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Pharmacy students' attitudes and perceptions about complementary and alternative medicine: a systematic review

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ABSTRACT
Complementary and alternative medicine (CAM) is extensively used worldwide. The attitudes and perceptions of pharmacy students about CAM may influence their practices upon graduation. In this work, a systematic review was conducted by searching available electronic databases, i.e., Medline, Web of Science, Directory of Open Access Journals, SCOPUS and CINAHL, using CAM-related search terms to summarise pharmacy students' attitudes and perceptions about CAM. Relevant peer-reviewed articles published in English within the years 2000–2014 were included. Pertinent data from eligible articles were recorded in a data-collection form and summarised. A total of 21 out of 2070 studies were included in the review, and nearly all of these studies were cross-sectional surveys. Overall, pharmacy students expressed favourable attitudes towards CAM and tended to believe that CAM could benefit conventional medicine. However, they opposed CAM modalities without scientific evidence. In addition, pharmacy students generally agreed that CAM knowledge was important, and they desired more CAM-related training and education. The Internet and mass media were commonly referred to by the pharmacy students for CAM information. The lack of scientific evidence for CAM was perceived by the students as a major barrier to CAM applications. Our findings may assist pharmaceutical educators in planning for teaching and training related with CAM.

Introduction

Complementary and alternative medicine (CAM) has been increasingly used by patients and the public worldwide [1]. CAM, according to the National Centre for Complementary and Integrative Health (NCCIH) in the United States (US), is defined as "diverse medical and healthcare systems, practices and products that are not presently considered to be part of conventional medicine, that are used for preventing or treating illness or to pro-

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mote health and well-being" [2]. CAM can be divided into natural products (e.g., herbal medicines, vitamins and minerals) and mind-body practices (e.g., acupuncture, massage and meditation).

Although scientific evidence for CAM is still limited, demands for these products are continually increasing [1]. The prevalence of use of at least one CAM modality can be as high as 74.8% [3]. In the US, about 35.5% and 33.2% of adults utilised CAM in 2007 and 2012, respectively [4]. In 2007 alone, USD33.9 billion was spent by American adults for purchasing CAM products or visiting CAM practitioners [5]. Additionally, the use of CAM in patients with chronic diseases, pregnancy or together with prescribed medicines and/or over-the-counter drugs is fairly common [6-8]. Approximately one in three people uses oral CAM products concomitantly with prescribed medications [6]. This should be a cause for concern because potential interactions between CAM products with prescribed medicines and diseases are possible.

Pharmacies are commonly the first point of contact for consumers to obtain information about CAM owing to the accessibility and availability of CAM products in these premises [9, 10]. Thus, pharmacists are highly expected to provide pharmaceutical care for patients and consumers who are using or planning to use CAM. In order to provide such pharmaceutical care, pharmacists should have adequate skills and knowledge about CAM, thereby allowing them to inquire, review, and educate patients and consumers about CAM effectively [11].

Ideally, pharmacists' awareness and familiarity on CAM should begin during their undergraduate study. Many pharmacy schools have endeavoured to incorporate CAM courses into their curriculum. Over the past years, there have been growing interests among researchers to explore pharmacy students' attitudes and perceptions about CAM [10, 12]. The attitudes and perceptions of pharmacy students about CAM can reflect their future views and practices in this regard. Therefore, the present study was intended to review and summarise pharmacy students' attitudes and perceptions about CAM. This information would benefit pharmaceutical educators and may assist in planning or improving pharmaceutical education.

Methods

This study was carried out by the research team at the Faculty of Pharmaceutical Sciences, Chulalongkorn University, between February 2015 and July 2015. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guideline was adapted to review all relevant studies systematically [13]. In this review, the terms "pharmacy student" and "student pharmacist" refer to students who were doing their first pharmacy degrees, such as the Bachelor of Science in Pharmacy, Bachelor of Pharmacy, Master of Pharmacy, and Doctor of Pharmacy. CAM is defined according to the NCCIH as described earlier [2].

In this review, attitude is defined as an inclination of viewing something positively or negatively. The tripartite model of attitudes by Rosenberg and Hovland [14] which consists of the (1) affective (feelings / emotions); (2) behavioural (intentions / actions); and (3) cognitive (thoughts / beliefs) types of attitudes, is employed in this review. Perception is defined as a process of interpretation whereby an individual ascribe meanings to something [15].

Search strategy. Information sources used in this study embraced Medline, Web of Science, Directory of Open Access Journals, SCOPUS and CINAHL. The present review covers the attitudes and perceptions of pharmacy students about CAM in its general term. However, to maximise the search results, a broadly defined search strategy was employed. Search terms included "pharmacy student" or "student pharmacist" combined with CAM-related terms, such as complementary medicine, complementary therapy, complementary health, alternative medicine, alternative therapy, alternative health, traditional medicine, natural product, herbal medicine, vitamin, mineral, dietary supplement, etc.

