size, d= standardized mean-difference effect size, NS = Non-significant, NA = Not Applicable.



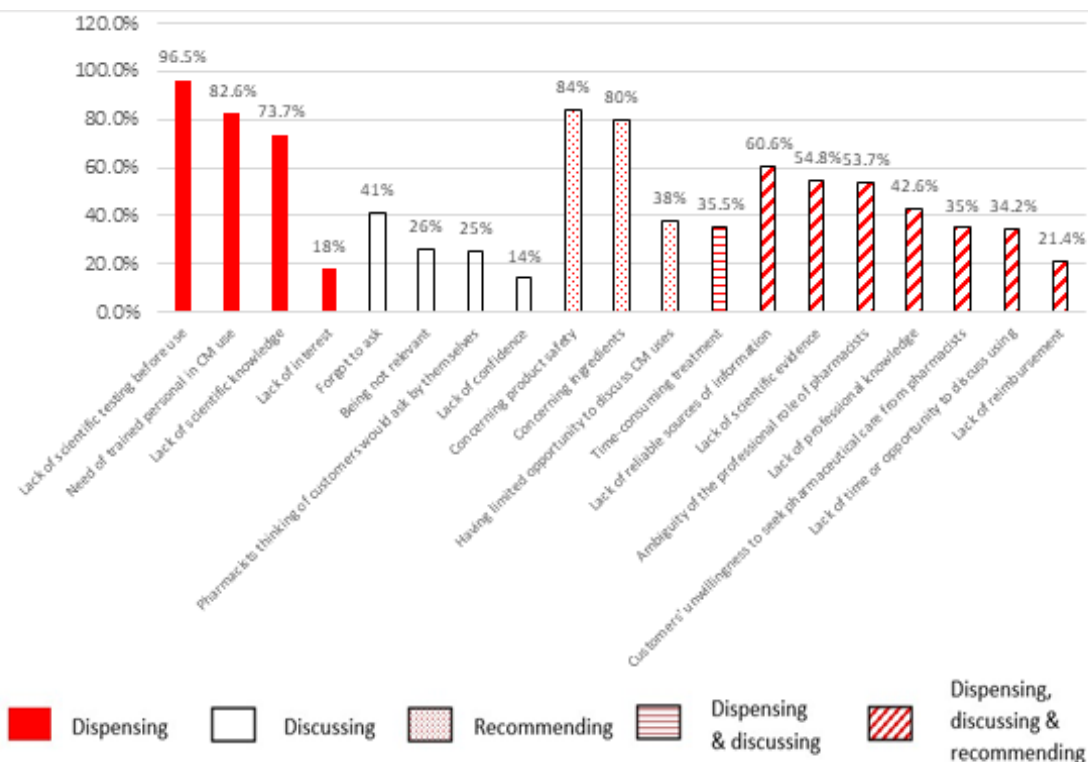


Figure 2. Barriers for the pharmacists' CM practice in their pharmacies

CMs.²³ Being less expensive than conventional drugs also motivated the pharmacists to recommend and discuss about CMs (in figure 3).²³⁻²⁵

Facilitators for improvement of the pharmacists' CM practice in pharmacies

In four included studies, the pharmacists had reported the factors which should be modified to improve their CM practice in the pharmacies (Figure 4).^{21,24,25,35} Having scientifically proven effectiveness was an important facilitator for improving CM recommendation.²⁴ Increasing CM knowledge was important to improve pharmacists' discussion about CMs whereas strengthening CM trainings was important for dispensing, recommending, and discussing about CMs.^{21,25,35}

