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Knowledge, Attitudes and Practices of Pharmacists towards Complementary and Alternative Medicine: A National Cross-Sectional Study in Lebanon

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Abstract

Introduction Despite the increased prevalence of Complementary and Alternative Medicine (CAM) use, the market for CAM products remains poorly regulated with a high rate of non-disclose to healthcare providers. This underscores the crucial role of pharmacists in ensuring patients' health and safety.

Objective To assess the CAM related attitudes, practices and knowledge of community pharmacists in Lebanon.

Design, methods and setting Using a stratified random sampling frame, a cross sectional survey of a nationally representative sample of pharmacists practicing in community pharmacies was conducted in Lebanon (n=357). Data collection was conducted using face to face interviews and included the completion of a four-section-questionnaire: 1) socio-demographic, education and practice characteristics, 2) attitudes towards CAM, 3) CAM-related practices and 4) knowledge about common CAM used in the country.

Results The majority of pharmacists agreed that CAM products are effective (63.2%) and they should be exclusively sold in pharmacies (80%). Pharmacists disagreed that commercially marketed CAM products are of good quality (42.3%), that they are well regulated (61.9%) and that media plays a positive role in educating users about CAM (56.5%). As for CAM practices, pharmacists were always/often advising patients on safe use and ask for their feedback after use (63%). However, 73.3% of participants rarely or never report toxic or undesirable effects that occurred with patients using CAM products. Regarding knowledge, although the majority of pharmacists are aware for the uses of CAM, fewer knew about their side effects and their drug interactions.

Conclusions The findings of this study revealed positive attitude of pharmacists in Lebanon towards CAM and indicated important gaps in their practice and knowledge. Deliberate efforts to enhance the education of pharmacists and support them with a clear and responsive regulatory framework are warranted to ensure the safe integration and use of CAM products in Lebanon and elsewhere.

Keywords: Complementary medicine, Community, Pharmacist, Health Policy, National Cross-sectional survey, Lebanon.

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Strength and limitations of this study

- This is the first national study to examine the CAM related knowledge, attitudes, and practices of a nationally representative sample of community pharmacists in Lebanon.
- The data collection relied on self-reported answers which could be subject to errors due to memory recall or social desirability bias.
- The cross sectional nature of the study prevented any inference about the change in CAM attitude, practice or knowledge over time among pharmacists in the country.

Introduction

Complementary and Alternative Medicine (CAM) is a diverse group of medical and healthcare systems, practices, and products that are not considered part of conventional medicine. CAM may complement mainstream medicine by diversifying the conceptual frameworks of medicine or by satisfying a demand not met by orthodoxy.[1] In recent years there has been a renaissance of interest in natural and herbal remedies worldwide whereby the global CAM market exceeded 100 billion USD during year 2017.[2] According to the World Health Organization (WHO), in developing countries, 65-80% of the population depends essentially on plants for primary health care.[3] CAM is usually used to for general health maintenance, treatment of specific disease states and more frequently for chronic conditions (e.g., anxiety, pain, headaches, depression, and cancer).[4] Such a widespread use of CAM could be attributed to dissatisfaction with conventional medicine, the increasing cost of conventional medical care, placebo effect or the desire of 'self-management' and decision-making process.[5,6] However, it is important to note that the use of natural products might be associated with hazardous health risks related to their toxicity, adverse reactions, interaction with conventional drugs, improper dosage, or quality of the products (e.g., contamination, misidentification or lack of standardization).[7] These risks could be amplified due to low rate of CAM use disclosure to the health care providers for fear of their disapproval, disinterest, or inability to help.[8-11] Such lack of professional supervision may further expose the consumer to various risks, including adverse reactions or interactions with conventional drugs.[4,12,13]

Among health care professionals, pharmacists are ideally positioned to promote the safe use of CAM and to provide patients with evidence based information to ensure the effective and safe use of CAM. Professional associations, such as the American College of Clinical Pharmacy (ACCP), the American Society of Health-System Pharmacists (ASHP), and the Canadian Society of Hospital Pharmacists (CSHP), have recommended that the profession of pharmacy actively embrace dietary supplement (natural health products, vitamins, and minerals) as part of the pharmacist's scope of practice.[14] The ACCP's stated that "pharmacist involvement in herbal products is an extension of their roles in pharmaceutical care, clinical pharmacy practices and collaborative health care teams".[15] Despite this marked commitment to promoting the safe use of CAM by pharmacists, the integration of CAM into the curricula of

pharmacy education has lagged behind,[16] leaving many pharmacists unfamiliar with the health effects of CAM.[14]

One of the fastest growing markets of CAM products in the world is the Middle East and North Africa Region (MENA). Despite of this growth, CAM products are poorly regulated. For example, in Lebanon, a small country of the MENA, the market for CAM products is largely unregulated and could be subject to abuse by both patient and provider.[17] About one third of Lebanese adults (29.87%) were reported to use CAM products in 2015, with the most prevalent consumed CAM type being herbal supplements.[5] Higher rates of CAM use were reported among patients with chronic diseases such as infertility (41%),[18] lung cancer (41%),[19] and HIV and AIDS conditions (46.6%).[20] A common finding to most studies conducted on CAM use in Lebanon was the low rate of disclosure to the treating physicians.[5,17,19,21-23] This behavior raised concerns about the safety, efficacy, and their impact on the patient health; especially when it is coupled with poor regulatory frameworks.[17]

In Lebanon, the increased prevalence of CAM use, the poorly regulated CAM market, together with the high rate of non-disclose to healthcare providers, underscore the crucial role of pharmacists in ensuring patients' health and safety. The aim of this study is to assess the CAM related attitudes, practices and knowledge of a nationally representative sample of community pharmacists in Lebanon. The findings of this study will inform the practice of pharmacy in the country, as well as the development and integration of CAM modules into mainstream educational programs of pharmacy.

Methods

This is a cross-sectional national survey of pharmacists practicing in community pharmacies conducted in Lebanon between September 2017 and February 2018. The sampling unit for this study was the pharmacy. A list of all community pharmacies and their location in Lebanon was obtained from the Order of Pharmacists in Lebanon (OPL). Pharmacies were selected from this list using a stratified random sampling technique. The strata were the six Lebanese governorates. The number of pharmacies selected was proportional to the number of pharmacies in each stratum. Sample size calculations showed that a minimum of 342 pharmacists ought to be recruited in order to estimate a prevalence of 50% with a 95% CI and a margin of error of 5%. In order to account for a 20% refusal rate, 412 pharmacies were selected from the OPL list.

To be included in the study, the pharmacist had to be licensed to practice by the Lebanese Ministry of Public Health and registered in the OPL. The pharmacist had to be working in the selected pharmacy whether as pharmacy owner or as an employee. In addition, the pharmacist had to be conversant in either the English or the Arabic languages. Pharmacists unable or unwilling to give consent for the study were not included. If a pharmacist in a selected pharmacy refused to participate, the pharmacist in the closest pharmacy was approached. In the case when more than one pharmacist in the selected pharmacy was eligible to participate, only one pharmacist was selected at random to take part in the study. The study protocol was approved by the Institutional Review Board at the Beirut Arab University; under the protocol number 2018H-0052-P-R-0249.

Data collection was conducted using face to face interviews with the pharmacists. The interviews were conducted by field workers who received extensive training on professional interviewing techniques and administration of the study questionnaire prior to the start of the study.

The questionnaire used in the data collection for this study was comprised of four sections. The first section included questions related to socio-demographic, education and practice characteristics, such as age, sex, employment status (full-time employee, part-time employee, or pharmacy owner), highest level of education attained (Bachelors, Masters, Pharm D or PhD), whether the pharmacist received CAM education/training during his/her university education years, whether the pharmacist pursued post graduate education/training in CAM, years of experience as community pharmacist, the number of pharmacist in the pharmacy and how long was the pharmacy open for. The second section of the questionnaire addressed the pharmacist's attitudes towards CAM. Specific questions were included tackling his/her perception of the regulation of CAM market, the role of media in Lebanon as well as the availability of resource and the need for continuous education in CAM. The third section of the questionnaire included questions assessing the pharmacist's practices in CAM, including selling CAM, advising patient on the safe use of CAM, reporting of CAM toxic effects and checking for CAM-drug interactions. For sections 2 and 3, the survey instrument used a 5-point Likert rating scale on which 1 represented strongly agree and 5 represented strongly disagree. The last section of the questionnaire addressed the pharmacist's knowledge about CAM covering the uses,

side effect, and interactions of commonly sold CAM products. The content validity of this questionnaire was confirmed by an expert panel consisting of a pharmacist, a nutrition epidemiologist, a biostatistician and a health policy expert. The questionnaire was originally written in English, before being translated to the Arabic language, and then back translated to English. The original and back-translated English versions of the questionnaire were examined to ensure parallel form reliability. The questionnaire was pilot tested on a convenient sample of 16 pharmacists to check for clarity and culture sensitivity. Given that there were no changes in the data collection tool following the pilot testing, its results were included in the analysis of this study.

For the summary of the data, descriptive statistics were used, such as frequency and proportions. A knowledge score corresponding to the number of correctly answered questions was generated, with a minimum of zero and a maximum of 10. Statistical Package for Social Sciences (SPSS) software version 20.0 for windows program was utilized to analyze the data.

Results

Out of 412 pharmacists approached, 357 agreed to participate in this study (86.7% response rate). The two main reasons for refusal to participate were lack of interest (34.5%) and lack of time (27.3%). Other reason for non-participation accounted for 18.2%, with an additional 20% not reporting a specific reason (20.0%).

The distributions of the pharmacies in Lebanon and in the study sample are presented in table 1. Overall, the study sample showed comparable distribution of pharmacies among the various governorates to the national distribution.

Characteristics of study sample.

Table 2 displayed the various characteristics of the study population. The pharmacists were of varied age groups, with most of them ranging between 20 and 40 years of age (66.4%). The study sample consisted of a slightly higher proportion of males versus females (54.8% male and 45.2% female). More than 50% of the pharmacists approached were the owners of the pharmacy (56.5%), the rest were either working as full-time (22.3%) or part-time (21.2%). As for educational level, 54.2% reported having a Bachelor's degree, while 45.8% of the pharmacist had attained higher degrees; 19.7% a Master's degree, 23.0% a Pharm D and 3.1% a PhD. Sixty-eight

percent of the pharmacists studied in Lebanese universities. More than two in three pharmacists reported receiving education about CAM-products during their university education (72.5%) and only 18% underwent a post-graduation training on CAM-products. Working experience among the pharmacists ranged from 1-3 years (21.5%) to greater than 10 years (44.4%) (Table 2).

Attitudes towards CAM products, their market and availability of resources.

Overall, study participants displayed positive general attitudes towards CAM with 63.2% of pharmacists strongly agreeing/agreeing that CAM products are effective and the majority (80.0%) strongly agreeing/agreeing that CAM products should be exclusively sold in pharmacies (Table 3). Only 28.3% disagreed/strongly disagreed that CAM products have less side effects compared to conventional medicines (16.7% were neutral and 55.0% strongly agreed/agreed). Over 80.0% percent strongly agreed/agreed that providing information to customers about CAM products is a pharmacist's professional responsibility (Table 3).

As for the pharmacists' attitudes towards the CAM market in the country, a sizable proportion of survey participants (73%) were not sure about the quality of commercially marketed CAM products in Lebanon, where (42.3%) were disagreeing/strongly disagreeing and 30.7% were neutral. When asked if they think that the market for CAM products in Lebanon is well regulated 61.9% of surveyed community pharmacists disagreed/strongly disagreed. Furthermore, more than half of pharmacists (56.5%) disagreed/strongly disagreed that media plays a positive role in educating patients about CAM (Table 3).

With regards to the availability of resources on the safe use of CAM for pharmacists, only 55.5% of study participants believed that information on CAM products are easily accessible to the pharmacists and 61.9% strongly agreed/agreed that continuous education on CAM should be mandatory for pharmacists (Table 3).

Current practice of dispensing CAM products.

Around two thirds of pharmacists participating in this study reported that they always/often sell CAM products in their pharmacy and 59.1% reported always/often getting inquiries from patients regarding the use of CAM products (Table 4). The

majority of pharmacists (63.0%) reported that they always/often advise patients on safe use of CAM products and ask for their feedback after use; however, 73.3% of pharmacists answered that they rarely or never reporting toxic or undesirable effects that occurred with patients using CAM products (Table 4). Among those who report the incidence of toxic effect of CAM, 50% of pharmacists indicated that they reported to the pharmaceutical company (provider of CAM) and only 13% reported to the OPL, the remaining reported to physician (14.5%), medical representative (8.7%), pharmacists (4.3%) and MOPH (4.3%) (Table 4 b). It is worth noting that 60% of pharmacists reported always/often for CAM product-drug interaction prior to selling the product (Table 4).

Evaluation of pharmacist' self-knowledge

Table 5 displayed the results of self- knowledge in CAM which was composed of 10 questions including uses, side effects and drug interactions of commonly sold products. The majority of pharmacist answered correctly the questions related to the uses of *Echinacea*, *Ginkgo biloba*, and Omega-3 (81%, 82.9%, and 91.9% respectively). However, only 23.9% recognized the effect of Echinacea on autoimmune disorders, 59.5% were aware that ginkgo may increase the risk of bleeding when combined with warfarin, and 50% did not know the potential effect of a vitamin B complex supplement on wound healing. On the other hand, 77.9% of the pharmacist knew that vitamin C enhances the absorption of iron supplement and 70% knew the side effect of ginseng on blood pressure. Of further concern are the high proportions of interviewed pharmacists who were not aware of the drug-CAM interactions. For instance, 80% did not know that Valerian should be used cautiously in patients using benzodiazepines and over 80% did not answer correctly the concurrence administration of omega-3 and clopidogrel (Table 5).

Discussion

This is the first national study to examine the CAM related knowledge, attitudes, and practices of a nationally representative sample of community pharmacists in Lebanon. This also presents one of a few regional attempts to solicit the opinion of pharmacists at a national scale, despite the MENA region hosting one of the fastest growing markets of CAM products in the world.[24-29] The study revealed that despite an overwhelming acknowledgement of the importance of CAM products by community

pharmacists, most believe that the market should be better regulated, majority also report the need for professional development opportunities to enhance their knowledge of CAM products. Lebanese pharmacists reported a generally safe and positive attitude towards the dispensing of CAM products; however, the assessment of self-knowledge unearthed some deficiencies in pharmacists' knowledge of potential side effects of CAM products and of CAM-drug interaction.

One of the main findings of this study relates to the generally positive attitudes of Lebanese community pharmacists towards CAM products which is similar to other studies in the region[24-29] and other countries such as USA,[16] Australia,[30] Singapore[31] and Ethiopia.[2] Pharmacists do not only believe in the utility of CAM products but are also willing to assume a leading role by asking for exclusive rights to sell CAM products in pharmacies and under the advice of a community pharmacists. This is in accordance with a recent published study by Gelayee et al. (2017).[2] Pharmacists believe that they are in ideal position to dispense CAM products, as a completion of their role in dispensing, monitoring, and counseling conventional medicine. This unique position of the pharmacist could be best achieved if equipped with good knowledge and skills.[2] The positive attitude of surveyed pharmacists could also be shaped by the high demand of patients for CAM products and the high frequency of pharmacies reporting the selling of such products.

The general positive attitude of pharmacists towards CAM products is contrasted by a strong negative attitude towards the means through which the market is governed. On that front, surveyed pharmacists were both critical of the regulatory framework for CAM products and of the counterproductive and misleading role played by media. With respect to the regulation of the misleading role of media, Lebanon could perhaps learn from the experience of the United States Food and Drug Administration (FDA) which prohibits manufacturers and distributors of CAM products from marketing adulterated or misbranded products.[32]

A remarkable finding in this study relates to half of surveyed pharmacists reporting toxic and undesirable side effects of CAM products to the distributing pharmaceutical/ CAM companies (only 13% report to the OPL) rather than doing so to the MoPH. This does not only jeopardize public safety but also raise ethical questions related to the obvious conflict of interest in reporting side effects to the company benefiting from the sales of CAM products. Similar findings were reported in the state of Qatar.[33] The findings call for the establishment of a more robust regulatory framework

that does go beyond the review and approval of CAM products to the establishment and implementation of the mechanisms to monitor and evaluate the safe use post-market distribution. Such role could be played by the MoPH, the OPL or an arms length organization with a national mandate to ensure safe consumption of CAM products. For instance, in USA the FDA is responsible for the regulation of dietary supplements.[32] Manufacturers of CAM products are responsible for the evaluation of the safety and labelling of their products to meet the requirements of FDA regulations. FDA is responsible for taking action against any adulterated CAM products that has reached the market.[32] In addition, the FDA allows consumers and healthcare professionals to report any adverse reactions on a designated reporting portal.[34]

It is further disconcerting that the majority of pharmacists disagree that commercially marketed CAM products in Lebanon are of good quality. This necessitates pharmacists to play a leading role to ensure safe utilization by their customers. Similarly in other studies pharmacists' main concern were the lack of clear regulations and safety governing the sale of CAM products.[16,31,33] However, the role of the community pharmacist related to the safe use of CAM products may be undermined by the lack of proper education and training on the safe use of CAM products. In fact, close to two thirds of pharmacist believe that the continuous education on CAM should be mandatory for pharmacists. This recommendation concurs with that of many other studies highlighting the need to have additional education and training on the use of CAM products.[2,14,26-31,33]

Perhaps one of the most disconcerting findings of this study relates to the assessment of Pharmacists' information which revealed deficiencies in their knowledge of CAM-drug interaction and to a lesser extent CAM products side effects. Such knowledge deficiencies were reported by many other studies and appear to be a concern of global nature.[2,4,16,24-29,31,33,35] This is despite pharmacists being well knowledgeable of the purpose of CAM use. One explanation for this is the means through which CAM companies market their products educating the physicians and pharmacists where they aim to maximize sales and neglect any factor that can affect the promotion of their products. Another explanation could be the lack of scientific resources and its availability and ease access by the pharmacist. The use of scientific resources and updated data should be integrated within the practice habit of the pharmacist to provide evidence based information for CAM products.