Study selection. Peer-reviewed articles published in English and found in the aforementioned databases within the years 2000–2014 were included. Articles published before the year 2000 were not included because the findings from these studies may not be relevant in the present situation; they may also not be useful for guiding the current education reform. In addition, qualitative studies, editorials, commentaries and letters were excluded. Articles describing the development of CAM curriculum and "entry and exit surveys" (as part of a CAM course, seminar and presentation) were also excluded. The present review aimed at summarising the attitudes and perceptions of pharmacy students about CAM in general, hence studies focusing on a specific CAM modality (such as dietary supplement, herbal medicine, yoga, etc.) were not included.

Data extraction and analysis. All articles retrieved from the electronic databases were checked against the eligibility criteria. Those articles reporting pharmacy students' attitudes and perceptions about CAM were further examined. To confirm the quality of the eligible papers, they must be checked with the answer "yes" against a set of criteria developed by the research team. These criteria included the following:

1.Are the research questions or objectives appropriate for the study?
2.Are the study variables in line with the research question?
3.Is the study design, including questionnaires, feasible for the study?
4.Are the data or statistical analyses appropriate?
5.Do the results answer the research questions or objectives?
6.Are the findings beneficial to the systematic review?

The relevant data from the selected papers were

recorded in a specifically designed data-collection form. The main key characteristics of the included studies were extracted, and major domains related with CAM attitudes and perceptions about CAM were identified. To elaborate each domain, the attitude and perception items of each study were identified and coded. CAM studies were highly heterogeneous in terms of student groups, study instruments, and definition of CAM; thus, pooling all data using a meta-analysis was not feasible.

Results

At the outset, a total of 2,070 records were retrieved from the electronic databases (Figure 1). After removing all duplicates and considering the eligibility criteria, only 23 articles were reviewed in-depth. Among the 23 articles, two articles [16, 17] included the same group of students as in another two corresponding studies [18, 19]. These articles were combined accordingly, thereby resulting in an effective total of 21 studies.

Table 1 summarises the characteristics of the 21 studies [16-38]. Most CAM studies were carried out in the US (5), Malaysia (4), Australia (2) and the United Kingdom (UK) (2); the remaining studies were from the other parts of the world. Articles included in this review were mostly published after 2011, and all of the studies were cross-sectional surveys, except for one longitudinal study [36]. The studies were small to moderate in scale, with the sample sizes of 35–887. Four studies included students from other disciplines (e.g., medicine, nursing and dentistry) [20, 21, 23, 34]. Pharmacy faculty members were included in two studies [23, 27]. One study included doctors, dentists and pharmacists [34], whereas one study compared pharmacists and pharmacy students' attitudes and perceptions about CAM [22].

Attitude and perception domains that explain pharmacy students' views on CAM were identified (Tables 2 and 3). Survey findings on the attitudes and perceptions of pharmacy students about CAM varied and were occasionally inconsistent. In addition, the instruments used in the included studies differed from one another. Majority of the studies developed their survey instruments based on previous literature or modified from previously validated questionnaire, such as the CAM Health Belief Questionnaire (CHBQ) [39]. Six studies reported the mean sum of attitudinal score to evaluate students' attitudes towards CAM [16, 24, 34, 35, 37, 38]. Among the six, only three included the original CHBQ questionnaire [16, 34, 38].

The CHBQ consists of 10 statements, in which the responses used a 7-point Likert-type scale from 1 = absolutely disagree to 7 = absolutely agree. A total CHBQ score of more than 35 indicate a positive attitude towards CAM. Positive attitudes of students towards CAM were reported in these three studies (mean CHBQ scores: Jakovljevic et al. [34], 51.16 ± 7.10; Pokladnikova et al. [16], 48.50 ± 8.50; and Wahab et al. [38], 48.58 ± 4.66.

James and Bah [37] and Noureldin et al. [35] used a modified questionnaire based on the CHBQ, which consisted of 10 and 15 statements, respectively, using a Likert-type scale ranging from 1 = strongly disagree to 5 = strongly agree. Both of these studies reported positive attitudes of the students towards CAM (mean attitudinal scores: James and Bah [37], 34.9 ± 4.5 out of 50; and Noureldin et al. [35], 52.57 ± 7.65 out of 75). On the other hand, Dutta et al. [24] utilised an 18-item questionnaire using a 5-point Likert-type scale for the responses (1 = strongly disagree, 5 = strongly agree). The mean attitudinal score reported was 67.54 (out of 90), which also suggested positive attitudes of students towards CAM.