DISCUSSION

This systematic review extracted the data from 23 included studies which were mainly from U.S, Australia, Saudi Arabia, and China. This data extraction was based on a framework adopted from the KAP model common in health education.³⁹ The results demonstrated that a positive attitude by community pharmacists towards safety and effectiveness of CMs encouraged the pharmacists to practice CM services.^{24,28,29} Five studies described that, on average, about 90% of community pharmacists in Lebanon, Saudi Arabia and China had dispensed CMs in community pharmacies. Four out of 7 studies described that less than and equal to 50% of the community pharmacists had discussed or initiated the conversation of CMs to their

customers or patients in pharmacies. Comparing to dispensing rates, the discussion or counselling rates were quite low. Dispensing together with providing information or counselling is pharmacist responsibility. Therefore, the CM counselling rate should be at least equal with dispensing rate in order that people can use CMs appropriately. Confidence issue had been mentioned relating with counselling. In this systematic review, some studies had shown that about 12% to 19% of community pharmacists had no confidence to discuss about CMs with their patients. Knowledge and reliable information are essential to make pharmacists have more confidence. Therefore, trainings or programs providing CM knowledge for the pharmacists should be arranged in order to increase counselling and improve CM practices. Furthermore, pharmacists in the included studies had suggested that learning CMs should be included in universities or provided from continuing education programs to benefit the pharmacy professional practices.^{20,28,29} The short course trainings, lectures, and continuing education programs were the most preferred ways of delivering CM information and education.^{27,29}

Another finding was that recording or adding the CM use to patient profiles and reporting any CM side-effect had been rarely performed by the community pharmacists.^{1,10,27,30} While the rate of CM dispensing in community pharmacies had been high, the rates of recording and reporting any side-effect or problem related to CMs were low, that might delay identifying adverse drug events (ADE) or evaluating signal detection of pharmacovigilance. Therefore, it is important to encourage