The findings on the lack of knowledge on safe use of CAM products, coupled with the majority of pharmacists requesting a mandatory continuous education program, open a remarkable window of opportunity for the Ministry of Public Health (MoPH) to work collaboratively with the Oder of Pharmacists to establish a national program for the continuous education of pharmacists on CAM products. Collaborating with academic institutions would enhance the design, implementation and evaluation of such a program. Such programs would enhance the knowledge of pharmacists on the safe use of CAM products, the appropriate reporting of side effects and their general role as CAM counsellors for their customers.

The findings of this study ought to be considered in light of a few of limitations. First, the data collection relied on self-reported answers for practices, attitudes and knowledge. These answers could be subject to errors due to memory recall or social desirability bias. To mitigate this, interviewers were trained to maintain a neutral attitude and avoid leading questions. Second, although a few questionnaires were validated to assess the CAM-related attitude, practice and knowledge among specific population, such as nurses, and medical students,[36,37] none was available for use among pharmacists. Therefore, the questionnaire used in data collection was developed and vetted by a panel of experts, including a pharmacist, nutrition epidemiologist, biostatistician and a health policy expert. The questionnaire was designed to capture the common traits in attitude, practice and knowledge of pharmacist towards CAM and to address to context specificity of the study. Lastly, despite the fact that the sample of pharmacists considered was nationally representative, the cross sectional nature of the study prevented any inference about the change in CAM attitude, practice or knowledge over time among pharmacists in the country.

The increased popularity and use of CAM products is catalyzing the efforts of many countries to enhance the integration of CAM products and therapies into mainstream medicine. The pharmacist plays a central role should such integration be successful. However, as this study highlights, deliberate efforts to enhance the education of pharmacists and support them with a clear and responsive regulatory framework would be necessary to ensure the safe integration and use of CAM products in Lebanon and elsewhere.

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Author Contributions FN, MAH, designed the data collection form and the methodology. MAH managed data collection.SK and HS analyzed the data. FN, MAH, MA and HS wrote the first draft of the manuscript. AE, MA contributed to drafting the paper. The final version was reviewed and approved by all authors.

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Data Statement: The de identified dataset for this study could be made available with the approval of the IRB Board.

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List of Tables

Table 1: Distribution of Pharmacists across governorates in comparison to national distribution of pharmacies

	Pharmacies in the study n(%)	Pharmacies in Lebanon n(%)
Beirut	36 (10.1)	238(7.8)
South	48 (13.4)	353(11.6)
North	49(13.7)	436(14.3)
Mount Lebanon	142(39.8)	1311(43.1)
Beqaa	57(15.9)	482(15.8)
Nabatieh	25(7.0)	223(7.3)
Total	**357**	**3043**

Table 2. Characteristics of study sample (n=357)

	Frequency	Percentage
Age range		
20-30 years	122	34.8
31-40 years	111	31.6
41-50 years	66	18.8
Above 50 years	52	14.8
Gender		
Male	193	54.8
Female	158	45.2
Employments status		
Full time	79	22.3
Part-time	75	21.2
Pharmacy owner	200	56.5
Highest educational level attained		
Bachelors	193	54.2
Masters	70	19.7
Pharm D	82	23.0
PhD	11	3.1
Which university did you graduate from		
Non-Lebanese Universities	104	31.7
Lebanese Universities	224	68.3
During your university education, did you receive any education/training on CAM-products?		
Yes	256	72.5
No	97	27.5
Did you receive any postgraduate education/training on CAM-products?		
Yes	64	18.1
No	290	81.9
Years of work experience (in community pharmacy)		
1-3 years	76	21.5
4-7 years	74	20.9
8-10 years	47	13.3
Above 10 years	157	44.4
How many pharmacists work in this pharmacy?		
0	30	8.5
1	138	38.9
2	122	34.4
≥3	65	18.3
How long has this pharmacy been opened for?		
1-5 years	81	25.5
6-10 years	83	26.1
11-15 years	42	13.2
16-20 years	41	12.9
>20 years	71	22.3

Table 3: General attitudes towards CAM products, their market and availability of resources among a national sample of pharmacists in Lebanon

	n(%)				
	Strongly agree	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
General attitudes toward CAM					
CAM products are effective	72(20.4)	151(42.8)	94(26.6)	24(6.8)	12(3.4)
CAM products should be sold only in a pharmacies	209(58.7)	76(21.3)	23(6.5)	37(10.4)	11(3.1)
The use of CAM products should not be limited to patients who have failed traditional prescription therapy	28(7.9)	46(13.0)	63(17.8)	132(37.4)	84(23.8)
CAM products have less side effect than conventional medicines	90(25.4)	105(29.7)	59(16.7)	69(19.5)	31(8.8)
Providing information about CAM products is a pharmacist's professional responsibility	188(53.0)	100(28.2)	36(10.1)	24(6.8)	7(2.0)
Attitudes towards CAM market in Lebanon					
Commercially marketed CAM products in Lebanon are well standardized and of good quality	28(7.9)	68(19.2)	109(30.7)	95(26.8)	55(15.5)
The market for CAM products in Lebanon is well regulated	20(5.7)	41(11.6)	73(20.7)	106(30.1)	112(31.8)
Media plays a positive role in educating patients about CAM	41(11.5)	40(11.2)	74(20.8)	89(25.0)	112(31.5)
Availability of resources					
Information resources on CAM products are available and easily accessible to the pharmacists	104(29.3)	93(26.2)	69(19.4)	65(18.3)	24(6.8)
Continuous education on CAM should be mandatory for pharmacists	118(33.2)	102(28.7)	72(20.3)	42(11.8)	21(5.9)

Table 4a. Current practice of dispensing CAM products

	Always	Often	Sometimes	Rarely	No
Do you sell CAM products in your pharmacy?	126(35.4)	112(31.5)	81(22.8)	24(6.7)	13 (3.7)
Do you get inquiries from patients regarding the use of CAM products?	103(29.0)	107(30.1)	80(22.5)	43(12.1)	22(6.1)
Do you advise patients on safe use of CAM products?	142(40.1)	81(22.9)	84(23.7)	26(7.3)	21(5.9)
Do you ask your patient about their feedback after their use of CAM products?	158(44.4)	65(18.3)	66(18.5)	45(12.6)	22(6.2)
Do you report any toxic or undesirable effect occurred with patients using CAM products?	34(9.6)	30(8.5)	31(8.7)	51(14.4)	209(58.9)
Do you get referrals from natural practitioners to your pharmacy?	27(7.7)	48(13.7)	59(16.9)	44(12.6)	172(49.1)
Do you check for CAM product-drug interaction?	135(38.1)	78(22.0)	53(15.0)	41(11.6)	47(13.3)

Table 4b: To whom do you report any toxic or undesirable effect that occurred with patients using CAM products?

	n=69	%
Company	35	50.7
Medical representative	6	8.7
MOPH	3	4.3
OPL	9	13.0
Pharmacists	3	4.3
Physician	10	14.5

Table 5: Evaluation of self-knowledge

	% answered correctly	% answered incorrect	% answered I don't know
Echinacea is commonly used for the treatment of cold & flu symptoms	289(81.0.)	28(7.8)	40(11.2)
Echinacea can be used in patients with autoimmune disorders	85(23.9)	144(40.4)	127(35.7)
Ginkgo can be used to delay dementia	296(82.9)	31(8.7)	30(8.4)
Ginkgo can increase the risk of bleeding when combined with warfarin	213(59.5)	59(16.6)	83(23.4)
Omega-3 is beneficial for patients suffering from cardiovascular disorders	327(91.9)	14(3.9)	15(4.2)
Omega-3 can be given safely to patient taking clopidogrel	65(18.3)	222(62.5)	68(19.2)
Vitamin C when taken with Iron (Ferrous salt) increases its absorption	278(77.9)	45(12.6)	34(9.5)
Ginseng may increase blood pressure	249(70.1)	77(21.7)	28(7.9)
Vitamin B complex may delay wound healing	176(49.2)	52(14.6)	128(36.0)
Valerian should be used cautiously in patients using benzodiazepines	73(20.5)	247(69.4)	36(10.1)

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Beliefs, Practices and Knowledge of Community Pharmacists Regarding Complementary and Alternative Medicine: National Cross-Sectional Study in Lebanon

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Beliefs, Practices and Knowledge of Community Pharmacists Regarding Complementary and Alternative Medicine: National Cross-Sectional Study in Lebanon

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Abstract

Introduction Pharmacists are uniquely positioned to provide patients with evidence-based information in order to ensure effective and safe use of Complementary and Alternative Medicine (CAM).

Objective Assess CAM-related beliefs, practices and knowledge of community pharmacists in Lebanon.

Design, methods and setting Using stratified random sampling, a nationally representative survey was conducted among community pharmacists in Lebanon. Through face-to-face interviews, pharmacists completed a multicomponent questionnaire consisting of four sections: 1) socio-demographic characteristics 2) beliefs related to regulation of CAM, role of media in promoting its safe use, availability of resources and continuing education, 3) practices including selling CAM products, providing advice for patients and reporting toxic effects and 4) knowledge about specific CAM products, their uses, side effects, and interactions.

Results A total of 341 pharmacists agreed to participate (response rate: 86%). Only pharmacists with complete data were included in this study (n=310)**.** Pharmacists agreed that CAM products are effective (63.8%) and that they should be exclusively sold in pharmacies (80.3%), but disagreed that commercially marketed CAM products are well regulated (63.5%) and that media plays a positive role in educating users about CAM (55.8%). As for practices, 64.5% of pharmacists were always or often advising patients on safe use; however 74.2% of participants rarely or never reported toxic effects. Regarding knowledge, although the majority of pharmacists were aware of the uses of CAM, fewer knew about their side effects and their interactions with drugs. After adjustment for covariates, receiving education/training on CAM products during university was the sole predictor of higher knowledge score (ß=0.68, 95%CI: 0.29-1.07).

Conclusions This study revealed positive beliefs of pharmacists in Lebanon towards CAM and indicated important gaps in their practice and knowledge. Deliberate efforts to enhance the education of pharmacists are warranted to ensure the safe integration and use of CAM products in Lebanon.

1 Keywords: Complementary medicine, Community, Pharmacist, Health Policy,
2 National Cross-sectional survey, Lebanon.

3 Word Count: 4198

Strength and limitations of this study

- This is the first study to survey a nationally representative sample of community pharmacists in Lebanon with an 86% response rate.
- The study employed a context-specific questionnaire examining CAM-related, beliefs, practices and knowledge of community pharmacists.
- The data collection relied on self-reported answers which could be subject to errors due to memory recall or social desirability bias.
- The cross-sectional nature of the study prevented any inference about the change in CAM beliefs, practice or knowledge over time among pharmacists in the country.

4

Introduction

Complementary and Alternative Medicine (CAM) is a diverse group of medical and health care systems, practices, and products that are not considered part of conventional medicine. CAM may complement mainstream medicine by diversifying the conceptual frameworks of medicine or by satisfying a demand not met by orthodoxy.[1] The United States (US) National Center for Complementary and Integrative Health (NCCIH) divides CAM into two main categories: (1) natural CAM products, such as herbs, vitamins and minerals and probiotics; and (2) mind and body therapies, most common of which are yoga, chiropractic and osteopathic manipulation, meditation, and massage therapy .[2] In this manuscript, CAM refers to natural CAM products. In recent years there has been a worldwide renaissance of interest in these CAM products whereby their global market exceeded 100 billion USD during year 2017.[3] Prevalence rate as high as 70% were reported for natural CAM products' use among the general population in various countries such as Canada and Kuwait. [4,5] CAM is usually used for general health maintenance, treatment of specific disease states and more frequently for chronic conditions (e.g., anxiety, pain, headaches, depression, and cancer).[6] Such a widespread use of CAM could be attributed to dissatisfaction with conventional medicine, the increasing cost of conventional medical care, placebo effect, and the desire to be involved in the decision-making process related to one's health.[7,8] However, it is important to note that the use of natural products might be associated with hazardous health risks related to their toxicity, adverse reactions, improper dosage, or quality of the products (e.g., contamination, misidentification or lack of standardization).[9] These risks could be amplified due to the low rate of CAM use disclosure to health care providers for fear of their disapproval, disinterest, or inability to help.[10-13] Such lack of professional supervision may further expose the consumer to various risks, including adverse reactions or interactions with conventional drugs.[6,14,15]

Among health care professionals, pharmacists are ideally positioned to promote the effective and safe use of CAM by providing patients with evidence-based information. Professional associations, such as the American College of Clinical Pharmacy (ACCP), the American Society of Health-System Pharmacists (ASHP), and the Canadian Society of Hospital Pharmacists (CSHP), have recommended that the profession of pharmacy actively embrace dietary supplements (natural health

products, vitamins, and minerals) as part of the pharmacist's scope of practice.[16] The ACCP's stated that "the pharmacist's involvement in herbal products is an extension of their roles in pharmaceutical care, clinical pharmacy practices and collaborative health care teams".[17] Despite this marked commitment to promoting the safe use of CAM by pharmacists, the integration of CAM into the curricula of pharmacy education has lagged behind,[18] leaving many pharmacists unfamiliar with the health effects of CAM.[16]

The Middle East and North Africa Region (MENA) hosts a growing market of CAM products. [19-25] Despite of this growth, CAM products remain poorly regulated. For example, in Lebanon, a small country of the MENA region, the market for CAM products is largely unregulated and could be subject to abuse by both patient and provider.[26] About one third of Lebanese adults (29.87%) were reported to use CAM products in 2015, with the most prevalent consumed CAM type being herbal supplements.[7] Higher rates of CAM use were reported among patients with chronic diseases such as infertility (41%),[27] lung cancer (41%),[28] and HIV and AIDS conditions (46.6%).[29] A common finding to most studies conducted on CAM use in Lebanon was the low rate of disclosure to the treating physicians.[7,26,28,30-32] This behavior raised concerns about CAM's safety, efficacy, and impact on the patient health; especially when its use is coupled with poor regulatory frameworks.[26]

In Lebanon, the increased prevalence of CAM use, the poorly regulated CAM market, together with the high rate of non-disclose to health care providers, underscore the crucial role of pharmacists in ensuring patients' health and safety. In the country, the Ministry of Public Health (MoPH) regulates the profession of pharmacy, through granting the 1) license to practice for pharmacists and 2) license to open a pharmacy. For the latter, the pharmacist ought to be registered within the Order of Pharmacists in Lebanon (OPL).[33]

The objective of this study was to assess the CAM-related beliefs, practices and knowledge of a nationally representative sample of community pharmacists in Lebanon. A secondary objective of the study was to investigate socio-demographic determinants of CAM-related knowledge in the study sample. The findings of this study will inform the practice of pharmacy in the country, as well as the development and integration of CAM modules into mainstream educational programs of pharmacy.

Methods

This is a cross-sectional national survey of pharmacists practicing in community pharmacies which was conducted in Lebanon between September 2017 and February 2018. The sampling unit for this study was the pharmacy. A list of all community pharmacies and their location was obtained from the OPL. Pharmacies were selected from this list using a stratified random sampling technique. The strata were the six Lebanese governorates. Within each stratum (governorate), pharmacies were selected at random from the list of all pharmacies within this stratum. The number of pharmacies selected was proportional to the total number of pharmacies in each stratum. Sample size calculations showed that a minimum of 342 pharmacists ought to be recruited in order to estimate a prevalence of 50% with a 95% confidence interval (CI) and a margin of error of 5%. In order to account for a 14% refusal rate, 396 pharmacies were selected from the OPL list.

To be included in the study, the pharmacist had to be 1) licensed to practice by MoPH, 2) registered in the OPL, 3) working in the selected pharmacy whether as pharmacy owner or as an employee and 4) conversant in either English or Arabic languages. Pharmacists unable or unwilling to give consent for the study were not included. If a pharmacist in a selected pharmacy refused to participate, the pharmacist in the closest pharmacy was approached. In the case when more than one pharmacist in the selected pharmacy were eligible to participate, only one pharmacist was selected at random to take part in the study. The study protocol was approved by the Institutional Review Board at the Beirut Arab University under the protocol number 2018H-0052-P-R-0249.

Data collection took place in the selected pharmacies. Through face-to-face interviews with the pharmacists, a multi-component questionnaire was completed. Each interview lasted 10-15 minutes. The interviews were conducted by field workers who received extensive training on professional interviewing techniques and administration of the questionnaire prior to the start of the study. Interviewers were specifically trained to clearly explain the purpose of the study and the potential benefits of its results for the pharmacy profession and the health and wellbeing of the patients, hence increasing the interest of pharmacist in participation and improving response rate.