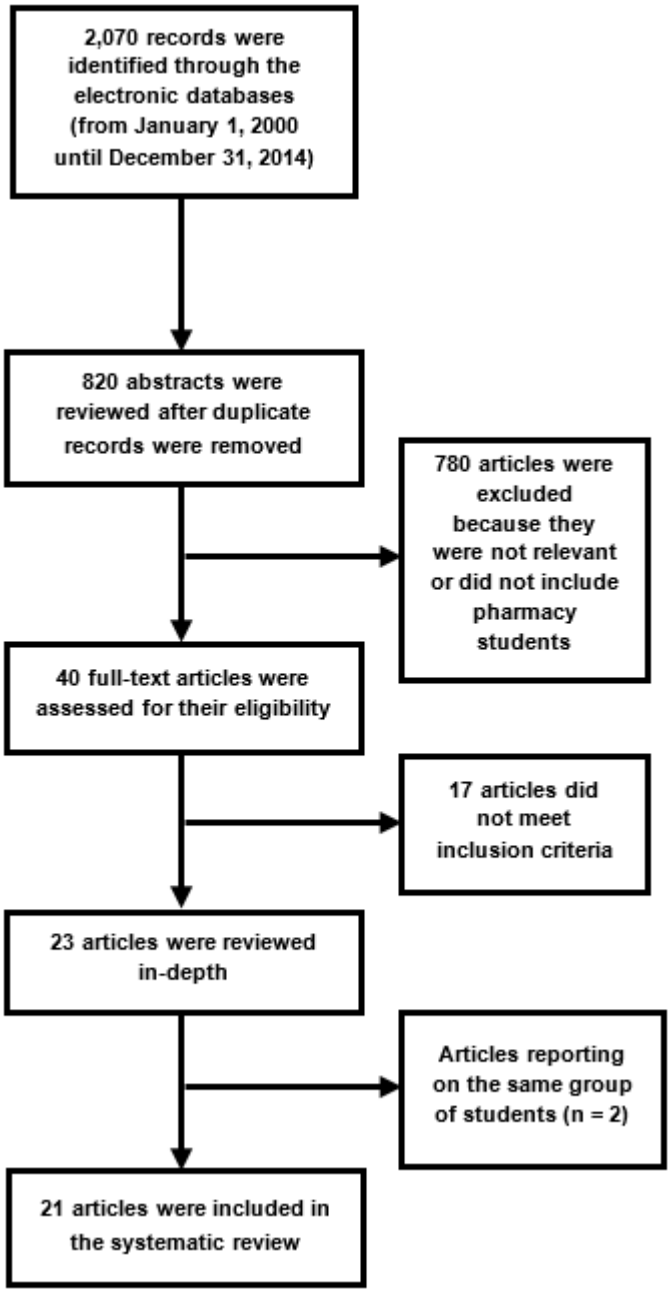

Figure 1 Flow chart of study selection process

Table 1. Characteristics of studies included in the systematic review

Author(s)	Year	Country	Study design	Participant	Response rate of pharmacy students[a]	Outcome	Topic of discussions
Baugniet et al. [20]	2000	Canada	Cross-sectional survey using self-completed questionnaire adapted from previous studies	4th year pharmacy (PharmD), medical, nursing, physiotherapy and occupational therapy students	Almost 100% (102/total NA)	Knowledge, attitudes, and perceptions	CAM (not explicitly defined)
Wilkinson and Simpson [21]	2001	Australia	Cross-sectional survey using self-completed questionnaire based on previous studies	1st to 3rd year nursing, pharmacy (BPharm) and biomedical sciences students	Not reported (69/total NA)	Use and attitudes	CAM (not explicitly defined)
Hamilton et al. [22]	2002	USA	Cross-sectional survey using self-completed 14-item questionnaire	PharmD students and pharmacy practitioners	100% (35/35)	Attitudes	Alternative therapies (not explicitly defined)
Kreitzer et al. [23]	2002	USA	Cross-sectional survey using self-completed questionnaire	4th year pharmacy (PharmD), medical and nursing students; and faculty members of pharmacy, medical and nursing school or college	Not reported	Attitudes and perceptions	CAM (not explicitly defined)
Dutta et al. [24]	2003	USA	Cross-sectional survey using self-completed 18-item questionnaire	3rd year PharmD students	91% (82/90)	Attitudes	CAM (not explicitly defined)
Truter [25]	2005	South Africa	Cross-sectional survey using self-completed questionnaire	1st to 4th year BPharm students	~ 66.7% (160/~ 240)	Knowledge, attitudes, and perceptions	Complementary and alternative healthcare was defined as diagnosis, treatment and/or prevention which complements mainstream medicine by contributing to a common whole, satisfying a demand not met by orthodoxy, or diversifying the conceptual framework of medicine