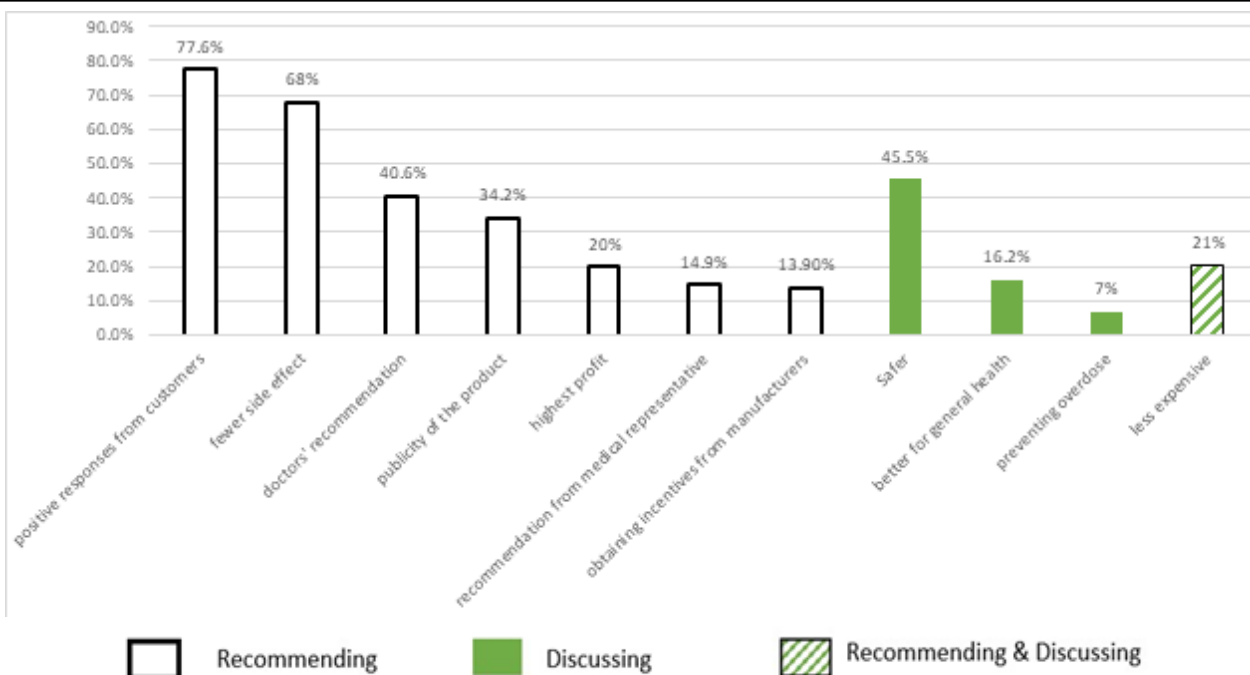


Figure 3. Motivators inducing the pharmacists' CM practice in their pharmacies

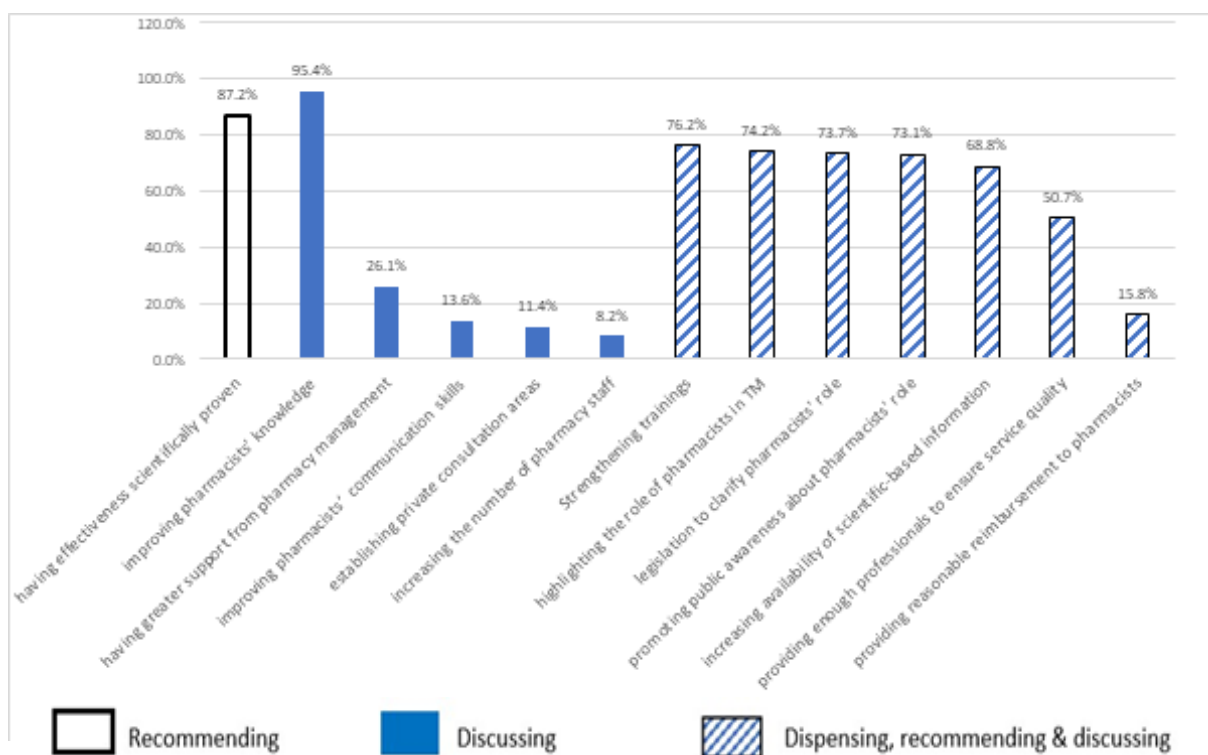


Figure 4. Facilitators for improvement of pharmacists' CM practice in their pharmacies

customers to report the side effects to community pharmacists and encourage pharmacists record and report these adverse event cases to pharmacovigilance centers or FDA. To report ADE cases, reporting systems are necessary and must be user friendly.

It is not unusual for pharmacist to review patient profiles and drug interactions related to CMs (Table 3). The data also showed that reviewing potential interactions had correlated with pharmacists' response to patients' queries (Table 4). Encouraging the pharmacists review potential interactions would make the pharmacists more likely to answer the

patients' queries. The pharmacies may need to give more time or resources for the pharmacists to do reviewing the potential interactions of CMs. Also, places for pharmacists to document patient CM use are important since the review showed the relationship of discussion about CM uses and response to the patients' queries with having a place to document patients' use of CM in their medication profiles.