The design of the questionnaire used in the data collection for this study was informed by a thorough review of relevant past literature[16,23,24,34] and by a careful examination of the local context. The content validity of this questionnaire was confirmed by an expert panel consisting of a pharmacist, a nutrition epidemiologist, a biostatistician and a health policy expert. The questionnaire was originally written in English, before being translated to the Arabic language, and then back translated to English. The original and back-translated English versions of the questionnaire were examined to ensure parallel form reliability. The questionnaire was comprised of four sections. The first section included questions related to socio-demographic, education and practice characteristics, such as age, sex, employment status (full-time employee, part-time employee, or pharmacy owner), highest level of education attained (Bachelors, Masters, Pharm D or PhD), whether the pharmacist received CAM education/training during his/her university education years, whether the pharmacist pursued post graduate education/training in CAM, years of experience as community pharmacist, the number of pharmacists in the pharmacy and how long was the pharmacy open for. The latter question was included because, in the local context, the longer the duration the pharmacy has been opened for, the more likely its clientele would develop a personalised relationship with the pharmacist allowing for a better communication of their health needs and concerns. The second section of the questionnaire addressed the pharmacist's beliefs related to CAM. Specific questions were included tackling his/her perception of the regulation of CAM products' market in Lebanon, the role of media in educating consumers about the safe use of CAM products as well as the availability of resources and the need for continuous education in CAM. The third section of the questionnaire included questions assessing the pharmacist's practices in CAM, such as selling CAM, advising patient on the safe use of CAM, reporting of CAM toxic effects and checking for CAM-drug interactions. For sections 2 and 3, the survey instrument used a 5-point Likert rating scale in which 1 represented strongly agree and 5 represented strongly disagree. The last section of the questionnaire addressed the pharmacist's knowledge about CAM products. A total of ten questions were selected to address the uses, side effects and drug interactions of commonly sold CAM products in the Lebanese market. According to a previous investigation by the authors, vitamin C was the most commonly sold CAM product (25%), followed by ginseng (22%), vitamin B (13%), Gingko (14%), Omega 3 fatty acids (9.5%), Echinacea (9.5%) and Valerian (7.4%) (*Hijazi M, Abou-Ela M, Ellakany A, Overview*

of CAM Products in Lebanon: Results from Community Pharamcists survey. 2011). The formulation of the questions around these products was carried out by an expert panel of pharmacists including MH, ME (authors), and Dr Ghassan Al Amine (previous president of the OPL), and in consultation with relevant literature.[23,35] The questionnaire was pilot tested on a convenient sample of 16 pharmacists to check for clarity and culture sensitivity. Data collected during the pilot testing phase of the questionnaire were not included in this study. A copy of the questionnaire used in data collection is provided as supplementary file to this manuscript.

For the summary of the data, descriptive statistics were used, such as frequencies and proportions. A knowledge score corresponding to the number of correctly answered questions was generated, with a minimum of zero and a maximum of 10. Simple and multiple linear regression analyses were used to investigate the associations socio-demographic factors with knowledge, using the knowledge score as dependent variable and the socio demographic factors as independent variables. P-value < 0.05 was considered statistically significant. Statistical Package for Social Sciences (SPSS) software version 20.0 for windows program was utilized to analyze the data.

Patient and Public Involvement

The specific aims of this study were to assess CAM related beliefs, practices and knowledge of community pharmacists in Lebanon. The specific target population of this study was community pharmacists. While there was no direct input of patients or members of the public into the design of this study, the outcomes could potentially benefit the public at large through enhancing the safe use of CAM products and their proper integration into the health care system. The results of this study will be disseminated through various means including published papers, presentations and executive summaries sent to concerned stakeholders.

Results

Out of 396 pharmacists approached, 341 agreed to participate in this study (86.1% response rate). The two main reasons for refusal to participate were lack of interest (34.5%) and lack of time (27.3%). Of the 341 questionnaires, only those with complete data were included in this study (n=310).

The distributions of the pharmacies in Lebanon and in the study sample were presented in table 1. Overall, compared to the national distribution, the study sample showed similar proportions of pharmacies among the various governorates.

Characteristics of study sample.

Table 2 displayed the various characteristics of the study population. The pharmacists were of varied age groups, with most of them ranging between 20 and 40 years of age (67.1%). The study sample consisted of a slightly higher proportion of males versus females (53.5% male and 46.5% female). More than 50% of the pharmacists approached were the owners of the pharmacy (54.8%), the rest was either working as full-time (23.2%) or part-time (21.9%). As for the educational level, 54.5% reported having a Bachelor's degree, while 45.5% of the pharmacist had attained higher degrees: 18.4% a Master's degree, 24.2% a Pharm D and 2.9% a PhD. Sixty-five percent of the pharmacists studied in Lebanese universities. More than two in three pharmacists (73.2%) reported receiving education about CAM-products during their university education and only 17.7% underwent a post-graduation training on CAM-products. Working experience among the pharmacists ranged from 1-3 years (22.9%) to greater than 10 years (43.9%). (Table 2).

Beliefs related to CAM products, their market and availability of resources.

Overall, study participants displayed positive general beliefs related to CAM with 63.8% and 80.3% of pharmacists strongly agreeing or agreeing that CAM products are effective and that CAM products should be exclusively sold in pharmacies, respectively. (Table 3). Only 30.0% disagreed or strongly disagreed that CAM products have less side effects compared to conventional medicines (17.4% were neutral and 52.5% strongly agreed or agreed). Over 80.0% strongly agreed or agreed that providing information to customers about CAM products is a pharmacist's professional responsibility. (Table 3).

As for the pharmacists' beliefs related to the CAM market in the country, a sizable proportion of survey participants (74.2%) were not sure about the quality of commercially marketed CAM products in Lebanon, whereby 41.9% were disagreeing or strongly disagreeing and 32.3% were neutral. When asked if they think that the market for CAM products in Lebanon is well regulated, 63.5% of surveyed community pharmacists disagreed or strongly disagreed. Furthermore, more than half

of pharmacists (55.8%) disagreed or strongly disagreed that media plays a positive role in educating patients about CAM. (Table 3).

With regards to the availability of resources on the safe use of CAM for pharmacists, only 55.5% of study participants believed that information on CAM products are easily accessible to the pharmacists and 61.9% strongly agreed or agreed that continuous education on CAM should be mandatory for pharmacists. (Table 3).

Current practices of dispensing CAM products.

More than two thirds of pharmacists (68.7%) participating in this study reported that they always/often sell CAM products in their pharmacy and 59.4% reported always/often getting inquiries from patients regarding the use of CAM products. (Table 4). The majority of pharmacists (64.5%) reported that they always/often advise patients on safe use of CAM products and ask for their feedback after use; however, 74.2% of pharmacists answered that they rarely or never reported toxic or undesirable effects that occurred with patients using CAM products. (Table 4). Among those who reported the incidence of toxic effect of CAM, 53.4% of pharmacists indicated that they reported it to the pharmaceutical company (provider of CAM) and only 15.5% reported to the OPL, the remaining reported to physician (13.8%), medical representative (8.6%), MOPH (5.2%) and pharmacists (3.5%). (Table 4 b). It is worth noting that 60.3% of pharmacists reported frequently checking for CAM product-drug interaction prior to selling the product (Table 4).

Evaluation of pharmacist' self-knowledge

Table 5 displayed the results of self- knowledge in CAM which was composed of 10 questions including uses, side effects and drug interactions of commonly sold products in Lebanon. The majority of pharmacists answered correctly the questions related to the uses of *Echinacea*, *Ginkgo biloba*, and Omega-3 (81.9%, 83.2%, and 93.5% respectively). However, only 24.5% recognized the effect of Echinacea on autoimmune disorders, 61.3% were aware that ginkgo may increase the risk of bleeding when combined with warfarin, 21.9% knew that ginseng does not affect blood pressure and 50.3% did not know the potential effect of a vitamin B complex supplement on wound healing. On the other hand, 78.4% of the pharmacist knew that vitamin C enhances the absorption of iron. Of further concern are the high proportions of interviewed pharmacists who were not aware of the drug-CAM interactions. For

instance, 80.7% did not know that Valerian should be used cautiously in patients using benzodiazepines and 80.9% did not answer correctly the concurrence administration of omega-3 and Clopidogrel (Table 5).

Socio-demographic determinants of CAM-related knowledge

Simple linear regression results indicated that, among all socio-demographic characteristics considered in this study, 'receiving education/training on CAM products during university' was the sole predictor of better knowledge (ß=0.68, 95% CI: 0.31,1.06). After adjustment for socio-demographic characteristics, the results of the multiple linear regression confirmed this finding (ß=0.68, 95% CI: 0.29, 1.07) (Data not shown).

Discussion

This is the first national study to examine the CAM-related, beliefs, practices and knowledge of a nationally representative sample of community pharmacists in Lebanon. This also presents one of a few regional attempts to solicit the opinion of pharmacists at a national scale. The study revealed that the majority of community pharmacists acknowledged the importance of CAM products, believed that the market should be better regulated and reported needing professional development opportunities to enhance their knowledge of CAM products. With regards to practices in CAM, pharmacists were found to frequently advise patients on safe use of CAM products; however most did not reported toxic effects. Furthermore, the assessment of self-knowledge unearthed some deficiencies in pharmacists' knowledge related to potential side effects of CAM products and of CAM-drug interactions. Receiving education/training on CAM products during university was the sole predictor of better CAM-related knowledge among pharmacists.

One of the main findings of this study related to the generally positive beliefs of Lebanese community pharmacists towards CAM products which is similar to other studies in the region[19-24] and other countries such as USA,[18] Australia,[36] Singapore[37] and Ethiopia.[3] Pharmacists do not only believe in the utility of CAM products but are also willing to assume a leading role by asking for exclusive rights to sell CAM products in pharmacies and under the advice of a community pharmacists. This is in accordance with a recent published study by Gelayee et al. (2017)[3], where

pharmacists believed that they are ideally positioned to dispense CAM products, as a completion of their role in dispensing, monitoring, and counseling conventional medicine. This unique position of the pharmacist could be best achieved if equipped with good knowledge and skills.[3]

The general positive beliefs of pharmacists towards CAM products were contrasted by doubts with regards to the quality of available CAM products and the regulations through which the CAM market is governed. Similarly in other studies pharmacists' main concern were the lack of clear regulations and safety governing the sale of CAM products.[18,37,38] On that front, surveyed pharmacists were both critical of the regulatory framework for CAM products and of the counterproductive and misleading role played by media. With respect to the regulation of media, Lebanon could perhaps learn from the experience of the United States' Food and Drug Administration (FDA) which prohibits manufacturers and distributors of CAM products from marketing adulterated or misbranded products.[39] From a regulatory point of view, there is no counterpart for the FDA in Lebanon. The MoPH has had some initiatives to protect consumers' health but more efforts are needed to ensure public safety.[26]

A remarkable finding in this study related to over 50% of surveyed pharmacists reporting toxic and undesirable side effects of CAM products to the distributing pharmaceutical/ CAM companies rather than doing so to the MoPH. Such a practice does not only jeopardize public safety but also raises ethical questions related to the obvious conflict of interest in reporting side effects to the company benefiting from the sales of CAM products. Similar findings were reported in Qatar.[38] These findings call for the establishment of a more robust regulatory framework that reaches beyond the review and approval of CAM products to the establishment and implementation of the mechanisms to monitor and evaluate the safe use post-market distribution. Such role could be played by the MoPH, the OPL or an arm's length organization with a national mandate to ensure safe consumption of CAM products. For instance, in US, the FDA is responsible for the regulation of dietary supplements.[39] Manufacturers of CAM products are responsible for the evaluation of the safety and labelling of their products to meet the requirements of FDA regulations. FDA is responsible for taking action against any adulterated CAM products that has reached the market.[39] In addition, the FDA allows consumers and health care professionals to report any adverse reactions on a designated reporting portal.[40]

Within this context it is important to note that, out of 123 pharmacists who had experience with reporting toxic or undesirable effects, only 58 indicated to whom they report such effects (47.2%). It is possible that participants were hesitant to answer this question because they were not sure of the correct answer. This further highlights the need to regulate the reporting of toxic effects and to clearly inform the pharmacists of the existing reporting channels.

In this study, the findings related to beliefs and practices of community pharmacists further underscored the need for pharmacists to play a leading role in ensuring safe utilization of CAM by their customers. However, such a role of the community pharmacist may be undermined by the lack of proper education and training on the safe use of CAM products. In fact, in this study, close to two thirds of pharmacists believed that the continuous education on CAM should be mandatory for pharmacists. This recommendation echoed that of many other studies highlighting the need to have additional education and training on the use of CAM products.[3,16,21-24,36-38]

Perhaps one of the most disconcerting findings of this study related to the deficiencies in the pharmacists' knowledge of CAM-drug interaction and to a lesser extent CAM products side effects. This lack of knowledge came along prevalent good intentions of community pharmacists to provide the best evidence-based advice to their customers. These findings may lead to the advice of pharmacists being suboptimal and could, in some instances jeopardize the health and wellbeing of the patients. The knowledge deficiencies found in this study were also reported by many other studies in the region such as Saudi Arabia,[6,23]Abu Dhabi,[24] Jordan,[19] Kuwait,[20,21] Oman,[22] Qatar,[38] Palestine,[41,42] and Iran[43] as well as other countries such as Ethiopia,[3] USA,[18] Singapore,[37] and in Trinidad and Tobago,[44] and therefore appear to be a concern of global. One possible explanation for the observed knowledge deficiencies could be due to the biased information propagated by some CAM product companies. This information usually aims to maximize sales and neglects any factor that can affect the promotion of their products.[45] Another explanation could be the lack of availability and ease access of pharmacists to scientific resources and professional development programs.

The findings on the lack of knowledge on safe use of CAM products, coupled with the majority of pharmacists requesting a mandatory continuous education program, open a remarkable window of opportunity for the MoPH to work collaboratively with the

OPL to establish a national program for the continuous education of pharmacists on CAM products. Collaborating with academic institutions would enhance the design, implementation and evaluation of such a program. Providing continuous education opportunities would enhance the knowledge of pharmacists on the safe use of CAM products, the appropriate reporting of side effects and their general role as CAM counsellors for their customers. Last but not least, the finding in our regression models that receiving education/training on CAM products during university was the sole predictor of better knowledge calls on the pharmacy schools to revise their curricula in order to ensure proper education and training of pharmacy students on the safe use of CAM products. Such revision is necessary to enhance public safety.

The findings of this study ought to be considered in light of a few limitations. First, the data collection relied on self-reported answers for practices, beliefs and knowledge. These answers could be subject to errors due to memory recall or social desirability bias. To mitigate this, interviewers were trained to maintain a neutral attitude and avoid leading questions. Second, although a few questionnaires were validated to assess the CAM-related beliefs , practices and knowledge among specific populations, such as nurses, and medical students,[46,47] none was available for use among pharmacists. Therefore, the questionnaire used in data collection was developed and vetted by a panel of experts, including a pharmacist, nutrition epidemiologist, biostatistician and a health policy expert. The questionnaire was designed to capture the common traits in beliefs, practices and knowledge of pharmacist towards CAM and to address to context specificity of the study. Future studies are encouraged to examine the validity and reliability of questionnaires assessing CAM-related beliefs, practices and knowledge among pharmacists. Third, despite the fact that the sample of pharmacists considered was nationally representative, the cross-sectional nature of the study prevented any inference about the change in CAM beliefs, practices or knowledge over time among pharmacists in the country. Lastly, it remains important to note that this study relied mainly on quantitative assessment. Future studies aiming to qualitatively examine pharmacists' beliefs, practices and knowledge, with regards to CAM could complement the results of quantitative investigations and provide a more complete evaluation of the subject matter.

In conclusion, the findings of this study revealed positive beliefs of pharmacists in Lebanon towards CAM and indicated important gaps in their practice and knowledge.

Given the central role that the pharmacists play in promoting the safe and efficient use of CAM products and in light of the study's findings, deliberate efforts to enhance the education of pharmacists and support them with a clear and responsive regulatory framework would be necessary to ensure the safe integration and use of CAM products in the country.