Author(s)	Year	Country	Study design	Participant	Response rate[a]	Outcome	Topic of discussions
Freymann et al. [26]	2006	UK	Cross-sectional survey using self-completed questionnaire and qualitative interview	1st to 4th year MPharm students	59.1% (264/447)	Use, attitudes, and perceptions	CAM, herbal medicinal products (HMPs), medicinal plants (MPs), and other natural remedies (not explicitly defined)
Harris et al. [27]	2006	USA	Cross-sectional survey using self-completed questionnaire	4th year PharmD students and pharmacy faculty members	63% (63/100)	Attitudes and perceptions	CAM (not explicitly defined)
Pokladnikova and Lie [16, 18]	2008	Czech Republic	Cross-sectional survey using self-completed questionnaire consisting of the Czech-translated version of CHBQ	1st and 3rd year BPharm students	64% (278/437)	Knowledge, attitudes, and perceptions	CAM (not explicitly defined)
Tiralongo and Wallis [17, 19]	2008	Australia	Cross-sectional survey using self-completed 50-item questionnaire and qualitative interview	2nd to 4th year BPharm students	75% (110/147)	Knowledge, attitudes, and perceptions	Complementary medicines (e.g., herbal medicines, minerals, vitamins) and complementary therapies (e.g., acupuncture, meditation)
Al-Omar and Al-Arifi [28]	2011	Saudi Arabia	Cross-sectional survey using self-completed 17-item questionnaire	4th and 5th year PharmD students	75% (135/180)	Knowledge, attitudes, and perceptions	CAM (not explicitly defined)
Hasan et al. [29]	2011	Malaysia	Cross-sectional, multi-institutional survey using self-completed questionnaire	1st to 4th year BPharm students	40.2% (500/1243)	Attitudes and perceptions	CAM was referred to as practices, approaches, knowledge and beliefs incorporating plant, animal and mineral based medicines, spiritual therapies, manual techniques and exercises
Jamal et al. [30]	2011	Malaysia	Cross-sectional, face-to-face interview using 18-item questionnaire	1st to 4th BPharm students	Not reported (160/ total NA)	Knowledge and attitudes	Traditional or complementary medicine (not explicitly defined)
Al-Dulaimy et al. [31]	2012	Malaysia	Cross-sectional survey using self-completed 20-item questionnaire	4th year BPharm students	72.7% (96/132)	Knowledge and perceptions	CAM (not explicitly defined)

Author(s)	Year	Country	Study design	Participant	Response rate[a]	Outcome	Topic of discussions
Hussain et al. [32]	2012	Pakistan	Cross-sectional survey using self-completed questionnaire consisting of a modified CHBQ	1st to 5th year PharmD students	70% (418/575)	Attitudes and perceptions	CAM (not explicitly defined)
Hanna et al. [33]	2013	UK	Cross-sectional survey using electronic self-completed 21-item questionnaire	1st to 4th year MPharm students	59% (337/569)	Perceptions	CAM was defined as numerous different treatments and some diagnostic methods e.g., homeopathy, herbal medicines, aromatherapy, and Bach flower remedies
Jakovljevic et al. [34]	2013	Serbia and Balkan region	Cross-sectional, face-to-face interview using structured questionnaire consisting of the CHBQ	Pharmacy (BPharm), medical and dental students, and healthcare professionals (e.g., doctors, dentist, pharmacists)	Not reported (137/total NA)	Knowledge and attitudes	Complementary medicines and complementary therapies (not explicitly defined)
Noureldin et al. [35]	2013	USA	Cross-sectional, multi-institutional survey using electronic self-completed 61-item questionnaire (9 items from CHBQ)	1st to 3rd year PharmD students	22.9% (887/3879)	Attitudes	CAM was defined according to the NCCIH
Anwar et al. [36]	2014	New Zealand	Longitudinal survey using self-completed 18-item questionnaire	2nd year BPharm students who were surveyed again during their 4th year	1st round: 90% (100/111) 2nd round: 97% (90/93)	Perceptions	Traditional healthcare, defined as treatment from the students' cultural heritage or that of other culture
James and Bah [37]	2014	Sierra Leone	Cross-sectional survey using self-completed questionnaire consisting of a modified CHBQ	1st to 5th year BPharm students	91% (90/99)	Attitudes and perceptions	CAM (not explicitly defined)
Wahab et al. [38]	2014	Malaysia	Cross-sectional survey using self-completed questionnaire consisting of the CHBQ	3rd and 4th year BPharm students	66.7% (226/339)	Knowledge, attitudes, and perceptions	CAM (not explicitly defined

BPharm, Bachelor of Pharmacy; MPharm, Master of Pharmacy; PharmD, Doctor of Pharmacy
CHBQ, Complementary and Alternative Medicine Heath Belief Questionnaire
[a]Calculated based on the responding students divided by the total number of students; total NA = the total number of student was not available

General views on CAM. Pharmacy students tended to concede that CAM included beliefs and methods that could benefit conventional medicine. Additionally, the majority of students believed that both conventional and CAM practices should be integrated in clinical care. Many students also thought that CAMs can be potentially used as treatment for symptoms, conditions and/or diseases. A multi-institutional study in the US involving 10 colleges

of pharmacy indicated students agreed that "patients should have the right to select between conventional and alternative therapies in health care" [35].

CAM education. Most of the students asserted that knowledge of CAM is crucial for both the pharmacy students and the pharmacists. CAM was perceived as an area that should be aggressively pursued. Moreover, across the surveys, numerous students welcomed CAM to be included in the pharmacy curriculum, and they wished to have more training about CAM. Only a small proportion of students believed that a CAM course is not required [25, 29]. On the contrary, a study in Pakistan [32] found that only 15% of the students would like to have a CAM course in their curriculum.