This study found that lack of reliable sources of information or scientific evidence was a huge barrier to making CM recommendations. Currently, the rate of CM utilization is high. Access to reliable sources of information or scientific evidence was critical for pharmacists to appropriately recommend and safely dispense CMs to customers. More scientific research about CMs must be supported. Channels of CM information distribution must be monitored for their reliability of information. At the same time, strengthening training of not only conventional medicines but also CMs is crucial for pharmacists to provide appropriate services to patients.

Some limitations existed in this review. The first limitation was that only full-text studies with English language were included. The second limitation is identifying only the published studies from formal databases. We were not able to identify reports related to CMs which were not available via the internet. We did not include gray literatures because we considered the validity and reliability issues of information, therefore, peer review publications were only included in the review.

CONCLUSION

Four common CM practices were identified. The average rate of CM dispensing (90.3%) was higher than average rates of CM recommending (77.5%), answering patients' CM queries (71.5%) and counselling about CMs (62.8%). Other CM practices such as documenting about patients' CM use, referring patients to other practitioners, and using CMs as self-treatment were also reviewed. The percentage of the pharmacists documenting about patients' CM use and the reporting of CM side effects was quite low. Training or education influences dispensing, recommending, and counseling about CMs. Lack of reliable sources of information and lack of scientific evidence were the most common barriers for those four CM practices. Being less expensive than other conventional medicines was a motivator

for both CM recommending and discussing. Strengthening CM trainings and educational workshops and highlighting the pharmacist role were the most important facilitators to improve those four CM practices in the pharmacy.

CONFLICTS OF INTEREST STATEMENT

There was none of conflicts of interest for this study.

FUNDING INFORMATION

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AUTHORSHIP CONTRIBUTION STATEMENT (CRedit)

Su Myat Thin: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Validation, Visualization, and Writing – original draft preparation.

Daylia Thet, Jia Yu Li, Tulakarn Nakpun & Sujin Nitadpakorn: Data curation, Validation, and Writing – review & editing.

Chamipa Phanudulkitti & Suntaree Watcharadamrongkun: Visualization, and Writing – review & editing.

Bernard A. Sorofman: Conceptualization, Validation, Visualization, and Writing – review & editing

Tanattha Kittisopee: Conceptualization, Data curation, Formal analysis, Funding Acquisition, Project administration, Supervision, Validation, Visualization, and Writing – review & editing.

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Appendix A. Search results			
Database	Search Date	Keyword	No. of articles found
PubMed	19.05.2022	#1 (knowledge) OR (attitude*) OR (practice*) Filters: Title/Abstract	70
		#2 (Community pharmacist*) OR (retail pharmacist*) Filters: Title/Abstract	
		#3 (Complementary medicin*) OR (traditional medicin*) OR (alternative medicin*) OR (natural medicin*) Filters: Title/Abstract	
		#4 #1 AND #2 AND #3 (knowledge) OR (attitude*) OR (practice*) AND (Community pharmacist*) OR (retail pharmacist*) AND (Complementary medicin*) OR (traditional medicin*) OR (alternative medicin*) OR (natural medicin*) Filters: Title/Abstract	
ScienceDirect	19.05.2022	("complementary medicine" OR "traditional medicine" OR "alternative medicine" OR "natural medicine") AND ("community pharmacist" OR "retail pharmacist") AND ("knowledge" OR "attitude" OR "practice") Article type: research articles	143
Scopus	19.05.2022	(knowledge) OR (attitude*) OR (practice*) AND (Community pharmacist*) OR (retail pharmacist*) AND (Complementary medicin*) OR (traditional medicin*) OR (alternative medicin*) OR (natural medicin*) in Title, Abstract or Key Word, Limit to: 1990-2021 and English	260
SpringerLink	19.05.2022	("complementary medicine" OR "traditional medicine" OR "alternative medicine" OR "natural medicine") AND ("community pharmacist" OR "retail pharmacist") AND ("knowledge" OR "attitude" OR "practice") Within Article, Limit to: 1990-2021	223
Total			696