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List of Tables

Table 1: Distribution of pharmacies across governorates in this study in comparison to national distribution of pharmacies

	Pharmacies in the study n(%)	**Pharmacies in Lebanon n(%)**
Beirut	30 (9.7)	238(7.8)
South	44 (14.2)	353(11.6)
North	47(15.2)	436(14.3)
Mount Lebanon	122(39.4)	1311(43.1)
Beqaa	43(13.9)	482(15.8)
Nabatieh	24(7.7)	223(7.3)
Total	**310**	**3043**

Table 2. Characteristics of study sample (n=310)

	Frequency	Percentage
Age range		
20-30 years	112	36.1
31-40 years	96	31.0
41-50 years	55	17.7
Above 50 years	47	15.2
Gender		
Male	166	53.5
Female	144	46.5
Employments status		
Full time	72	23.2
Part-time	68	21.9
Pharmacy owner	170	54.8
Highest educational level attained		
Bachelors	169	54.5
Masters	57	18.4
Pharm D	75	24.2
PhD	9	2.9
Which university did you graduate from		
Non-Lebanese Universities	86	27.7
Lebanese Universities	203	65.5
Did not specify	21	6.8
During your university education, did you receive any education/training on CAM-products?		
Yes	227	73.2
No	83	26.8
Did you receive any postgraduate education/training on CAM-products?		
Yes	55	17.7
No	255	82.3
Years of work experience (in community pharmacy)		
1-3 years	71	22.9
4-7 years	68	21.9
8-10 years	35	11.3
Above 10 years	136	43.9
How many pharmacists work in this pharmacy, in addition to yourself ?		
0	20	6.5
1	121	39.0
2	113	36.5
≥3	56	18.1
How long has this pharmacy been opened for?		
1-5 years	77	24.8
6-10 years	70	22.6
11-15 years	37	11.9
16-20 years	38	12.3
>20 years	63	20.3
Don't know	25	8.1

Table 3: General beliefs towards CAM products, their market and availability of resources among a national sample of community pharmacists in Lebanon (n=310)

	n(%)				
	Strongly agree	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
General beliefs toward CAM products					
CAM products are effective	63(20.3)	135(43.5)	81(26.1)	22(7.1)	9(2.9)
CAM products should be sold only in a pharmacies	191(61.6)	58(18.7)	21(6.8)	30(9.7)	10(3.2)
The use of CAM products should not be limited to patients who have failed conventional medicine therapy	77(24.8)	119(38.4)	50(16.1)	41(13.2)	23(7.4)
CAM products have less side effect than conventional medicines	76(24.4)	87(28.1)	54(17.4)	66(21.3)	27(8.7)
Providing information about CAM products is a pharmacist's professional responsibility	170(54.8)	83(26.8)	30(9.7)	21(6.8)	6(1.9)
Beliefs towards CAM products available in the Lebanese market					
CAM products available in the Lebanese market are well standardized and of good quality	25(8.1)	55(17.7)	100(32.3)	80(25.8)	50(16.1)
The market for CAM products in Lebanon is well regulated	15(4.8)	35(11.3)	63(20.3)	98(31.6)	99(31.9)
Media plays a positive role in educating consumers about safe use of CAM products available in the Lebanese market	35(11.3)	39(12.6)	63(20.3)	74(23.9)	99(31.9)
Availability of resources					
Information resources on CAM products are available and easily accessible to the pharmacists	87(28.1)	85(27.4)	56(18.1)	59(19.0)	23(7.4)
Continuous education on CAM products should be mandatory for pharmacists	102(32.9)	90(29.0)	61(19.7)	40(12.9)	17(5.5)

Table 4a. Current practices of dispensing CAM products among a national sample of community pharmacists in Lebanon (n=310)

	Always	Often	Sometimes	Rarely	No
Do you sell CAM products in your pharmacy?	109(35.2)	104(33.5)	70(22.6)	15(4.8)	12(3.9)
Do you get inquiries from patients regarding the use of CAM products?	92(29.7)	92(29.7)	69(22.3)	38(12.3)	19(6.1)
Do you advise patients on safe use of CAM products?	126(40.6)	74(23.9)	72(23.2)	22(7.1)	16(5.2)
Do you ask your patient about their feedback after their use of CAM products?	136(43.9)	57(18.4)	56(18.1)	43(13.9)	18(5.8)
Do you report any toxic or undesirable effect occurred with patients using CAM products?	30(9.7)	23(7.4)	27(8.7)	43(13.9)	187(60.3)
Do you get referrals from naturopath to your pharmacy?	21(6.8)	38(12.3)	52(16.8)	42(13.5)	157(50.6)
Do you check for CAM product-drug interaction?	121(39.0)	66(21.3)	44(14.2)	38(12.3)	41(13.2)

Table 4b: To whom do you report any toxic or undesirable effect that occurred with patients using CAM products?

	n=58	%
Pharmaceutical company	31	50.7
Medical representative	5	8.7
MOPH	3	4.3
OPL	9	13.0
Pharmacists	2	4.3
Physician	8	14.5

Table 5: Evaluation of self-knowledge among a national sample of pharmacists in Lebanon (n=310)

	True/ False	% answered correctly	% answered incorrect	% answered I don't know
Echinacea is commonly used for the treatment of cold & flu symptoms[48]	T	254(81.9)	22(7.1)	34(11.0)
Echinacea can be used in patients with autoimmune disorders[49]	F	76(24.5)	120(38.7)	114(36.8)
Ginseng may increase blood pressure[50]	F	68(21.9)	218(70.3)	24(7.7)
Valerian should be used cautiously in patients using benzodiazepines[51]	T	60(19.4)	216(69.7)	34(11.0)
Ginkgo can increase the risk of bleeding when combined with warfarin[52,53]	F	190(61.3)	42(13.5)	78(25.2)
Ginkgo can be used to delay dementia[54]	F	258(83.2)	26(8.4)	26(8.4)
Omega-3 is beneficial for patients suffering from cardiovascular disorders[55,56]	T	290(93.5)	9(2.9)	11(3.5)
Omega-3 can be given safely to patient taking Clopidogrel [57,58]	T	59(19.0)	188(60.6)	63(20.3)
Vitamin B complex may delay wound healing[59,60]	F	154(49.7)	41(13.2)	115(37.1)
Vitamin C when taken with Iron (Ferrous salt) increases its absorption[61]	T	243(78.4)	36(11.6)	31(10.0)

جامعة بيروت العربية
BEIRUT ARAB UNIVERSITY

Lebanese Pharmacist Knowledge and Attitudes towards Complementary and Alternative Medicine

Date (dd /mm/ yy): ___/___/___

Subject ID: _____

Interview date:

Interview time:

Interviewer name:

District of the Pharmacy:

- ❑ Beirut
- ❑ South
- ❑ North
- ❑ Mount Lebanon
- ❑ Beqaa
- ❑ Nabatieh

Section A: Socio-demographics

Mark with an (X) for the suitable answer:

- Age range:
  - ❑ 20 – 30 years
  - ❑ 31 – 40 years
  - ❑ 41 – 50 years
  - ❑ Above 50 years

- Gender:
  - ❑ Male
  - ❑ Female

- Employment status
  - ❑ Full-time
  - ❑ Part-time

- Highest educational level attained:
  - ❑ Bachelors
  - ❑ Masters
  - ❑ Pharm D
  - ❑ Ph.D

- Which university did you graduate from:_____

- During your university education, did you receive any education/training on CAM-products?
  - ❑ Yes
  - ❑ No

- Did you receive any post graduate education/training on CAM-products?
  - ❑ Yes
  - ❑ No

- Years of work experience (in community pharmacy):
  - ❑ 1 – 3 years
  - ❑ 4 – 7 years
  - ❑ 8 – 10 years
  - ❑ Above 10 years

- How many pharmacists work in your pharmacy? _____
- How long has this pharmacy been opened for? _____

Section B: Pharmacist Attitudes/ (beliefs) Towards Natural/ CAM products

Statement	5	4	3	2	1
CAM products are effective					
CAM products should be sold only in a pharmacies					
The use of CAM products should not be limited to patients who have failed traditional prescription therapy					
Providing information about CAM products is a pharmacist's professional responsibility					
Information resources on CAM products are available and easily accessible to the pharmacist					
Continuous education on complementary and alternative medicine should be mandatory for pharmacists					
CAM products have less side effects than conventional medicines					
CAM products available in the Lebanese market are well standardized and of good quality					
The market for CAM products in Lebanon is well regulated					
Media plays a positive role in educating consumers about safe use of CAM products available in the Lebanese market					
***Scale of 1-5 (5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, 1 = strongly disagree)**					

Section C: Current practice of dispensing CAM products

This is a 5-scale question so mark with an (X) for the suitable answer:

1 (always), 2 (often), 3 (sometimes), 4 (rarely), and 5 (no)

1- Do you sell CAM products in your pharmacy?

☐1 ☐2 ☐3 ☐4 ☐ 5

2- Do you get inquiries from patients regarding the use of CAM products?

☐1 ☐2 ☐3 ☐4 ☐ 5

3- Do you advise patients on safe use of CAM products?

☐1 ☐2 ☐3 ☐4 ☐ 5

4- Do you ask your patient about their feedback after their use of CAM products?

☐1 ☐2 ☐3 ☐4 ☐ 5

5- Do you report any toxic or undesirable effect occurred with patients using CAM products?

☐1 ☐2 ☐3 ☐4 ☐ 5

6- If yes, to whom do you report_____

7- Do you get referrals from natural practitioners to your pharmacy?

☐1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

8- Do you check for CAM product-drug interaction?

☐1 ☐2 ☐3 ☐4 ☐ 5

Sector D: Evaluation of self-knowledge

Statement	True	False	I don't know
Echinacea is commonly used for the treatment of cold & flu symptoms			
Echinacea can be used in patients with autoimmune disorders			
Ginseng may increase blood pressure			
Valerian should be used cautiously in patients using benzodiazepines			
Ginkgo can increase the risk of bleeding when combined with warfarin			
Ginkgo can be used to delay dementia			
Omega-3 is beneficial for patients suffering from cardiovascular disorders			
Omega-3 can be given safely to patient taking clopidogrel			
Vitamin B complex may delay wound healing			
Vitamin C when taken with Iron (Ferrous salt) increases its absorption			

Beliefs, Practices and Knowledge of Community Pharmacists Regarding Complementary and Alternative Medicine: National Cross-Sectional Study in Lebanon

STROBE Statement—Checklist of items

	Item No	Recommendation	Completed
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Beliefs, Practices and Knowledge of Community Pharmacists towards Complementary and Alternative Medicine: National Cross-Sectional Study in Lebanon
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	See Abstract sections: Objective, Design, Methods and Setting, and Results.
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Scientific background: Page 4 and 5 Rationale: In Lebanon, the increased prevalence of CAM use, the poorly regulated CAM market, together with the high rate of non-disclose to health care providers, underscore the crucial role of pharmacists in ensuring patients' health and safety.
Objectives	3	State specific objectives, including any pre specified hypotheses	The objective of this study was to assess the CAM- related beliefs, practices and knowledge of a nationally representative sample of community pharmacists in Lebanon. A secondary objective of the study was to investigate socio-demographic determinants of CAM- related knowledge in the study sample
Methods			
Study design	4	Present key elements of study design early in the paper	This is a cross-sectional national survey of pharmacists practicing in community pharmacies conducted in Lebanon between September 2017 and February 2018
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Pharmacists practicing in community pharmacies conducted in Lebanon between September 2017 and February 2018 The sampling unit for this study was the pharmacy. A list of all community pharmacies and their location in Lebanon was obtained from the Order of Pharmacists in Lebanon (OPL).
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	Pharmacies were selected from this list using a stratified random sampling technique. The strata were the six Lebanese governorates. Within each stratum (governorate), pharmacies were selected at random from the list of all pharmacies within this stratum. The number of pharmacies selected was proportional to the number of pharmacies in each stratum.

			To be included in the study, the pharmacist had to be licensed to practice by the Lebanese Ministry of Public Health and registered in the OPL The pharmacist had to be working in the selected pharmacy whether as pharmacy owner or as an employee. In addition, the pharmacist had to be conversant in either the English or the Arabic languages.
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Socio-demographic, education and practice characteristics, such as age, sex, employment status (full-time employee, part-time employee, or pharmacy owner), highest level of education attained (Bachelors, Masters, Pharm D or PhD), whether the pharmacist received CAM education/training during his/her university education years, whether the pharmacist pursued post graduate education/training in CAM, years of experience as community pharmacist, the number of pharmacist in the pharmacy and how long was the pharmacy open. The pharmacist's beliefs related to CAM: his/her perception of the regulation of CAM products' market in Lebanon, the role of media educating consumers about the safe use of CAM products as well as the availability of resource and the need for continuous education in CAM. The pharmacist's practices in CAM: selling CAM, advising patient on the safe use of CAM, reporting of CAM toxic effects and checking for CAM-drug interactions. Pharmacist's knowledge about CAM products: uses, side effect, and interactions of commonly sold CAM products in Lebanon.
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	All variables were derived for one source: the multi-component questionnaire.
Bias	9	Describe any efforts to address potential sources of bias	In order to decrease recall bias, data was collected through face to face interviews whereby interviewers were trained to pose probing questions assisting the pharmacist to accurately recall information. Furthermore, in order to minimize the effect of social desirability bias, interviewers were trained to maintain a neutral attitude vis-a-vis the answers of the pharmacists.
Study size	10	Explain how the study size was arrived at	The number of pharmacies selected was proportional to the number of pharmacies in each stratum. Sample size calculations showed that a minimum of 342 pharmacists ought to be recruited in order to estimate a prevalence of 50% with a 95% CI and a margin of error of 5%. In order to account for a 14% refusal rate, 396 pharmacies were selected from the OPL list. Out of 396 pharmacists approached, 341 agreed to participate in this study (86.1% response rate). Of the 341 questionnaires, only those with complete data were included in this study (n=310).
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	For the summary of the data, descriptive statistics were used, such as frequency and proportions. A knowledge score corresponding to the number of correctly answered questions was generated, with a minimum of zero and a maximum of 10.

Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	For the summary of the data, descriptive statistics were used, such as frequency and proportions. A knowledge score corresponding to the number of correctly answered questions was generated, with a minimum of zero and a maximum of 10. Simple and multiple linear regression analyses were used to investigate the associations socio-demographic factors with knowledge, using the knowledge score as dependent variable and the socio demographic factors as independent variables. P-value < 0.05 was considered statistically significant. Statistical Package for Social Sciences (SPSS) software version 20.0 for windows program was utilized to analyse the data.
		(*b*) Describe any methods used to examine subgroups and interactions	N/A
		(*c*) Explain how missing data were addressed	Only those with complete data were included in this study
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	N/A
		(*e*) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Out of 396 pharmacists approached, 341 agreed to participate in this study (86.1% response rate). Of the 341 questionnaires, only those with complete data were included in this study (n=310).
		(b) Give reasons for non-participation at each stage	The two main reasons for refusal to participate were lack of interest (34.5%) and lack of time (27.3%).
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 2 displayed the various characteristics of the study population. The pharmacists were of varied age groups, with most of them ranging between 20 and 40 years of age (66.467.1%). The study sample consisted of a slightly higher proportion of males versus females (54.853.5% male and 45.246.5% female). More than 50% of the pharmacists approached were the owners of the pharmacy (5654.85%), the rest were either working as full-time (232.23%) or part-time (21.92%). As for educational level, 54.52% reported having a Bachelor's degree, while 45.58% of the pharmacist had attained higher degrees; 19.718.4% a Master's degree, 23.024.2% a Pharm D and 3.12.9% a PhD. Sixty-eight five percent of the pharmacists studied in Lebanese universities. More than two in three pharmacists reported receiving education about CAM-products during their university education (72.573.2%) and only 1817.7% underwent a post-graduation training on CAM-products. Working experience among the pharmacists ranged from 1-3 years (21.522.9%) to greater than 10 years (44.443.9%) (Table 2).

		(b) Indicate number of participants with missing data for each variable of interest	Any questionnaire with missing data was removed
Outcome data	15*	Report numbers of outcome events or summary measures	N/A
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Simple linear regression results indicated that 'receiving education/training on CAM products during university' was the sole predictor of better knowledge (ß=0.68, 95% CI: 0.31,1.06), among all socio-demographic characteristics considered in this study. After adjustment for socio-demographic characteristics, the results of the multiple linear regression confirmed this finding (ß=0.68, 95% CI: 0.29, 1.07)
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	See results section
Discussion			
Key results	18	Summarise key results with reference to study objectives	First paragraph of the Discussion section
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	The findings of this study ought to be considered in light of a few of limitations. First, the data collection relied on self-reported answers for practices, beliefs and knowledge. These answers could be subject to errors due to memory recall or social desirability bias. To mitigate this, interviewers were trained to maintain a neutral attitude and avoid leading questions. Second, although a few questionnaires were validated to assess the CAM-related belief attitude, practice and knowledge among specific population, such as nurses, and medical students, none was available for use among pharmacists. Therefore, the questionnaire used in data collection was developed and vetted by a panel of experts, including a pharmacist, nutrition epidemiologist, biostatistician and a health policy expert. The questionnaire was designed to capture the common traits in belief, practice and knowledge of pharmacist towards CAM and to address to context specificity of the study. Future studies are encouraged to examine the validity and reliability of questionnaires assessing CAM-related attitude, beliefs, practices and knowledge among pharmacists Third, despite the fact that the sample of pharmacists considered was nationally representative, the cross sectional nature of the study prevented any inference about the change in CAM belief, practice or knowledge over time among pharmacists in the country. Lastly, it remains important to note that this study relied mainly on quantitative assessment. Future studies aiming to qualitatively examine pharmacists' beliefs, practices and knowledge, with regards to CAM could complement the results of quantitative investigations and provide a more

			complete evaluation of the subject matter.
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Done. See Discussion section
Generalisability	21	Discuss the generalisability (external validity) of the study results	Done. See Discussion section
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Beliefs, Practices and Knowledge of Community Pharmacists Regarding Complementary and Alternative Medicine: National Cross-Sectional Study in Lebanon

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Beliefs, Practices and Knowledge of Community Pharmacists Regarding Complementary and Alternative Medicine: National Cross-Sectional Study in Lebanon

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Abstract

Introduction Pharmacists are uniquely positioned to provide patients with evidence-based information in order to ensure effective and safe use of Complementary and Alternative Medicine (CAM) products.

Objective Assess beliefs, practices and knowledge related to CAM products among community pharmacists in Lebanon.

Design, methods and setting Using stratified random sampling, a nationally representative survey was conducted among community pharmacists in Lebanon. Through face-to-face interviews, pharmacists completed a multicomponent questionnaire consisting of four sections: 1) socio-demographic characteristics, 2) beliefs related to regulation of CAM products, role of media in promoting their safe use, availability of resources and continuing education, 3) practices including selling CAM products, providing advice for patients and reporting adverse effects and 4) knowledge about specific CAM products, their uses, side effects, and interactions.