Knowledge of CAM. Pharmacy students believed that pharmacists should be knowledgeable and skilful in both conventional and CAM treatments [33]. In five surveys, pharmacy students were requested to rate their knowledge of selected CAM modalities [16, 20, 25, 28, 38]. In these studies, many students considered themselves knowledgeable in common CAM modalities such as herbal medicines [16, 20, 25], massage [16, 25, 38] and dietary supplements [16, 25, 28, 38]. Notably, many students also claimed to be knowledgeable about homeopathy even though the therapy is controversial [16, 20, 25].

Roles of pharmacists in CAM. In many studies, pharmacy students asserted that pharmacists should be able to advise patients about CAM. Students in a UK survey asserted that pharmacists have a role in ensuring the safe use of CAM [33]. Nevertheless, they believed that providing CAM to the patients is an ethical dilemma due to the lack of evidence on the effectiveness of CAM [33]. It was also noted that only a small proportion of the students thought that pharmacists should not discuss CAM with patients [20, 28].

CAM information sources (used, preferred, or perceived as useful). Many students cited the Internet or websites, as their major sources of CAM information [28, 29, 38]. Scientific journals [27, 28, 32, 38] and the mass media, such as television, newspapers and magazines [28, 29, 38] were also construed as common sources of CAM information. In addition, according to the students' perspectives, their colleagues, friends and family members [21, 29] could also provide CAM information.

CAM effectiveness. Diverse opinions on CAM effectiveness were reported. In several studies, many pharmacy students disagreed that the effectiveness of CAM is the result of placebo effects [17, 20, 23, 27, 30, 32, 37], whereas in other studies, students were in agreement or being neutral [16, 28, 33, 35, 38]. Large percentages of the Saudi Arabian and Sierra Leone students (93.2% and 73.4%, respectively) perceived CAM as effective [28, 37]. In other studies, students affirmed that CAM is useful to complement conventional medicine [20, 28, 30]. Survey findings also showed that CAM was not perceived as a form of quackery, or having limited or no purpose [21, 22, 30]. However, the perceptions of students about the availability of robust evidence on CAM effectiveness were inconsistent, in which 43%–79% of the students believe that sufficient evidence exists to support CAM use [28, 30, 31, 33].

CAM safety. Many pharmacy students agreed that CAM therapies that were not tested in a scientifically manner should be discouraged. The majority of the students however, believed that CAM does not pose any threat to the public health. An exception to this was noted among the Saudi Arabian students, in which 52.6% of them perceived CAM as a threat to the public [28]. Survey findings also showed that only a few students perceived that CAM is generally safer than conventional medicine or possesses few side effects [21, 26, 30, 33].

Self-use of CAM. The proportions of pharmacy students using CAM ranged from 6%–93.7% (regardless of a specific time period). When students were presented with different CAM modalities, different percentages of responses were noted for each CAM modality. The use of herbal medicines [16, 28, 37], dietary supplements (including vitamins and minerals) [16, 21, 28, 32, 37, 38], and massage [16, 25, 38] was common among the students.

Possibility of CAM recommendation. Three studies asked pharmacy students about their likelihood of recommending CAM to others. In these studies, the students were more likely to recommend CAM that they have used or those that they were familiar with [16, 29, 38]. The reasons for recommending CAM to patients included the following: (1) treatment for most medical conditions; (2) treatment for medical conditions without a cure; (3) treatment of diseases with long-term management; (4) to substitute conventional medicine; (5) to complement conventional treatment and (6) to prevent disease [32].

Table 2. Attitudes and perceptions of pharmacy students about general CAM issues

Domains / items	Perceptions / attitudes[a]		References[b]
	Percentage (%)	Mean Likert score	
General views on CAM			
CAM includes beliefs and methods from which conventional medicine could benefit	60, 74.5, 75.6, 81.1, 85	2.2[e], 3.9[c], 4.7[f], 4.9[f], 5.7[f]	[32], [20], [37], [17], [27]; [23], [35], [29], [38], [16]