Appendix B. Questions of QualSyst Tool for quantitative studies		
No.	Question	Note
Q1	Question/Objective sufficiently described?	-
Q2	Study design evident and appropriate?	-
Q3	Method of subject/comparison group selection or source of information / input variables described and appropriate?	-
Q4	Subject (and comparison group, if applicable) characteristics sufficiently described?	-
Q5	Outcome and (if applicable) exposure measure(s) well defined and robust to measurement/ misclassification bias?	-
Q6	Sample size appropriate?	-
Q7	If interventional and random allocation was possible, was it described?	N/A
Q8	If interventional and blinding of investigators was possible, was it reported?	N/A
Q9	If interventional and blinding of subjects was possible, was it reported?	N/A
Q10	Analytic methods described/ justified for the main results?	-
Q11	Some estimate of variance is reported for the main results?	-
Q12	Results reported in sufficient detail?	-
Q13	Conclusion supported by the results?	-
Q14	Controlled for confounding?	N/A

Note: N/A = not applicable for the study



Appendix C. Quality assessment score												
Author (year)	Average score given by three researchers for each question of the tool used in the current systematic review										Total average	
	Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 10	Q 11	Q12	Q13		
Kanjanarach et al, 2011 ¹	2	2	2	2	2	2	2	2	2	2	2	1
Taing et al, 2017 ²	2	2	2	2	2	2	2	0	2	2	1	0.85
Al-Arifi et al, 2013 ³	2	2	2	2	2	2	2	0	2	2	2	0.9
Hijazi et al, 2019 ⁴	2	2	2	2	2	2	2	2	2	2	2	1
Brown et al, 2005 ⁵	2	2	2	2	2	2	2	2	2	2	2	1
Thandar et al, 2019 ⁶	2	2	2	2	1	1	2	1	2	2	2	0.85
Alsayari et al, 2018 ⁷	2	2	2	2	2	2	2	1	2	2	2	0.95
Shraim et al, 2017 ⁸	2	2	2	2	2	2	2	2	2	2	2	1
Chen et al, 2016 ⁹	2	2	2	2	2	2	2	0	2	2	2	0.9
Alkharfy et al, 2010 ¹⁰	2	2	2	1	1	2	2	0	1	2	2	0.75
Song et al, 2017 ¹¹	2	2	2	2	2	2	2	1	2	2	2	0.95
Tiralongo et al, 2010 ¹²	2	2	2	1	2	1	2	1	2	2	2	0.85
Taing et al, 2016 ¹³	2	2	2	2	2	1	2	0	2	2	2	0.85
Brown et al, 2011 ¹⁴	2	2	2	2	2	1	2	1	2	2	2	0.9
Bouldin et al, 1999 ¹⁵	2	2	2	2	2	1	1	2	2	2	2	0.9
Barnes et al, 2007 ¹⁶	2	2	2	2	2	2	2	1	2	2	2	0.95
Coon et al, 2015 ¹⁷	2	2	2	1	2	1	2	2	2	2	2	0.9
Medhat et al, 2020 ¹⁸	2	2	2	2	2	2	2	0	2	2	2	0.9
Shilbayeh, 2011 ¹⁹	2	2	2	2	2	2	2	2	2	2	2	1
Tahir et al, 2020 ²⁰	2	2	2	2	2	2	2	1	2	2	2	0.95
Yao et al, 2020 ²¹	2	2	2	2	2	2	1	2	2	2	2	0.95
Lee et al, 2021 ²²	2	2	2	2	2	1	2	2	2	2	2	0.95
Mahnashi et al, 2021 ²³	2	2	2	2	2	1	1	2	2	2	2	0.9
Ogbogu et al, 2016 ²⁴	2	2	1	1	1	2	2	0	2	1	1	0.7
Clayton et al, 2020 ²⁵	2	1	1	1	1	1	1	0	1	2	2	0.55
GÜLPINAR et al, 2019 ²⁶	2	2	1	1	1	1	1	0	2	2	2	0.65