Results A total of 341 pharmacists agreed to participate (response rate: 86%). Only pharmacists with complete data were included in this study (n=310)**.** Pharmacists agreed that CAM products are effective (63.8%) and that they should be exclusively sold in pharmacies (80.3%), but disagreed that commercially marketed CAM products are well regulated (63.5%) and that media plays a positive role in educating users about these products (55.8%). As for practices, 64.5% of pharmacists were always or often advising patients on safe use; however 74.2% of participants rarely or never reported adverse effects. Regarding knowledge, although the majority of pharmacists were aware of the uses of CAM products, fewer knew about their side effects and their interactions with drugs. After adjustment for covariates, receiving education/training on CAM products during university was the sole predictor of higher knowledge score (ß=0.68, 95%CI: 0.29-1.07).

Conclusions This study revealed positive beliefs of pharmacists in Lebanon towards CAM products and indicated important gaps in their practice and knowledge. Deliberate efforts to enhance the education of pharmacists are warranted to ensure the safe integration and use of CAM products in Lebanon.

1 Keywords: Complementary medicine, Alternative Medicine, Community, Pharmacist,
2 Health Policy, Lebanon.

3 Word Count: 4198

Strength and limitations of this study

- This is the first study to survey a nationally representative sample of community pharmacists in Lebanon with an 86% response rate.
- The study employed a context-specific questionnaire examining beliefs, practices and knowledge of CAM products among community pharmacists.
- The data collection relied on self-reported answers which could be subject to errors due to memory recall or social desirability bias.
- The cross-sectional nature of the study prevented any inference about the change in beliefs, practice or knowledge related to CAM products over time among pharmacists in the country.

4

Introduction

Complementary and Alternative Medicine (CAM) is a diverse group of medical and health care systems, practices, and products that are not considered part of conventional medicine. CAM may complement mainstream medicine by diversifying the conceptual frameworks of medicine or by satisfying a demand that has not been met by orthodoxy.[1] The United States (US) National Center for Complementary and Integrative Health (NCCIH) divides CAM into two main categories: (1) CAM products, such as herbs, vitamins and minerals and probiotics; and (2) mind and body therapies, including yoga, chiropractic and osteopathic manipulation, meditation, and massage therapy .[2] In recent years there has been a worldwide renaissance of interest in these CAM products whereby their global market exceeded 100 billion USD during year 2017.[3] Prevalence rate as high as 70% were reported for natural CAM products' use among the general population in various countries such as Canada and Kuwait. [4,5] CAM products are usually used for general health maintenance, treatment of specific disease states and more frequently for chronic conditions (e.g., anxiety, pain, headaches, depression, and cancer).[6] Such a widespread use of CAM products could be attributed to dissatisfaction with conventional medicine, the increasing cost of conventional medical care, placebo effect, and the desire to be involved in the decision-making process related to one's health.[7,8] However, it is important to note that the use of CAM products might be associated with hazardous health risks related to their adverse effects, improper dosage, or quality of the products (e.g., contamination, misidentification or lack of standardization).[9] These risks could be amplified due to the low rate of disclosure to health care providers for fear of their disapproval, disinterest, or inability to help.[10-13] Such lack of professional supervision may further expose the consumer to various risks, including adverse reactions or interactions with conventional drugs.[6,14,15]

Among health care professionals, pharmacists are ideally positioned to promote the effective and safe use of CAM products by providing patients with evidence-based information. Professional associations, such as the American College of Clinical Pharmacy (ACCP), the American Society of Health-System Pharmacists (ASHP), and the Canadian Society of Hospital Pharmacists (CSHP), have recommended that the profession of pharmacy actively embrace dietary supplements (natural health products, vitamins, and minerals) as part of the pharmacist's scope of practice.[16] The

ACCP's stated that "the pharmacist's involvement in herbal products is an extension of their roles in pharmaceutical care, clinical pharmacy practices and collaborative health care teams".[17] Despite this marked commitment to promoting the safe use of CAM products by pharmacists, the integration of CAM into the curricula of pharmacy education has lagged behind,[18] leaving many pharmacists unfamiliar with the health effects of CAM products.[16]

The Middle East and North Africa (MENA) region hosts a growing market of CAM products. [19-25] However, in many countries of the region, including Lebanon this market remained poorly regulated and subject to abuse by both patient and provider.[26] About one third of Lebanese adults (29.87%) were reported to use CAM in 2015, with the most prevalent being CAM products, specifically herbal supplements.[7] Higher rates of use were reported among patients with chronic diseases such as infertility (41%),[27] lung cancer (41%),[28] and HIV and AIDS conditions (46.6%).[29] A common finding to most of the aforementioned studies was the low rate of disclosure to the treating physicians.[7,26,28,30-32] This raised concerns about CAM safety, efficacy, and impact on the patient health; especially when its use is coupled with poor regulatory frameworks.[26]

In Lebanon, the high prevalence of use of CAM products and their poorly regulated market, in addition to the high rate of non-disclose to health care providers, underscore the crucial role of pharmacists in ensuring patients' health and safety. The Lebanese Ministry of Public Health (MoPH) regulates the profession of pharmacy, through granting two licensures: 1) the license to practice for pharmacists and 2) the license to open a pharmacy. For the latter, the pharmacist ought to be registered within the Order of Pharmacists in Lebanon (OPL).[33]

The primary objective of this study was to assess the beliefs, practices and knowledge related to CAM products among a nationally representative sample of community pharmacists in Lebanon. A secondary objective of the study was to investigate the socio-demographic determinants of knowledge related to CAM products among study participants. The findings of this study will inform the practice of pharmacy in the country, as well as the development and integration of CAM modules into mainstream educational programs of pharmacy.

Methods

This is a cross-sectional national survey of pharmacists practicing in community pharmacies which was conducted in Lebanon between September 2017 and February 2018. The sampling unit for this study was the pharmacy. A list of all community pharmacies and their location was obtained from the OPL. Pharmacies were selected from this list using a stratified random sampling technique. The strata were the six Lebanese governorates. Within each stratum (governorate), pharmacies were selected at random from the list of all pharmacies within this stratum. The number of pharmacies selected was proportional to the total number of pharmacies in each stratum. Sample size calculations showed that a minimum of 342 pharmacists ought to be recruited in order to estimate a prevalence of 50% with a 95% confidence interval (CI) and a margin of error of 5%. In order to account for a 14% refusal rate, 396 pharmacies were selected from the OPL list.

To be included in the study, the pharmacist had to be 1) licensed to practice by MoPH, 2) registered in the OPL, 3) working in the selected pharmacy either as pharmacy owner or as an employee and 4) conversant in either English or Arabic languages. Pharmacists who were unable or unwilling to give consent for the study were not included. If a pharmacist in a selected pharmacy refused to participate, the pharmacist in the closest pharmacy was approached. In the case when more than one pharmacist in the selected pharmacy was eligible to participate, only one pharmacist was selected at random. The study protocol was approved by the Institutional Review Board at the Beirut Arab University under the protocol number 2018H-0052-P-R-0249.

Data collection took place in the selected pharmacies. Through face-to-face interviews with the pharmacists, a multi-component questionnaire was completed. Each interview lasted 10-15 minutes. The interviews were conducted by field workers who received extensive training on professional interviewing techniques and administration of the questionnaire prior to the start of the study. In order to increase participation rate, the interviewers were trained to clearly explain the purpose of the study and the potential benefits of its results for the pharmacy profession and the health and wellbeing of the patients.

The design of the questionnaire used in the data collection for this study was informed by a thorough review of relevant literature[16,23,24,34] and by a careful examination of the local context. The content validity of this questionnaire was confirmed by an expert panel consisting of a pharmacist, a nutrition epidemiologist, a biostatistician and a health policy expert. The questionnaire was originally written in English, before being translated to the Arabic language, and then back translated to English. The original and back-translated English versions of the questionnaire were examined to ensure parallel form reliability. The questionnaire was comprised of four sections. The first section included questions related to socio-demographic, education and practice characteristics, such as age, sex, employment status (full-time employee, part-time employee, or pharmacy owner), highest level of education attained (Bachelors, Masters, Pharm D or PhD), whether the pharmacist received education/training related to CAM during his/her university education years or post-graduation, years of experience as community pharmacist, the number of pharmacists in the pharmacy and how long was the pharmacy open for. The latter question was included because, in the local context, the longer the duration the pharmacy has been opened for, the more likely its clientele would develop a personalised relationship with the pharmacist allowing for a better communication of their health needs and concerns. The second section of the questionnaire addressed the pharmacist's beliefs related to CAM products. Specific questions were included tackling his/her perception of the regulation of CAM products' market in Lebanon, the role of media in educating consumers about the safe use of these products as well as the availability of resources and the need for continuous education. Section 3 included questions assessing the pharmacist's practices in relation to CAM products, such as selling, advising patient on safe use, reporting of adverse effects and checking for drug interactions. For sections 2 and 3, the survey instrument used a 5-point Likert rating scale in which 1 represented strongly agree and 5 represented strongly disagree. The last section of the questionnaire addressed the pharmacist's knowledge about CAM products. A total of ten questions were selected to address the uses, side effects and drug interactions of commonly sold CAM products in the Lebanese market. According to a previous investigation by the authors, vitamin C was the most commonly sold CAM product (25%), followed by ginseng (22%), vitamin B (13%), Gingko (14%), Omega 3 fatty acids (9.5%), Echinacea (9.5%) and Valerian (7.4%). [35]. The formulation of the questions around these products was carried out by an expert panel of pharmacists

including MH, MA (authors), and Dr Ghassan Al Amine (previous president of the OPL), and in consultation with relevant literature.[23,36] The questionnaire was pilot tested on a convenient sample of 16 pharmacists to check for clarity and culture sensitivity. Data collected during the pilot testing phase of the questionnaire were not included in this study. A copy of the questionnaire used in data collection is provided as a supplementary file to this manuscript.

For the summary of the data, descriptive statistics were used, such as frequencies and proportions. A knowledge score corresponding to the number of correctly answered questions was generated. Pharmacists were assigned a score value of '1' for any specific question which they have answered correctly and '0' if their answer was wrong. An 'I don't know' answer was also given a '0' because it reflected lack of knowledge. For each pharmacist, the assigned values for all questions were summed to obtain their respective knowledge score. Given that the questionnaire included 10 questions to evaluate knowledge, the score could range between a minimum of 0 and a maximum of 10. The resulting score was considered as a continuous variable with higher values indicating better knowledge. Simple and multiple linear regression analyses were used to investigate the associations socio-demographic factors with knowledge, using the knowledge score as dependent variable and the socio demographic factors as independent variables. P-values < 0.05 were considered statistically significant. Statistical Package for Social Sciences (SPSS) software version 20.0 for windows program was utilized to analyze the data.

Patient and Public Involvement

The specific aims of this study were to assess beliefs, practices and knowledge related to CAM products among community pharmacists in Lebanon. The specific target population of this study was community pharmacists. While there was no direct input of patients or members of the public into the design of this study, the outcomes could potentially benefit the public at large through enhancing the safe use of CAM products and their proper integration into the health care system. The results of this study will be disseminated through various means including published papers, presentations and executive summaries sent to concerned stakeholders.

Results

Out of 396 pharmacists approached, 341 agreed to participate in this study (86.1% response rate). The two main reasons for refusal to participate were lack of interest (34.5%) and lack of time (27.3%). Of the 341 questionnaires, only those with complete data were included in this study (n=310).

The distributions of the pharmacies in Lebanon and in the study sample were presented in table 1. Overall, compared to the national distribution, the study sample showed similar proportions of pharmacies among the various governorates.

Characteristics of study sample.

Table 2 displayed the various characteristics of the study population. The pharmacists were of varied age groups, with most of them aged below 40 years (67.1%). The study sample consisted of a slightly higher proportion of males versus females (53.5% male and 46.5% female). More than half of the pharmacists approached were the owners of the pharmacy (54.8%), while the rest was either working as full-time (23.2%) or part-time (21.9%). As for the educational level, 54.5% reported having a Bachelor's degree, while 45.5% of the pharmacist had attained higher degrees: 18.4% a Master's degree, 24.2% a Pharm D and 2.9% a PhD. Sixty-five percent of the pharmacists studied in Lebanese universities. More than two in three pharmacists (73.2%) reported receiving education about CAM-products during their university education and only 17.7% underwent a post-graduation training on CAM products. Working experience among the pharmacists ranged from 1-3 years (22.9%) to greater than 10 years (43.9%). (Table 2).

Beliefs related to CAM products, their market and availability of resources.

Overall, study participants displayed positive general beliefs related to CAM products with 63.8% and 80.3% of pharmacists strongly agreeing or agreeing that CAM products are effective and that CAM products should be exclusively sold in pharmacies, respectively. (Table 3). Only 30.0% disagreed or strongly disagreed that CAM products have less side effects compared to conventional medicines (17.4% were neutral and 52.5% strongly agreed or agreed). Over 80.0% strongly agreed or agreed that providing information to customers about CAM products is a pharmacist's professional responsibility. (Table 3).

As for the pharmacists' beliefs related to the CAM products' market in the country, a sizable proportion of survey participants (41.9%) disagreed or strongly disagreed that CAM products in the Lebanese market are well standardized and of good quality. When asked if they think that the market for CAM products in Lebanon is well regulated, 63.5% of surveyed community pharmacists disagreed or strongly disagreed. Furthermore, more than half of pharmacists (55.8%) disagreed or strongly disagreed that media plays a positive role in educating patients about CAM products. (Table 3).

With regards to the availabilibarrety of resources on the safe use of CAM products for pharmacists, only 55.5% of study participants believed that information on CAM products are easily accessible to the pharmacists and 61.9% strongly agreed or agreed that continuous education in this field should be mandatory for pharmacists. (Table 3).

Current practices of dispensing CAM products.

More than two thirds of pharmacists (68.7%) participating in this study reported that they always/often sell CAM products in their pharmacy and 59.4% reported always/often getting inquiries from patients regarding the use of CAM products. (Table 4). The majority of pharmacists (64.5%) reported that they always/often advise patients on safe use of CAM products and ask for their feedback after use; however, 74.2% of pharmacists answered that they rarely or never reported adverse effects that occurred with patients using CAM products. (Table 4). Among those who reported the incidence of adverse effects, 53.4% of pharmacists indicated that they reported it to the pharmaceutical company (provider of CAM) and only 15.5% reported to the OPL, while the remaining reported to physician (13.8%), medical representative (8.6%), and MOPH (5.2%). A couple of pharmacists reported the adverse effects to other pharmacists working with them in the same pharmacy (Table 4 b). It is worth noting that 60.3% of pharmacists reported frequently checking for CAM product-drug interaction prior to selling the product. (Table 4).

Evaluation of pharmacists' knowledge

Table 5 displayed the results of knowledge which included 10 questions addressing uses, side effects and drug interactions of commonly sold CAM products in Lebanon. The majority of pharmacists answered correctly the questions related to the uses of *Echinacea*, *Ginkgo biloba*, and Omega-3 (81.9%, 83.2%, and 93.5% respectively). However, only 24.5% recognized the effect of Echinacea on autoimmune disorders,

61.3% were aware that ginkgo may increase the risk of bleeding when combined with warfarin, 21.9% knew that ginseng does not affect blood pressure and 50.3% did not know the potential effect of a vitamin B complex supplement on wound healing. On the other hand, 78.4% of the pharmacist knew that vitamin C enhances the absorption of iron. Of further concern were the high proportions of interviewed pharmacists who were not aware of the interactions between drugs and CAM products. For instance, 80.7% did not know that Valerian should be used cautiously in patients using benzodiazepines and 80.9% did not answer correctly the concurrence administration of omega-3 and Clopidogrel. (Table 5).

Socio-demographic determinants of knowledge

Overall the score for knowledge ranged between 1 and 9 in the study population, with a mean of 5.32 ±1.43. Simple linear regression results indicated that, among all socio-demographic characteristics considered in this study, 'receiving education/training on CAM products during university' was the sole predictor of better knowledge (ß=0.68, 95% CI: 0.31,1.06). After adjustment for socio-demographic characteristics, the results of the multiple linear regression confirmed this finding (ß=0.68, 95% CI: 0.29, 1.07). (Table 6).

Discussion

This is the first national study to examine the beliefs, practices and knowledge related to CAM products among a nationally representative sample of community pharmacists in Lebanon. Additionally, it presents one of a few regional attempts to solicit the opinion of pharmacists at a national scale. The study revealed that the majority of community pharmacists acknowledged the importance of CAM products, believed that the market should be better regulated and reported needing professional development opportunities to enhance their knowledge of CAM products. With regards to practices, pharmacists were found to frequently advise patients on safe use of CAM products; however most did not reported adverse effects. Furthermore, the assessment of knowledge unearthed some deficiencies in pharmacists' knowledge related to potential side effects of CAM products and their potential interactions with drugs. Receiving education/training on CAM products during university was the sole predictor of better knowledge among pharmacists.