Domains / items	Perceptions / attitudes[a]		References[b]
	Percentage (%)	Mean Likert score	
General views on CAM			
Clinical care should integrate the best conventional and CAM practices	81, 84.4, 85, 89.2, 93.4	2.4[e]	[32], [31], [27], [17], [37]; **[23]**
CAM holds promise for treatment of symptoms, conditions and/or diseases	60, 80, 80, 85.5	-	[32], [23], [27], [17]
CAM treatment has no true impact on treatment of symptoms, conditions and or/diseases	8.9, 15, 20	3.9[e]	[37], [32], [27]; **[23]**
Patients should have the rights to select conventional and/or alternative approaches in health care	-	3.9[c]	**[35]**
CAM stimulates the natural healing power of the body	29.5, 74.4	4.9[f]	[20], [28]; **[38]**
CAM restores the body balance by creating the sense of well-being	63	-	[30]
CAM Education			
CAM knowledge is important for pharmacists and pharmacy students	69, 69, 79.9, 88, 89, 89.6, 98, 98.9	2.1[e]	[32], [29], [35], [27], [16], [31], [20], [37]; **[23]**
Pharmacists should be aware of existing CAM in the country	97.1	-	[20]
CAM education should be aggressively pursued	62.9, 79	-	[22], [31]
CAM education should be included in the pharmacy curriculum	15, 67.5, 71.4, 83, 84.3, 89.2 & 74.8 (CM & CT), 90	2.2[e]	[32], [30], [22], [27], [33], [17], [37]; **[23]**
A CAM course is not required	2.2, 20	-	[25], [29]
CAM topics have been covered in the curriculum	33.3	-	[31]
Students have acquired sufficient knowledge about CAM	17.7	-	[31]
Students need more training in CAM	76	-	28]
Students would like CAM to be a core or compulsory course	40	2.6[-]	[30]; **[29]**
Students would like CAM to be an elective course	66, 94.6	-	[29], [16]
Students prefer to participate in an integrative medicine course	83.1	-	[16]
Students prefer CAM to be taught as a separate course in the curriculum	61, 99	-	[28], [20]
A CAM course should be studied at the postgraduate level	-	3.1[d]	**[29]**
A continuing education on CAM should be mandatory	74.4	-	[28]
Roles of pharmacists in CAM			
Providing CAM information is pharmacists' responsibilities	85, 88.4	-	[28], [33]
Pharmacists should be able to advise patients about CAM	74.4, 84, 88, 88.1, 89.6, 92.2, 95.5 & 65.8 (CM & CT)	2.3[e]	[30], [32], [27], [20], [31], [37], [17]; **[23]**
Pharmacists have a role to play in ensuring CAM is used safely and effectively	95.5	-	[33]
Pharmacists should not discuss CAM with patients	5.9, 40.6	-	[20], [28]
It is an ethical dilemma for pharmacists to provide CAM that lacks evidence of effectiveness	71.5	-	[33]
CAM information sources (used, preferred, or perceived as useful)			
CAM practitioners	39, 43.3, 53	4.2[c]	[32], [37], [29]; **[38]**
Colleagues or peers	38, 65, 67.6	-	[21], [27], [28]
Coursework or formal education, e.g. lectures	3.3, 10, 27.4, 28, 38, 75.2, 76.4	3.7[c]	[37], [16], [29], [32], [27], [28], [19]; **[38]**
Drug information center	66.1	-	[28]
Electronic databases, e.g. PubMed	13.6, 18.3, 58.6	-	[19], [16], [28]
Friends or family members			
Unspecified	25.5, 63	-	[19], [29]
Friends	48.9, 73	-	[28], [21]
Family	43.6, 62	-	[28], [21]

Domains / items	Perceptions / attitudes[a]		References[b]
	Percentage (%)	Mean Likert score	
CAM information sources (used, preferred, or perceived as useful)			
Healthcare providers/professionals Unspecified Doctors	10, 18, 41, 51, 55 46	3.7[c] -	[21], [37], [32], [29], [27]; **[38]** [21]
Internet or websites	15, 33.6, 39, 48, 50, 65.4, 69	4.3[c]	[21], [19], [32], [27], [16], [28], [29]; **[38]**
Journals in pharmacy, medicine, nursing or others	22.2, 49.6, 58.6, 64, 70	4.0[c]	[37], [16], [28], [32], [27]; **[38]**
Marketing materials	10	-	[16]
Mass media, e.g. television, newspapers, magazines, etc. Unspecified Newspaper Television Magazines	10, 33, 58.9, 61, 63.1 38 41 38	3.8[c] - - -	[16], [27], [37], [29], [28]; **[38]** [21] [21] [21]
Textbooks or books	30, 35.6, 41.7, 61.7	-	[19], [37], [16], [28]
Training or apprenticeship with CAM healers	8, 8.9, 12	-	[27], [37], [32]

CAM, complementary and alternative medicine; CM, complementary medicine (e.g., herbal medicines, vitamins, etc.); CT, complementary therapy (e.g., acupuncture, meditation, etc.)
[a]Agreed on a particular statement by pharmacy students and presented as a percentage or mean Likert score
[b]References for mean Likert score are in bold
[c]Response based on 5-point Likert scale: 1 (strongly disagree) to 5 (strongly agree)
[d]Response based on 5-point Likert scale: 1 (strongly agree) to 5 (strongly disagree)
[e]Response based on 6-point Likert scale: 1 (strongly agree) to 6 (strongly disagree)
[f]Response based on 7-point Likert scale: 1 (absolutely disagree) to 7 (absolutely agree)