Note: Scores used: 2 = totally appropriate, 1 = partially appropriate, and 0 = not appropriate; score with *Italic style*= low quality score (lower than 0.75)

Appendix D. Information of excluded studies			
No.	Author, Year	Title	Reasons of exclusion
1	Waddington et al, 2018 ²⁷	Australian pharmacists' knowledge of the efficacy and safety of complementary medicines	The study included all healthcare professionals in pharmacy and there was no separation of community pharmacist data.
2	Pokladnikova et al, 2014 ²⁸	CAM attitudes, self-reported use and client recommendations of Czech pharmacists and pharmacy technicians: Implications for training: Running head: What Czech pharmacists and technicians believe and recommend about CAM therapies	The study included all healthcare professionals in pharmacy and there was no separation of community pharmacist data.
3	Semple et al, 2006 ²⁹	Community pharmacists in Australia: barriers to information provision on complementary and alternative medicines	Using qualitative method
4	Barnes et al, 2020 ³⁰	Community pharmacists' professional practices for complementary medicines: a qualitative study in New Zealand	Using qualitative method

Appendix D. Information of excluded studies			
No.	Author, Year	Title	Reasons of exclusion
5	Tran et al, 2013 ³¹	Consumer-pharmacist interactions around complementary medicines: Agreement between pharmacist and consumer expectations, satisfaction and pharmacist influence	Using qualitative method
6	Kwan et al, 2008 ³²	Exploring consumer and pharmacist views on the professional role of the pharmacist with respect to natural health products: A study of focus groups	Using qualitative method
7	Cavaco et al, 2017 ³³	Informing the homeopathic practice for Turkish pharmacists: reviewing the example of Portuguese community pharmacies	Using qualitative method
8	Robinson et al, 2011 ³⁴	Responding to patient demand: Community pharmacists and herbal and nutritional products for children	Using qualitative method
9	Simmons-Yon et al, 2012 ³⁵	Understanding pharmacists' experiences with advice-giving in the community pharmacy setting: a focus group study	Using qualitative method
10	Asahina et al, 2012 ³⁶	Community pharmacists' attitudes relating to patients' use of health products in Japan	Using qualitative method
11	Ung et al, 2019 ³⁷	Barriers to pharmacists adopting professional responsibilities that support the appropriate and safe use of dietary supplements in the United States: Perspectives of key stakeholders	Using qualitative method
12	Walji et al, 2011 ³⁸	Reporting natural health product related adverse drug reactions: Is it the pharmacist's responsibility?	Using qualitative method
13	Sim et al, 2018 ³⁹	The use of non-prescription medicines during lactation: A qualitative study of community pharmacists' attitudes and perspectives	Using qualitative method
14	Schultz et al, 2014 ⁴⁰	Australian pharmacists' uncertainty about homeopathic products in community pharmacy	Using qualitative method
15	Ogbogu et al, 2016 ²⁴	Community Pharmacists' Views and Practices Regarding Natural Health Products Sold in Community Pharmacies	< 0.75 of quality assessment score
16	Clayton et al, 2020 ²⁵	Community pharmacists' recommendations for natural products for stress in Melbourne, Australia: a simulated patient study	< 0.75 of quality assessment score
17	GÜLPINAR et al, 2019 ²⁶	A study on determining the opinions and attitudes of community pharmacists about non-pharmaceutical medicinal products	< 0.75 of quality assessment score

- Kanjanarach T, Krass I, Cumming RG. Australian community pharmacists' practice in complementary medicines: a structural equation modeling approach. *Patient Educ Couns*. 2011;83(3):352-359. <https://doi.org/10.1016/j.pec.2011.05.003>
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