One of the main findings of this study was related to the generally positive beliefs of Lebanese community pharmacists towards CAM products which is similar to other studies in the region[19-24] and other countries such as USA,[18] Australia,[37] Singapore[38] and Ethiopia.[3] The results of this study showed that pharmacists believed in the utility of CAM products and were willing to assume a leading role by asking for exclusive rights to sell these products in pharmacies and under the advice of community pharmacists. This is in accordance with a recent study by Gelayee et al. (2017)[3], where pharmacists believed that they are ideally positioned to dispense CAM products, as part of their role in dispensing, monitoring, and counseling conventional medicine. This unique position of the pharmacist could be best achieved if equipped with good knowledge and skills.[3]

The general positive beliefs of pharmacists towards CAM products were contrasted by doubts with regards to the quality of available CAM products and the regulations through which the market of these products is governed. Similarly in other studies pharmacists' main concerns was the lack of clear regulations and safety governing the sale of CAM products.[18,38,39] on that front, surveyed pharmacists were both critical of the regulatory framework for CAM products and of the counterproductive and misleading role played by media. With respect to the regulation of media, Lebanon could perhaps learn from the experience of the United States' Food and Drug Administration (FDA) which prohibits manufacturers and distributors of CAM products from marketing adulterated or misbranded products.[40] From a regulatory point of view, there is no counterpart for the FDA in Lebanon. The MoPH has had some initiatives to protect consumers' health but more efforts are needed to ensure public safety.[26]

A remarkable finding in this study related to over 50% of surveyed pharmacists reporting adverse effects of CAM products to the distributing companies rather than doing so to the MoPH. Such a practice does not only jeopardize public safety but also raises ethical questions related to the obvious conflict of interest in reporting adverse effects to the company benefiting from the sales of CAM products. Similar findings were reported in Qatar.[39] These findings call for the establishment of a more robust regulatory framework that reaches beyond the review and approval of CAM products to the establishment and implementation of the mechanisms to monitor and evaluate the safe use post-market distribution. Such role could be played by the MoPH, the OPL or an arm's length organization with a national mandate to ensure safe

consumption of CAM products. For instance, in US, the FDA is responsible for the regulation of dietary supplements.[40] Manufacturers of CAM products are responsible for the evaluation of the safety and labelling of their products to meet the requirements of FDA regulations. FDA is responsible for taking action against any adulterated CAM products that has reached the market.[40] In addition, the FDA allows consumers and health care professionals to report any adverse reactions on a designated reporting portal.[41] Within this context it is important to note that, out of 123 pharmacists who had experience with reporting adverse effects, only 58 indicated to whom they report such effects (47.2%). It is possible that participants were hesitant to answer this question because they were not sure about the correct answer. This further highlights the need to regulate the reporting of adverse effects and to clearly inform the pharmacists of the existing reporting channels.

In this study, the findings related to beliefs and practices of community pharmacists further underscored the need for pharmacists to play a leading role in ensuring safe utilization of CAM products by their customers. However, such a role of the community pharmacist may be undermined by the lack of proper education and training on the safe use of CAM products. In fact, in this study, close to two thirds of pharmacists believed that continuous education on safe and efficient use of CAM products should be mandatory for pharmacists. This recommendation echoed that of many other studies highlighting the need to have additional education and training on the use of CAM products.[3,16,21-24,37-39]

Perhaps one of the most disconcerting findings of this study was related to the deficiencies in the pharmacists' knowledge of potential interactions among CAM products and drugs and to a lesser extent CAM products' side effects. This lack of knowledge came along prevalent good intentions of community pharmacists to provide the best evidence-based advice to their customers. These findings may lead to the advice of pharmacists being suboptimal and could, in some instances jeopardize the health and wellbeing of the patients. The knowledge deficiencies found in this study were also reported by many studies in the region such as Saudi Arabia,[6,23]Abu Dhabi,[24] Jordan,[19] Kuwait,[20,21] Oman,[22] Qatar,[39] Palestine,[42,43] and Iran[44] as well as other countries such as Ethiopia,[3] USA,[18] Singapore,[38] and in Trinidad and Tobago,[45] and therefore appear to be a global concern. One possible explanation for the observed knowledge deficiencies could be due to the biased information propagated by some CAM product companies. This information usually aims to maximize sales

and neglects any factor that can affect the promotion of their products.[46] A few studies showed that personal sale visits of certain products' companies to pharmacists (called "detailing") could drive prescriptions in favor of the product being promoted. This is true even though pharmacists' may be aware of the potential conflict of interest these visits precipitate.[47-49] another explanation could be the lack of availability and ease access of pharmacists to scientific resources and professional development programs.

The findings on the lack of knowledge on safe use of CAM products, coupled with the majority of pharmacists requesting a mandatory continuous education program, open a remarkable window of opportunity for the MoPH to work collaboratively with the OPL to establish a national program for the continuous education of pharmacists on CAM products. Collaborating with academic institutions would enhance the design, implementation and evaluation of such a program. Providing continuous education opportunities would enhance the knowledge of pharmacists on the safe use of CAM products, the appropriate reporting of side effects and their general role as counsellors for their customers. Last but not least, the finding in our regression models that receiving education/training on CAM products during university was the sole predictor of better knowledge calls on the pharmacy schools to revise their curricula in order to ensure proper education and training of pharmacy students on the safe use of CAM products. Such revision is necessary to enhance public safety.

The findings of this study ought to be considered in light of a few limitations. First, the data collection relied on self-reported answers for practices, beliefs and knowledge. These answers could be subject to errors due to memory recall or social desirability bias. To mitigate this, interviewers were trained to maintain a neutral attitude and avoid leading questions. Second, although a few questionnaires were validated to assess the beliefs, practices and knowledge related to CAM products among specific populations, such as nurses, and medical students,[50,51] none was available for use among pharmacists. Therefore, the questionnaire used in data collection was developed and vetted by a panel of experts, including a pharmacist, nutrition epidemiologist, biostatistician and a health policy expert. The questionnaire was designed to capture the common traits in beliefs, practices and knowledge of pharmacist towards CAM products and to address to context specificity of the study. It is important to note that a couple of the questions in the questionnaire were double barreled and could have been better broken into two questions each to ensure clarity

and accuracy of answer. Future studies are encouraged to examine the validity and reliability of questionnaires assessing beliefs, practices and knowledge of CAM products among pharmacists. Third, despite the fact that the sample of pharmacists considered was nationally representative, the cross-sectional nature of the study prevented any inference about the change in beliefs, practices or knowledge over time among pharmacists in the country. Lastly, this study relied mainly on quantitative assessment. Future studies aiming to qualitatively examine pharmacists' beliefs, practices and knowledge, with regards to CAM products could complement the results of quantitative investigations and provide a more complete evaluation of the subject matter.

In conclusion, the findings of this study revealed positive beliefs of pharmacists in Lebanon towards CAM products and indicated important gaps in their practice and knowledge. Given the central role that the pharmacists play in promoting the safe and efficient use of CAM products and in light of the study's findings, deliberate efforts to enhance the education of pharmacists and support them with a clear and responsive regulatory framework would be necessary to ensure the safe integration and use of CAM products in the country.

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List of Tables

Table 1: Distribution of pharmacies across governorates in this study in comparison to national distribution of pharmacies

	Pharmacies in the study n(%)	**Pharmacies in Lebanon n(%)**
Beirut	30 (9.7)	238(7.8)
South	44 (14.2)	353(11.6)
North	47(15.2)	436(14.3)
Mount Lebanon	122(39.4)	1311(43.1)
Beqaa	43(13.9)	482(15.8)
Nabatieh	24(7.7)	223(7.3)
Total	**310**	**3043**

Table 2. Characteristics of study sample (n=310)

	Frequency	Percentage
Age range		
20-30 years	112	36.1
31-40 years	96	31.0
41-50 years	55	17.7
Above 50 years	47	15.2
Gender		
Male	166	53.5
Female	144	46.5
Employments status		
Full time	72	23.2
Part-time	68	21.9
Pharmacy owner	170	54.8
Highest educational level attained		
Bachelors	169	54.5
Masters	57	18.4
Pharm D	75	24.2
PhD	9	2.9
Which university did you graduate from		
Non-Lebanese Universities	86	27.7
Lebanese Universities	203	65.5
Did not specify	21	6.8
During your university education, did you receive any education/training on CAM-products?		
Yes	227	73.2
No	83	26.8
Did you receive any postgraduate education/training on CAM-products?		
Yes	55	17.7
No	255	82.3
Years of work experience (in community pharmacy)		
1-3 years	71	22.9
4-7 years	68	21.9
8-10 years	35	11.3
Above 10 years	136	43.9
How many pharmacists work in this pharmacy, in addition to yourself ?		
0	20	6.5
1	121	39.0
2	113	36.5
≥3	56	18.1
How long has this pharmacy been opened for?		
1-5 years	77	24.8
6-10 years	70	22.6
11-15 years	37	11.9
16-20 years	38	12.3
>20 years	63	20.3
Don't know	25	8.1

Table 3: General beliefs towards CAM products, their market and availability of resources among a national sample of community pharmacists in Lebanon (n=310)

	n(%)				
	Strongly agree	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
General beliefs toward CAM products					
CAM products are effective	63(20.3)	135(43.5)	81(26.1)	22(7.1)	9(2.9)
CAM products should be sold only in a pharmacies	191(61.6)	58(18.7)	21(6.8)	30(9.7)	10(3.2)
The use of CAM products should not be limited to patients who have failed conventional medicine therapy	77(24.8)	119(38.4)	50(16.1)	41(13.2)	23(7.4)
CAM products have less side effect than conventional medicines	76(24.4)	87(28.1)	54(17.4)	66(21.3)	27(8.7)
Providing information about CAM products is a pharmacist's professional responsibility	170(54.8)	83(26.8)	30(9.7)	21(6.8)	6(1.9)
Beliefs towards CAM products available in the Lebanese market					
CAM products available in the Lebanese market are well standardized and of good quality	25(8.1)	55(17.7)	100(32.3)	80(25.8)	50(16.1)
The market for CAM products in Lebanon is well regulated	15(4.8)	35(11.3)	63(20.3)	98(31.6)	99(31.9)
Media plays a positive role in educating consumers about safe use of CAM products available in the Lebanese market	35(11.3)	39(12.6)	63(20.3)	74(23.9)	99(31.9)
Availability of resources					
Information resources on CAM products are available and easily accessible to the pharmacists	87(28.1)	85(27.4)	56(18.1)	59(19.0)	23(7.4)
Continuous education on CAM products should be mandatory for pharmacists	102(32.9)	90(29.0)	61(19.7)	40(12.9)	17(5.5)

Table 4a. Current practices of dispensing CAM products among a national sample of community pharmacists in Lebanon (n=310)

	Always	Often	Sometimes	Rarely	No
Do you sell CAM products in your pharmacy?	109(35.2)	104(33.5)	70(22.6)	15(4.8)	12(3.9)
Do you get inquiries from patients regarding the use of CAM products?	92(29.7)	92(29.7)	69(22.3)	38(12.3)	19(6.1)
Do you advise patients on safe use of CAM products?	126(40.6)	74(23.9)	72(23.2)	22(7.1)	16(5.2)
Do you ask your patient about their feedback after their use of CAM products?	136(43.9)	57(18.4)	56(18.1)	43(13.9)	18(5.8)
Do you report any adverse effect occurred with patients using CAM products?	30(9.7)	23(7.4)	27(8.7)	43(13.9)	187(60.3)
Do you get referrals from naturopath to your pharmacy?	21(6.8)	38(12.3)	52(16.8)	42(13.5)	157(50.6)
Do you check for CAM product-drug interaction?	121(39.0)	66(21.3)	44(14.2)	38(12.3)	41(13.2)

Table 4b: To whom do you report any adverse effect that occurred with patients using CAM products?

	n=58	%
Pharmaceutical company	31	53.4
Medical representative	5	8.6
MOPH	3	5.2
OPL	9	15.5
Pharmacists	2	3.4
Physician	8	13.8

Table 5: Evaluation of knowledge among a national sample of pharmacists in Lebanon (n=310)

	True/ False	% answered correctly	% answered incorrect	% answered I don't know
Echinacea is commonly used for the treatment of cold & flu symptoms[52]	T	254(81.9)	22(7.1)	34(11.0)
Echinacea can be used in patients with autoimmune disorders[53]	F	76(24.5)	120(38.7)	114(36.8)
Ginseng may increase blood pressure[54]	F	68(21.9)	218(70.3)	24(7.7)
Valerian should be used cautiously in patients using benzodiazepines[55]	F	60(19.4)	216(69.7)	34(11.0)
Ginkgo can increase the risk of bleeding when combined with warfarin[56,57]	T	190(61.3)	42(13.5)	78(25.2)
Ginkgo can be used to delay dementia[58]	T	258(83.2)	26(8.4)	26(8.4)
Omega-3 is beneficial for patients suffering from cardiovascular disorders[59,60]	T	290(93.5)	9(2.9)	11(3.5)
Omega-3 can be given safely to patient taking Clopidogrel [61,62]	F	59(19.0)	188(60.6)	63(20.3)
Vitamin B complex may delay wound healing[63,64]	F	154(49.7)	41(13.2)	115(37.1)
Vitamin C when taken with Iron (Ferrous salt) increases its absorption[65]	T	243(78.4)	36(11.6)	31(10.0)

Table 6. Simple and multiple linear regression analyses for the association of characteristics of study participants with the knowledge score.

	Crude B, 95% CI	Adjusted B, 95% CI
Age range		
20-30 years	Ref	Ref
31-40 years	-0.04 (-0.45, 0.37)	-0.29 (-0.86, 0.29)
41-50 years	-0.19 (-0.68, 0.30)	-0.53 (-1.27, 0.21)
Above 50 years	-0.51(-1.03, 0.00)	-0.74(-1.57,0.10)
Gender		
Male	Ref	Ref
Female	-0.05 (-0.39,0.29)	-0.19 (-0.55,0.17)
Employments status		
Pharmacy owner	Ref	Ref
Full time	0.38(-0.04,0.79)	0.32 (-0.15,0.78)
Part-time	-0.04 (-0.47,0.38)	-0.08(-0.60,0.45)
Highest educational level attained		
BSc, MSc and PhD	Ref	Ref
Pharm D	0.37 (-0.02,0.76)	0.27 (-0.14,0.68)
Which university did you graduate from		
Non-Lebanese Universities*	Ref	Ref
Lebanese Universities	0.05 (-0.35,0.26)	-0.06(-0.40,0.28)
During your university education, did you receive any education/training on CAM-products?		
No	Ref	Ref
Yes	0.68 (0.31,1.06)	0.68(0.29,1.07)
Did you receive any post graduate education/training on CAM-products?		
No	Ref	Ref
Yes	0.25 (-0.19,0.69)	0.25(-0.20,-0.70)
Years of work experience (in community pharmacy)		
1-3 years	Ref	Ref
4-7 years	-0.28 (-0.78,0.22)	-0.22(-0.75,0.30)
8-10 years	0.37 (-0.24,0.98)	0.67(-0.08,1.42)
Above 10 years	-0.18 (-0.62,0.25)	0.15(-0.60,0.87)
How many pharmacists work in this pharmacy?		
0	Ref	Ref
1	-0.19 (-0.91,0.53)	-0.28(-1.01,0.45)
2	-0.28 (-1.01-0.44)	-0.56(-1.33,0.21)
≥3	-0.05 (-0.83,0.73)	-0.31(-1.16,0.54)
How long has this pharmacy been opened for?		
1-5 years	Ref	Ref
6-10 years	0.13 (-0.36,0.63)	0.11(-0.40,0.62)
11-15 years	0.22 (-0.38,0.82)	0.24(-0.39,0.88)
16-20 years	0.19 (-0.40, 0.79)	0.33(-0.32,0.98)
>20 years	-0.56 (-0.45,0.56)	0.35(-0.25,0.94)
I don't know	-0.39 (-1.08,0.30)	-0.38(-1.10,0.34)

*Including 'Non-specified universities'

جامعة بيروت العربية
BEIRUT ARAB UNIVERSITY

Lebanese Pharmacist Knowledge and Attitudes towards Complementary and Alternative Medicine

Date (dd /mm/ yy): ___/___/___

Subject ID: _____

Interview date:

Interview time:

Interviewer name:

District of the Pharmacy:

- ❑ Beirut
- ❑ South
- ❑ North
- ❑ Mount Lebanon
- ❑ Beqaa
- ❑ Nabatieh

Section A: Socio-demographics

Mark with an (X) for the suitable answer:

- Age range:
  - ❑ 20 – 30 years
  - ❑ 31 – 40 years
  - ❑ 41 – 50 years
  - ❑ Above 50 years

- Gender:
  - ❑ Male
  - ❑ Female

- Employment status
  - ❑ Full-time
  - ❑ Part-time

- Highest educational level attained:
  - ❑ Bachelors
  - ❑ Masters
  - ❑ Pharm D
  - ❑ Ph.D

- Which university did you graduate from:_____

- During your university education, did you receive any education/training on CAM-products?
  - ❑ Yes
  - ❑ No

- Did you receive any post graduate education/training on CAM-products?
  - ❑ Yes
  - ❑ No

- Years of work experience (in community pharmacy):
  - ❑ 1 – 3 years
  - ❑ 4 – 7 years
  - ❑ 8 – 10 years
  - ❑ Above 10 years

- How many pharmacists work in your pharmacy? _____
- How long has this pharmacy been opened for? _____

Section B: Pharmacist Attitudes/ (beliefs) Towards CAM products

Statement	5	4	3	2	1
CAM products are effective					
CAM products should be sold only in a pharmacies					
The use of CAM products should not be limited to patients who have failed traditional prescription therapy					
Providing information about CAM products is a pharmacist's professional responsibility					
Information resources on CAM products are available and easily accessible to the pharmacist					
Continuous education related to CAM products should be mandatory for pharmacists					
CAM products have less side effects than conventional medicines					
CAM products available in the Lebanese market are well standardized and of good quality					
The market for CAM products in Lebanon is well regulated					
Media plays a positive role in educating consumers about safe use of CAM products available in the Lebanese market					
***Scale of 1-5 (5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, 1 = strongly disagree)**					

Section C: Current practice of dispensing CAM products

This is a 5-scale question so mark with an (X) for the suitable answer:

1 (always), 2 (often), 3 (sometimes), 4 (rarely), and 5 (no)

1- Do you sell CAM products in your pharmacy?