Table 3. Attitudes and perceptions of students about CAM application

Domains / items	Perceptions / attitudes[a]		References[b]
	Percentage (%)	Mean Likert score	
CAM effectiveness			
The effects of CAM are the results of placebo effects	10.8 & 9 (CM & CT), 25.5, 30, 30, 32.4, 46.9, 47, 50.4, 61.7	2.8[c], 4.0[f], 4.18[f]	[17], [37], [27], [23], [20], [30], [32], [28], [33]; **[35], [16], [38]**
The effectiveness of CAM is not supported by robust evidence	65.6	-	[33]
CAM is mostly quackery	6.1, 33	-	[22], [30]
CAM has limited use	38.8	-	[21]
CAM has no purpose	1	-	[21]
Sufficient evidence exists to support the use of CAM	43, 53.2, 79	-	[30], [31], [28]
CAM is effective	73.4, 93.2	-	[37], [28]
CAM is useful as a complement to regular medicine	64.4, 69.6, 76	-	[30], [20], [28]
CAM is useful for disease prevention	52 & 59 (2011 & 2013)	-	[36]
CAM is useful for treatment of diseases	35, 61 & 64 (2011 & 2013)	-	[21], [36]
CAM can improve patient's quality of life	85	-	[21]
CAM can only relieve symptoms	45	-	[21]
CAM safety			
CAM therapies that are not scientifically tested should be discouraged	51, 53, 55 & 44.1 (CM & CT), 56.7, 71.3, 73, 94	3.1[e], 3.2[c], 3.4[f], 4.8[f], 5.3[f]	[20], [27], [17], [37], [30], [28], [32]; **[23], [35], [16], [29], [38]**
CAM is safe to be used or not harmful	8.3, 25.6, 74.4	-	[31], [30], [37]
CAM is generally safer than conventional medicine	13.6, 15	-	[33], [21]

Domains / items	Perceptions / attitudes[a]		References[b]
	Percentage (%)	Mean Likert score	
CAM safety			
CAM has few side-effects	25.6, 39.1	-	[30], [26]
CAM is a threat to the public health	4.5 & 2.7 (CM & CT), 8.8, 15, 23.4, 25, 52.6	2.1 & 2.4[c] (CM & AM), 2.5[f] 3.3[d], 3.7[f], 4.2[e]	[17], [20], [27], [37], [32], [28]; **[35], [16], [38], [29], [23]**
Self-use of CAM			
At any time	6, 31.5, 39, 44.6, 48 & 61 (2011 & 2013), 57.3, 74.8, 78, 92, 93.7 & 38.7 (CM & CT)	-	[31], [33], [28], [20], [36], [30], [35], [29], [16], [17]
Within the past 12 months	43	-	[26]
At the time of survey	58	-	[29]
Reasons for recommending CAM			
For any conditions	93	-	[16]
For most medical problems	76	-	[32]
For conditions without known cure	67	-	[32]
For conditions with long waiting time for treatment	66	-	[32]
To generate income	31.4	-	[22]
To replace conventional therapies	67	-	[32]
To use in conjunction with conventional therapies	69	-	[32]
To prevent diseases	67	-	[32]
Barriers to CAM use			
Concern over legal issues	27, 37, 65, 66	3.5[c]	[17], [29], [27], [32]; **[38]**
Too time consuming	8, 28, 32, 50	3.4[c]	[32], [27], [29], [37]; **[38]**
Lack of scientific evidence for practice	71, 75, 85, 85.6, 86.5	4.2[c]	[32], [29], [27], [37], [17]; **[38]**
Lack of reimbursement or government subsidies	31, 39, 48.6, 75	3.4[c]	[32], [29], [17], [27]; **[38]**
Lack of appropriate equipment	46, 58	-	[32], [27]
Lack of knowledge about CAM	87.8	-	[37]
Lack of staff training	59, 75	4.0[c]	[32], [27]; **[38]**
Unavailability of credentialed providers or trained professionals	65.8, 69.4, 80, 91.1	-	[17], [29], [27], [37]

CAM, complementary and alternative medicine; CM, complementary medicine (e.g., herbal medicines, vitamins, etc.); CT, complementary therapy (e.g., acupuncture, meditation, etc.)
[a]Agreed on a particular statement by pharmacy students and presented as a percentage or mean Likert score
[b]References for mean Likert score are in bold
[c]Response based on 5-point Likert scale: 1 (strongly disagree) to 5 (strongly agree)
[d]Response based on 5-point Likert scale: 1 (strongly agree) to 5 (strongly disagree)
[e]Response based on 6-point Likert scale: 1 (strongly agree) to 6 (strongly disagree)
[f]Response based on 7-point Likert scale: 1 (absolutely disagree) to 7 (absolutely agree)

Barriers to CAM use. Many pharmacy students perceived the lack of CAM evidence [17, 27, 29, 32, 37, 38], limited knowledge [37], and inadequate trained professionals [17, 27, 29, 37] as restrictions to the use of CAM. The concerns about legal issues [27, 32, 38], and lack of reimbursement [27, 38] were also considered as barriers to some extent.

Discussion

In this review, the attitudes and perceptions of pharmacy students about CAM were summarised from 21 heterogeneous studies. In general, survey findings showed that pharmacy students exhibited positive attitudes and perceptions about CAM as treatment modalities that could benefit conventional medicine. The students also welcomed the integration of CAM into conventional medicine, and believed in the potential of CAM for disease prevention and treatment.

Pharmacy students' attitudes and perceptions about CAM effectiveness and safety were noted to be diverse and conflicting among surveys. Nevertheless, consistent findings showed that pharmacy students believed that CAM knowledge is important for both the students and the pharmacists. Many students welcomed CAM to be included in the pharmacy curriculum. A low interest in having a CAM course in the curriculum was reported in only one study [32]. The authors believed that this finding

might be the result of students' lack of knowledge of the content and volume of a CAM course, and the students might be concerned about how the course would fit in their already crowded curriculum.