☐1 ☐2 ☐3 ☐4 ☐ 5

2- Do you get inquiries from patients regarding the use of CAM products?

☐1 ☐2 ☐3 ☐4 ☐ 5

3- Do you advise patients on safe use of CAM products?

☐1 ☐2 ☐3 ☐4 ☐ 5

4- Do you ask your patient about their feedback after their use of CAM products?

☐1 ☐2 ☐3 ☐4 ☐ 5

5- Do you report any toxic or undesirable effect occurred with patients using CAM products?

☐1 ☐2 ☐3 ☐4 ☐ 5

6- If yes, to whom do you report_____

7- Do you get referrals from natural practitioners to your pharmacy?

☐1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

8- Do you check for CAM product-drug interaction?

☐1 ☐2 ☐3 ☐4 ☐ 5

Sector D: Evaluation of knowledge related to CAM products

Statement	True	False	I don't know
Echinacea is commonly used for the treatment of cold & flu symptoms			
Echinacea can be used in patients with autoimmune disorders			
Ginseng may increase blood pressure			
Valerian should be used cautiously in patients using benzodiazepines			
Ginkgo can increase the risk of bleeding when combined with warfarin			
Ginkgo can be used to delay dementia			
Omega-3 is beneficial for patients suffering from cardiovascular disorders			
Omega-3 can be given safely to patient taking clopidogrel			
Vitamin B complex may delay wound healing			
Vitamin C when taken with Iron (Ferrous salt) increases its absorption			

Beliefs, Practices and Knowledge of Community Pharmacists Regarding Complementary and Alternative Medicine: National Cross-Sectional Study in Lebanon

STROBE Statement—Checklist of items

	Item No	Recommendation	Completed
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Beliefs, Practices and Knowledge of Community Pharmacists towards Complementary and Alternative Medicine: National Cross-Sectional Study in Lebanon
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	See Abstract sections: Objective, Design, Methods and Setting, and Results.
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Scientific background: Page 4 and 5 Rationale: In Lebanon, the increased prevalence of CAM use, the poorly regulated CAM market, together with the high rate of non-disclose to health care providers, underscore the crucial role of pharmacists in ensuring patients' health and safety.
Objectives	3	State specific objectives, including any pre specified hypotheses	The objective of this study was to assess the CAM- related beliefs, practices and knowledge of a nationally representative sample of community pharmacists in Lebanon. A secondary objective of the study was to investigate socio-demographic determinants of CAM- related knowledge in the study sample
Methods			
Study design	4	Present key elements of study design early in the paper	This is a cross-sectional national survey of pharmacists practicing in community pharmacies conducted in Lebanon between September 2017 and February 2018
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Pharmacists practicing in community pharmacies conducted in Lebanon between September 2017 and February 2018 The sampling unit for this study was the pharmacy. A list of all community pharmacies and their location in Lebanon was obtained from the Order of Pharmacists in Lebanon (OPL).
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	Pharmacies were selected from this list using a stratified random sampling technique. The strata were the six Lebanese governorates. Within each stratum (governorate), pharmacies were selected at random from the list of all pharmacies within this stratum. The number of pharmacies selected was proportional to the number of pharmacies in each stratum.

			To be included in the study, the pharmacist had to be licensed to practice by the Lebanese Ministry of Public Health and registered in the OPL The pharmacist had to be working in the selected pharmacy whether as pharmacy owner or as an employee. In addition, the pharmacist had to be conversant in either the English or the Arabic languages.
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Socio-demographic, education and practice characteristics, such as age, sex, employment status (full-time employee, part-time employee, or pharmacy owner), highest level of education attained (Bachelors, Masters, Pharm D or PhD), whether the pharmacist received CAM education/training during his/her university education years, whether the pharmacist pursued post graduate education/training in CAM, years of experience as community pharmacist, the number of pharmacist in the pharmacy and how long was the pharmacy open. The pharmacist's beliefs related to CAM: his/her perception of the regulation of CAM products' market in Lebanon, the role of media educating consumers about the safe use of CAM products as well as the availability of resource and the need for continuous education in CAM. The pharmacist's practices in CAM: selling CAM, advising patient on the safe use of CAM, reporting of CAM toxic effects and checking for CAM-drug interactions. Pharmacist's knowledge about CAM products: uses, side effect, and interactions of commonly sold CAM products in Lebanon.
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	All variables were derived for one source: the multi-component questionnaire.
Bias	9	Describe any efforts to address potential sources of bias	In order to decrease recall bias, data was collected through face to face interviews whereby interviewers were trained to pose probing questions assisting the pharmacist to accurately recall information. Furthermore, in order to minimize the effect of social desirability bias, interviewers were trained to maintain a neutral attitude vis-a-vis the answers of the pharmacists.
Study size	10	Explain how the study size was arrived at	The number of pharmacies selected was proportional to the number of pharmacies in each stratum. Sample size calculations showed that a minimum of 342 pharmacists ought to be recruited in order to estimate a prevalence of 50% with a 95% CI and a margin of error of 5%. In order to account for a 14% refusal rate, 396 pharmacies were selected from the OPL list. Out of 396 pharmacists approached, 341 agreed to participate in this study (86.1% response rate). Of the 341 questionnaires, only those with complete data were included in this study (n=310).
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	For the summary of the data, descriptive statistics were used, such as frequency and proportions. A knowledge score corresponding to the number of correctly answered questions was generated, with a minimum of zero and a maximum of 10.

Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	For the summary of the data, descriptive statistics were used, such as frequency and proportions. A knowledge score corresponding to the number of correctly answered questions was generated, with a minimum of zero and a maximum of 10. Simple and multiple linear regression analyses were used to investigate the associations socio-demographic factors with knowledge, using the knowledge score as dependent variable and the socio demographic factors as independent variables. P-value < 0.05 was considered statistically significant. Statistical Package for Social Sciences (SPSS) software version 20.0 for windows program was utilized to analyse the data.
		(*b*) Describe any methods used to examine subgroups and interactions	N/A
		(*c*) Explain how missing data were addressed	Only those with complete data were included in this study
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	N/A
		(*e*) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Out of 396 pharmacists approached, 341 agreed to participate in this study (86.1% response rate). Of the 341 questionnaires, only those with complete data were included in this study (n=310).
		(b) Give reasons for non-participation at each stage	The two main reasons for refusal to participate were lack of interest (34.5%) and lack of time (27.3%).
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 2 displayed the various characteristics of the study population. The pharmacists were of varied age groups, with most of them ranging between 20 and 40 years of age (66.467.1%). The study sample consisted of a slightly higher proportion of males versus females (54.853.5% male and 45.246.5% female). More than 50% of the pharmacists approached were the owners of the pharmacy (5654.85%), the rest were either working as full-time (232.23%) or part-time (21.92%). As for educational level, 54.52% reported having a Bachelor's degree, while 45.58% of the pharmacist had attained higher degrees; 19.718.4% a Master's degree, 23.024.2% a Pharm D and 3.12.9% a PhD. Sixty-eight five percent of the pharmacists studied in Lebanese universities. More than two in three pharmacists reported receiving education about CAM-products during their university education (72.573.2%) and only 1817.7% underwent a post-graduation training on CAM-products. Working experience among the pharmacists ranged from 1-3 years (21.522.9%) to greater than 10 years (44.443.9%) (Table 2).

		(b) Indicate number of participants with missing data for each variable of interest	Any questionnaire with missing data was removed
Outcome data	15*	Report numbers of outcome events or summary measures	N/A
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Simple linear regression results indicated that 'receiving education/training on CAM products during university' was the sole predictor of better knowledge (ß=0.68, 95% CI: 0.31,1.06), among all socio-demographic characteristics considered in this study. After adjustment for socio-demographic characteristics, the results of the multiple linear regression confirmed this finding (ß=0.68, 95% CI: 0.29, 1.07)
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	See results section
Discussion			
Key results	18	Summarise key results with reference to study objectives	First paragraph of the Discussion section
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	The findings of this study ought to be considered in light of a few of limitations. First, the data collection relied on self-reported answers for practices, beliefs and knowledge. These answers could be subject to errors due to memory recall or social desirability bias. To mitigate this, interviewers were trained to maintain a neutral attitude and avoid leading questions. Second, although a few questionnaires were validated to assess the CAM-related belief attitude, practice and knowledge among specific population, such as nurses, and medical students, none was available for use among pharmacists. Therefore, the questionnaire used in data collection was developed and vetted by a panel of experts, including a pharmacist, nutrition epidemiologist, biostatistician and a health policy expert. The questionnaire was designed to capture the common traits in belief, practice and knowledge of pharmacist towards CAM and to address to context specificity of the study. Future studies are encouraged to examine the validity and reliability of questionnaires assessing CAM-related attitude, beliefs, practices and knowledge among pharmacists Third, despite the fact that the sample of pharmacists considered was nationally representative, the cross sectional nature of the study prevented any inference about the change in CAM belief, practice or knowledge over time among pharmacists in the country. Lastly, it remains important to note that this study relied mainly on quantitative assessment. Future studies aiming to qualitatively examine pharmacists' beliefs, practices and knowledge, with regards to CAM could complement the results of quantitative investigations and provide a more

			complete evaluation of the subject matter.
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Done. See Discussion section
Generalisability	21	Discuss the generalisability (external validity) of the study results	Done. See Discussion section
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Beliefs, Practices and Knowledge of Community Pharmacists Regarding Complementary and Alternative Medicine: National Cross-Sectional Study in Lebanon

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Beliefs, Practices and Knowledge of Community Pharmacists Regarding Complementary and Alternative Medicine: National Cross-Sectional Study in Lebanon

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Abstract

Introduction Pharmacists are uniquely positioned to provide patients with evidence-based information in order to ensure effective and safe use of Complementary and Alternative Medicine (CAM) products.

Objective Assess beliefs, practices and knowledge related to CAM products among community pharmacists in Lebanon.

Design, methods and setting Using stratified random sampling, a nationally representative survey was conducted among community pharmacists in Lebanon. Through face-to-face interviews, pharmacists completed a multicomponent questionnaire consisting of four sections: 1) socio-demographic characteristics, 2) beliefs related to regulation of CAM products, role of media in promoting their safe use, availability of resources and continuing education, 3) practices including selling CAM products, providing advice for patients and reporting adverse effects and 4) knowledge about specific CAM products, their uses, side effects, and interactions.

Results A total of 341 pharmacists agreed to participate (response rate: 86%). Only pharmacists with complete data were included in this study (n=310)**.** Pharmacists agreed that CAM products are effective (63.8%) and that they should be exclusively sold in pharmacies (80.3%), but disagreed that commercially marketed CAM products are well regulated (63.5%) and that media plays a positive role in educating users about these products (55.8%). As for practices, 64.5% of pharmacists were always or often advising patients on safe use; however 74.2% of participants rarely or never reported adverse effects. Regarding knowledge, although the majority of pharmacists were aware of the uses of CAM products, fewer knew about their side effects and their interactions with drugs. After adjustment for covariates, receiving education/training on CAM products during university was the sole predictor of higher knowledge score (ß=0.68, 95%CI: 0.29-1.07).

Conclusions This study revealed positive beliefs of pharmacists in Lebanon towards CAM products and indicated important gaps in their practice and knowledge. Deliberate efforts to enhance the education of pharmacists are warranted to ensure the safe integration and use of CAM products in Lebanon.

1 Keywords: Complementary medicine, Alternative Medicine, Community, Pharmacist,
2 Health Policy, Lebanon.

3 Word Count: 4198

Strength and limitations of this study

- This is the first study to survey a nationally representative sample of community pharmacists in Lebanon with an 86% response rate.
- The study employed a context-specific questionnaire examining beliefs, practices and knowledge of CAM products among community pharmacists.
- The data collection relied on self-reported answers which could be subject to errors due to memory recall or social desirability bias.
- The cross-sectional nature of the study prevented any inference about the change in beliefs, practice or knowledge related to CAM products over time among pharmacists in the country.

4

Introduction

Complementary and Alternative Medicine (CAM) is a diverse group of medical and health care systems, practices, and products that are not considered part of conventional medicine. CAM may complement mainstream medicine by diversifying the conceptual frameworks of medicine or by satisfying a demand that has not been met by orthodoxy.[1] The United States (US) National Center for Complementary and Integrative Health (NCCIH) divides CAM into two main categories: (1) CAM products, such as herbs, vitamins and minerals and probiotics; and (2) mind and body therapies, including yoga, chiropractic and osteopathic manipulation, meditation, and massage therapy .[2] In recent years there has been a worldwide renaissance of interest in these CAM products whereby their global market exceeded 100 billion USD during year 2017.[3] Prevalence rate as high as 70% were reported for natural CAM products' use among the general population in various countries such as Canada and Kuwait. [4,5] CAM products are usually used for general health maintenance, treatment of specific disease states and more frequently for chronic conditions (e.g., anxiety, pain, headaches, depression, and cancer).[6] Such a widespread use of CAM products could be attributed to dissatisfaction with conventional medicine, the increasing cost of conventional medical care, placebo effect, and the desire to be involved in the decision-making process related to one's health.[7,8] However, it is important to note that the use of CAM products might be associated with hazardous health risks related to their adverse effects, improper dosage, or quality of the products (e.g., contamination, misidentification or lack of standardization).[9] These risks could be amplified due to the low rate of disclosure to health care providers for fear of their disapproval, disinterest, or inability to help.[10-13] Such lack of professional supervision may further expose the consumer to various risks, including adverse reactions or interactions with conventional drugs.[6,14,15]

Among health care professionals, pharmacists are ideally positioned to promote the effective and safe use of CAM products by providing patients with evidence-based information. Professional associations, such as the American College of Clinical Pharmacy (ACCP), the American Society of Health-System Pharmacists (ASHP), and the Canadian Society of Hospital Pharmacists (CSHP), have recommended that the profession of pharmacy actively embrace dietary supplements (natural health products, vitamins, and minerals) as part of the pharmacist's scope of practice.[16] The

ACCP's stated that "the pharmacist's involvement in herbal products is an extension of their roles in pharmaceutical care, clinical pharmacy practices and collaborative health care teams".[17] Despite this marked commitment to promoting the safe use of CAM products by pharmacists, the integration of CAM into the curricula of pharmacy education has lagged behind,[18] leaving many pharmacists unfamiliar with the health effects of CAM products.[16]

The Middle East and North Africa (MENA) region hosts a growing market of CAM products. [19-25] However, in many countries of the region, including Lebanon this market remained poorly regulated and subject to abuse by both patient and provider.[26] About one third of Lebanese adults (29.87%) were reported to use CAM in 2015, with the most prevalent being CAM products, specifically herbal supplements.[7] Higher rates of use were reported among patients with chronic diseases such as infertility (41%),[27] lung cancer (41%),[28] and HIV and AIDS conditions (46.6%).[29] A common finding to most of the aforementioned studies was the low rate of disclosure to the treating physicians.[7,26,28,30-32] This raised concerns about CAM safety, efficacy, and impact on the patient health; especially when its use is coupled with poor regulatory frameworks.[26]

In Lebanon, the high prevalence of use of CAM products and their poorly regulated market, in addition to the high rate of non-disclose to health care providers, underscore the crucial role of pharmacists in ensuring patients' health and safety. The Lebanese Ministry of Public Health (MoPH) regulates the profession of pharmacy, through granting two licensures: 1) the license to practice for pharmacists and 2) the license to open a pharmacy. For the latter, the pharmacist ought to be registered within the Order of Pharmacists in Lebanon (OPL).[33]

The primary objective of this study was to assess the beliefs, practices and knowledge related to CAM products among a nationally representative sample of community pharmacists in Lebanon. A secondary objective of the study was to investigate the socio-demographic determinants of knowledge related to CAM products among study participants. The findings of this study will inform the practice of pharmacy in the country, as well as the development and integration of CAM modules into mainstream educational programs of pharmacy.

Methods

This is a cross-sectional national survey of pharmacists practicing in community pharmacies which was conducted in Lebanon between September 2017 and February 2018. The sampling unit for this study was the pharmacy. A list of all community pharmacies and their location was obtained from the OPL. Pharmacies were selected from this list using a stratified random sampling technique. The strata were the six Lebanese governorates. Within each stratum (governorate), pharmacies were selected at random from the list of all pharmacies within this stratum. The number of pharmacies selected was proportional to the total number of pharmacies in each stratum. Sample size calculations showed that a minimum of 342 pharmacists ought to be recruited in order to estimate a prevalence of 50% with a 95% confidence interval (CI) and a margin of error of 5%. In order to account for a 14% refusal rate, 396 pharmacies were selected from the OPL list.

To be included in the study, the pharmacist had to be 1) licensed to practice by MoPH, 2) registered in the OPL, 3) working in the selected pharmacy either as pharmacy owner or as an employee and 4) conversant in either English or Arabic languages. Pharmacists who were unable or unwilling to give consent for the study were not included. If a pharmacist in a selected pharmacy refused to participate, the pharmacist in the closest pharmacy was approached. In the case when more than one pharmacist in the selected pharmacy was eligible to participate, only one pharmacist was selected at random. The study protocol was approved by the Institutional Review Board at the Beirut Arab University under the protocol number 2018H-0052-P-R-0249.