Having numerous students who were well-informed about pharmacists' responsibilities in advising patients to ensure the safe use of CAM is a good sign. However, more importantly students should be equipped with knowledge of CAM fundamentals so that they can evaluate CAM safety, effectiveness, potential interactions, and evidences in a timely manner. Pharmacy students should also be trained to communicate with consumers about the use of CAM in a supportive and non-judgmental manner [11]. Accordingly, students should be taught to provide consumers with CAM advice that are valid, evidence-based, and non-biased, so that they can make an informed decision.

When pharmacy students were presented with a list of CAM modalities, they were more likely to rate their knowledge as high for certain CAM modalities that are commonly used by the public, e.g., herbal medicines, dietary supplements, and massage. However, self-perceived knowledge may not correspond to students' actual knowledge of the modalities. Therefore, further studies should be warranted to assess students' knowledge about CAM accurately. Findings from such studies will identify the areas where students should improve or emphasise.

The common sources of CAM information cited by the pharmacy students included the Internet, mass media, and family and friends, probably due to its convenience and easy access. However, the information provided by these sources might not necessarily be valid or reliable. Hence, students should be taught on how to analyse and critically assess CAM claims, and recognise misinformation from these sources. Nevertheless, the recognition of the Internet as a source of CAM information could be seen as an opportunity to educate students about CAM through web-based learning. Professional journals were also preferred by the students as a means to obtain CAM information. Accordingly, critical evaluation of scientific literature should be emphasised in CAM education, and students should be encouraged to use this source of evidence-based information for their future pharmacy practice.

CAM utilisation by the pharmacy students themselves is not uncommon, specifically for herbal medicines, dietary supplements, and massage. Students' self-use of CAM may be possibly associated with the students' cultural background [26, 36], and may change over a period of time due to increased awareness of CAM throughout their study or increased comfort level in reporting CAM during their senior year where they have been exposed with unbiased CAM information [36].

The likelihood of the pharmacy students in recommending CAM to others is common in several studies [16, 29, 38]. It has been argued that the sales and recommendation of CAM in pharmacies breach the pharmacist's ethical code [40]. However, pharmacists often stock CAM in their pharmacies because of the high demand of these products [41]. In addition, the selling and recommendation of CAM are often defended by the argument that respecting patients' choices and decisions is always an integral part in the relationship between patients and healthcare professionals; thus consumers should always have an access to medicine of their own preference. Nevertheless, in the context of pharmacy students, one particularly important aspect to be concerned of is the likelihood of students recommending CAM to others despite having inadequate knowledge of CAM, or based on personal experiences, and familiarity [16, 29, 38].

Therefore, CAM education should aim to provide CAM knowledge and skills that would rationalise pharmacy students' perspectives about CAM. Essentially, students with positive attitudes towards CAM should be educated to be more cautious towards modalities that have potential to interact with prescribed medicines or produce adverse effects; whereas those with negative ones should be made informed of some CAM that may provide symptom relief, when conventional medicine failed [17, 42].

The use of CAM by the public varies based on geographical regions and may be influenced by local cultures [1]. It is therefore imperative for Pharmacy schools and colleges to keep abreast of the trend of use of CAM in their regions [43]. Additionally pharmacy schools and colleges should be aware of the latest evidence and updates about CAM effectiveness and safety [11]. These information can be incorporated into CAM education for pharmacy students to ensure they receive current and relevant CAM information.

Limitations of the study. The small number of studies with various findings caused the challenge in summarising and elaborating the findings. Additionally, not all of the articles reported response rates or had sufficient information for the calculation. For example, a total of 13 and 4 studies had a response rate of higher and less than 60%, respectively, and none for the remaining studies. A response rate is an important indicator for assessing the quality of the studies. Thus, this limitation might eventually affect this review to some extent. Lastly, a majority of the studies used in this review were carried out in a single institution, thereby limiting the generalisation even at a regional level.

Conclusion

This review provides a synopsis of pharmacy students' attitudes and perceptions about CAM despite the data heterogeneity. Although the students expressed favourable attitudes and perceptions about CAM, they should be educated to appraise pertinent information critically, specifically that obtained from the Internet or websites. This approach would enable them to provide evidence-based advice on the effectiveness and safety of CAM to patients and the public in the future. CAM modalities are increasingly available in the market; hence pharmacists and pharmacy students should be aware of the existence and applications of these modalities in actual practice. The roles of pharmacists in CAM are rather obvious because they are generally the first point of contact for pharmaceutical care. However, more efforts should be exerted to improve pharmacy students' knowledge of CAM and boost their confidence in advising patients or consumers about CAM. Further studies are required to measure students' knowledge of CAM modalities accurately and investigate

their willingness and preparedness in talking to patients about CAM. In addition, the attitudes of the pharmacy faculty members towards CAM and their ability to provide CAM education should be investigated to ascertain the high calibre of CAM teaching and training.

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