Data collection took place in the selected pharmacies. Through face-to-face interviews with the pharmacists, a multi-component questionnaire was completed. Each interview lasted 10-15 minutes. The interviews were conducted by field workers who received extensive training on professional interviewing techniques and administration of the questionnaire prior to the start of the study. In order to increase participation rate, the interviewers were trained to clearly explain the purpose of the study and the potential benefits of its results for the pharmacy profession and the health and wellbeing of the patients.

The design of the questionnaire used in the data collection for this study was informed by a thorough review of relevant literature[16,23,24,34] and by a careful examination of the local context. The content validity of this questionnaire was confirmed by an expert panel consisting of a pharmacist, a nutrition epidemiologist, a biostatistician and a health policy expert. The questionnaire was originally written in English, before being translated to the Arabic language, and then back translated to English. The original and back-translated English versions of the questionnaire were examined to ensure parallel form reliability. The questionnaire was comprised of four sections. The first section included questions related to socio-demographic, education and practice characteristics, such as age, sex, employment status (full-time employee, part-time employee, or pharmacy owner), highest level of education attained (Bachelors, Masters, Pharm D or PhD), whether the pharmacist received education/training related to CAM during his/her university education years or post-graduation, years of experience as community pharmacist, the number of pharmacists in the pharmacy and how long was the pharmacy open for. The latter question was included because, in the local context, the longer the duration the pharmacy has been opened for, the more likely its clientele would develop a personalised relationship with the pharmacist allowing for a better communication of their health needs and concerns. The second section of the questionnaire addressed the pharmacist's beliefs related to CAM products. Specific questions were included tackling his/her perception of the regulation of CAM products' market in Lebanon, the role of media in educating consumers about the safe use of these products as well as the availability of resources and the need for continuous education. Section 3 included questions assessing the pharmacist's practices in relation to CAM products, such as selling, advising patient on safe use, reporting of adverse effects and checking for drug interactions. For sections 2 and 3, the survey instrument used a 5-point Likert rating scale in which 1 represented strongly agree and 5 represented strongly disagree. The last section of the questionnaire addressed the pharmacist's knowledge about CAM products. A total of ten questions were selected to address the uses, side effects and drug interactions of commonly sold CAM products in the Lebanese market. According to a previous investigation by the authors, vitamin C was the most commonly sold CAM product (25%), followed by ginseng (22%), vitamin B (13%), Gingko (14%), Omega 3 fatty acids (9.5%), Echinacea (9.5%) and Valerian (7.4%). [35]. The formulation of the questions around these products was carried out by an expert panel of pharmacists

including MH, MA (authors), and Dr Ghassan Al Amine (previous president of the OPL), and in consultation with relevant literature.[23,36] The questionnaire was pilot tested on a convenient sample of 16 pharmacists to check for clarity and culture sensitivity. Data collected during the pilot testing phase of the questionnaire were not included in this study. A copy of the questionnaire used in data collection is provided as a supplementary file to this manuscript.

For the summary of the data, descriptive statistics were used, such as frequencies and proportions. A knowledge score corresponding to the number of correctly answered questions was generated. Pharmacists were assigned a score value of '1' for any specific question which they have answered correctly and '0' if their answer was wrong. An 'I don't know' answer was also given a '0' because it reflected lack of knowledge. For each pharmacist, the assigned values for all questions were summed to obtain their respective knowledge score. Given that the questionnaire included 10 questions to evaluate knowledge, the score could range between a minimum of 0 and a maximum of 10. The resulting score was considered as a continuous variable, with no specific cutoff, whereby higher values indicated better knowledge. Simple and multiple linear regression analyses were used to investigate the associations socio-demographic factors with knowledge, using the knowledge score as dependent variable and the socio demographic factors as independent variables. P-values < 0.05 were considered statistically significant. Statistical Package for Social Sciences (SPSS) software version 20.0 for windows program was utilized to analyze the data.

Patient and Public Involvement

The specific aims of this study were to assess beliefs, practices and knowledge related to CAM products among community pharmacists in Lebanon. The specific target population of this study was community pharmacists. While there was no direct input of patients or members of the public into the design of this study, the outcomes could potentially benefit the public at large through enhancing the safe use of CAM products and their proper integration into the health care system. The results of this study will be disseminated through various means including published papers, presentations and executive summaries sent to concerned stakeholders.

Results

Out of 396 pharmacists approached, 341 agreed to participate in this study (86.1% response rate). The two main reasons for refusal to participate were lack of interest (34.5%) and lack of time (27.3%). Of the 341 questionnaires, only those with complete data were included in this study (n=310).

The distributions of the pharmacies in Lebanon and in the study sample were presented in table 1. Overall, compared to the national distribution, the study sample showed similar proportions of pharmacies among the various governorates.

Characteristics of study sample.

Table 2 displayed the various characteristics of the study population. The pharmacists were of varied age groups, with most of them aged below 40 years (67.1%). The study sample consisted of a slightly higher proportion of males versus females (53.5% male and 46.5% female). More than half of the pharmacists approached were the owners of the pharmacy (54.8%), while the rest was either working as full-time (23.2%) or part-time (21.9%). As for the educational level, 54.5% reported having a Bachelor's degree, while 45.5% of the pharmacist had attained higher degrees: 18.4% a Master's degree, 24.2% a Pharm D and 2.9% a PhD. Sixty-five percent of the pharmacists studied in Lebanese universities. More than two in three pharmacists (73.2%) reported receiving education about CAM-products during their university education and only 17.7% underwent a post-graduation training on CAM products. Working experience among the pharmacists ranged from 1-3 years (22.9%) to greater than 10 years (43.9%). (Table 2).

Beliefs related to CAM products, their market and availability of resources.

Overall, study participants displayed positive general beliefs related to CAM products with 63.8% and 80.3% of pharmacists strongly agreeing or agreeing that CAM products are effective and that CAM products should be exclusively sold in pharmacies, respectively. (Table 3). Only 30.0% disagreed or strongly disagreed that CAM products have less side effects compared to conventional medicines (17.4% were neutral and 52.5% strongly agreed or agreed). Over 80.0% strongly agreed or agreed that providing information to customers about CAM products is a pharmacist's professional responsibility. (Table 3).

As for the pharmacists' beliefs related to the CAM products' market in the country, a sizable proportion of survey participants (41.9%) disagreed or strongly disagreed that CAM products in the Lebanese market are well standardized and of good quality. When asked if they think that the market for CAM products in Lebanon is well regulated, 63.5% of surveyed community pharmacists disagreed or strongly disagreed. Furthermore, more than half of pharmacists (55.8%) disagreed or strongly disagreed that media plays a positive role in educating patients about CAM products. (Table 3).

With regards to the availability of resources on the safe use of CAM products for pharmacists, only 55.5% of study participants believed that information on CAM products are easily accessible to the pharmacists and 61.9% strongly agreed or agreed that continuous education in this field should be mandatory for pharmacists. (Table 3).

Current practices of dispensing CAM products.

More than two thirds of pharmacists (68.7%) participating in this study reported that they always/often sell CAM products in their pharmacy and 59.4% reported always/often getting inquiries from patients regarding the use of CAM products. (Table 4). The majority of pharmacists (64.5%) reported that they always/often advise patients on safe use of CAM products and ask for their feedback after use; however, 74.2% of pharmacists answered that they rarely or never reported adverse effects that occurred with patients using CAM products. (Table 4). Among those who reported the incidence of adverse effects, 53.4% of pharmacists indicated that they reported it to the pharmaceutical company (provider of CAM) and only 15.5% reported to the OPL, while the remaining reported to physician (13.8%), medical representative (8.6%), and MOPH (5.2%). A couple of pharmacists reported the adverse effects to other pharmacists working with them in the same pharmacy (Table 4 b). It is worth noting that 60.3% of pharmacists reported frequently checking for CAM product-drug interaction prior to selling the product. (Table 4).

Evaluation of pharmacists' knowledge

Table 5 displayed the results of knowledge which included 10 questions addressing uses, side effects and drug interactions of commonly sold CAM products in Lebanon. The majority of pharmacists answered correctly the questions related to the uses of *Echinacea*, *Ginkgo biloba*, and Omega-3 (81.9%, 83.2%, and 93.5% respectively). However, only 24.5% recognized the effect of Echinacea on autoimmune disorders,

61.3% were aware that ginkgo may increase the risk of bleeding when combined with warfarin, 21.9% knew that ginseng does not affect blood pressure and 50.3% did not know the potential effect of a vitamin B complex supplement on wound healing. On the other hand, 78.4% of the pharmacist knew that vitamin C enhances the absorption of iron. Of further concern were the high proportions of interviewed pharmacists who were not aware of the interactions between drugs and CAM products. For instance, 80.7% did not know that Valerian should be used cautiously in patients using benzodiazepines and 80.9% did not answer correctly the concurrence administration of omega-3 and Clopidogrel. (Table 5).

Socio-demographic determinants of knowledge

Overall the score for knowledge ranged between 1 and 9 in the study population, with a mean of 5.32 ±1.43. Simple linear regression results indicated that, among all socio-demographic characteristics considered in this study, 'receiving education/training on CAM products during university' was the sole predictor of better knowledge (ß=0.68, 95% CI: 0.31,1.06). After adjustment for covariates, receiving education/training on CAM products during university was also positively correlated with higher knowledge score (ß=0.68, 95%CI: 0.29-1.07); that is, receiving any education/training on CAM-products increases the mean knowledge score by 0.68 while adjusting for socio-demographic characteristics. (Table 6).

Discussion

This is the first national study to examine the beliefs, practices and knowledge related to CAM products among a nationally representative sample of community pharmacists in Lebanon. Additionally, it presents one of a few regional attempts to solicit the opinion of pharmacists at a national scale. The study revealed that the majority of community pharmacists acknowledged the importance of CAM products, believed that the market should be better regulated and reported needing professional development opportunities to enhance their knowledge of CAM products. With regards to practices, pharmacists were found to frequently advise patients on safe use of CAM products; however most did not reported adverse effects. Furthermore, the assessment of knowledge unearthed some deficiencies in pharmacists' knowledge related to potential side effects of CAM products and their potential interactions with

drugs. Receiving education/training on CAM products during university was the sole predictor of better knowledge among pharmacists.

One of the main findings of this study was related to the generally positive beliefs of Lebanese community pharmacists towards CAM products which is similar to other studies in the region[19-24] and other countries such as USA,[18] Australia,[37] Singapore[38] and Ethiopia.[3] The results of this study showed that pharmacists believed in the utility of CAM products and were willing to assume a leading role by asking for exclusive rights to sell these products in pharmacies and under the advice of community pharmacists. This is in accordance with a recent study by Gelayee et al. (2017)[3], where pharmacists believed that they are ideally positioned to dispense CAM products, as part of their role in dispensing, monitoring, and counseling conventional medicine. This unique position of the pharmacist could be best achieved if equipped with good knowledge and skills.[3]

The general positive beliefs of pharmacists towards CAM products were contrasted by doubts with regards to the quality of available CAM products and the regulations through which the market of these products is governed. Similarly in other studies pharmacists' main concerns was the lack of clear regulations and safety governing the sale of CAM products.[18,38,39] On that front, surveyed pharmacists were both critical of the regulatory framework for CAM products and of the counterproductive and misleading role played by media. With respect to the regulation of media, Lebanon could perhaps learn from the experience of the United States' Food and Drug Administration (FDA) which prohibits manufacturers and distributors of CAM products from marketing adulterated or misbranded products.[40] From a regulatory point of view, there is no counterpart for the FDA in Lebanon. The MoPH has had some initiatives to protect consumers' health but more efforts are needed to ensure public safety.[26]

A remarkable finding in this study related to over 50% of surveyed pharmacists reporting adverse effects of CAM products to the distributing companies rather than doing so to the MoPH. Such a practice does not only jeopardize public safety but also raises ethical questions related to the obvious conflict of interest in reporting adverse effects to the company benefiting from the sales of CAM products. Similar findings were reported in Qatar.[39] These findings call for the establishment of a more robust regulatory framework that reaches beyond the review and approval of CAM products to the establishment and implementation of the mechanisms to monitor and evaluate

the safe use post-market distribution. Such role could be played by the MoPH, the OPL or an arm's length organization with a national mandate to ensure safe consumption of CAM products. For instance, in US, the FDA is responsible for the regulation of dietary supplements.[40] Manufacturers of CAM products are responsible for the evaluation of the safety and labelling of their products to meet the requirements of FDA regulations. FDA is responsible for taking action against any adulterated CAM products that has reached the market.[40] In addition, the FDA allows consumers and health care professionals to report any adverse reactions on a designated reporting portal.[41] Within this context it is important to note that, out of 123 pharmacists who had experience with reporting adverse effects, only 58 indicated to whom they report such effects (47.2%). It is possible that participants were hesitant to answer this question because they were not sure about the correct answer. This further highlights the need to regulate the reporting of adverse effects and to clearly inform the pharmacists of the existing reporting channels.

In this study, the findings related to beliefs and practices of community pharmacists further underscored the need for pharmacists to play a leading role in ensuring safe utilization of CAM products by their customers. However, such a role of the community pharmacist may be undermined by the lack of proper education and training on the safe use of CAM products. In fact, in this study, close to two thirds of pharmacists believed that continuous education on safe and efficient use of CAM products should be mandatory for pharmacists. This recommendation echoed that of many other studies highlighting the need to have additional education and training on the use of CAM products.[3,16,21-24,37-39]

Perhaps one of the most disconcerting findings of this study was related to the deficiencies in the pharmacists' knowledge of potential interactions among CAM products and drugs and to a lesser extent CAM products' side effects. This lack of knowledge came along prevalent good intentions of community pharmacists to provide the best evidence-based advice to their customers. These findings may lead to the advice of pharmacists being suboptimal and could, in some instances jeopardize the health and wellbeing of the patients. The knowledge deficiencies found in this study were also reported by many studies in the region such as Saudi Arabia,[6,23]Abu Dhabi,[24] Jordan,[19] Kuwait,[20,21] Oman,[22] Qatar,[39] Palestine,[42,43] and Iran[44] as well as other countries such as Ethiopia,[3] USA,[18] Singapore,[38] and in Trinidad and Tobago,[45] and therefore appear to be a global concern. One possible explanation for the

observed knowledge deficiencies could be due to the biased information propagated by some CAM product companies. This information usually aims to maximize sales and neglects any factor that can affect the promotion of their products.[46] A few studies showed that personal sale visits of certain products' companies to pharmacists (called "detailing") could drive prescriptions in favor of the product being promoted. This is true even though pharmacists' may be aware of the potential conflict of interest these visits precipitate.[47-49] Another explanation could be the lack of availability and ease access of pharmacists to scientific resources and professional development programs.

The findings on the lack of knowledge on safe use of CAM products, coupled with the majority of pharmacists requesting a mandatory continuous education program, open a remarkable window of opportunity for the MoPH to work collaboratively with the OPL to establish a national program for the continuous education of pharmacists on CAM products. Collaborating with academic institutions would enhance the design, implementation and evaluation of such a program. Providing continuous education opportunities would enhance the knowledge of pharmacists on the safe use of CAM products, the appropriate reporting of side effects and their general role as counsellors for their customers. Last but not least, the finding in our regression models that receiving education/training on CAM products during university was the sole predictor of better knowledge calls on the pharmacy schools to revise their curricula in order to ensure proper education and training of pharmacy students on the safe use of CAM products. Such revision is necessary to enhance public safety.

The findings of this study ought to be considered in light of a few limitations. First, the data collection relied on self-reported answers for practices, beliefs and knowledge. These answers could be subject to errors due to memory recall or social desirability bias. To mitigate this, interviewers were trained to maintain a neutral attitude and avoid leading questions. Second, although a few questionnaires were validated to assess the beliefs, practices and knowledge related to CAM products among specific populations, such as nurses, and medical students,[50,51] none was available for use among pharmacists. Therefore, the questionnaire used in data collection was developed and vetted by a panel of experts, including a pharmacist, nutrition epidemiologist, biostatistician and a health policy expert. The questionnaire was designed to capture the common traits in beliefs, practices and knowledge of pharmacist towards CAM products and to address to context specificity of the study.

It is important to note that a couple of the questions in the questionnaire were double barreled and could have been better broken into two questions each to ensure clarity and accuracy of answer. Future studies are encouraged to examine the validity and reliability of questionnaires assessing beliefs, practices and knowledge of CAM products among pharmacists. Third, despite the fact that the sample of pharmacists considered was nationally representative, the cross-sectional nature of the study prevented any inference about the change in beliefs, practices or knowledge over time among pharmacists in the country. Lastly, this study relied mainly on quantitative assessment. Future studies aiming to qualitatively examine pharmacists' beliefs, practices and knowledge, with regards to CAM products could complement the results of quantitative investigations and provide a more complete evaluation of the subject matter.

In conclusion, the findings of this study revealed positive beliefs of pharmacists in Lebanon towards CAM products and indicated important gaps in their practice and knowledge. Given the central role that the pharmacists play in promoting the safe and efficient use of CAM products and in light of the study's findings, deliberate efforts to enhance the education of pharmacists and support them with a clear and responsive regulatory framework would be necessary to ensure the safe integration and use of CAM products in the country.

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List of Tables

Table 1: Distribution of pharmacies across governorates in this study in comparison to national distribution of pharmacies

	Pharmacies in the study n(%)	**Pharmacies in Lebanon n(%)**
Beirut	30 (9.7)	238(7.8)
South	44 (14.2)	353(11.6)
North	47(15.2)	436(14.3)
Mount Lebanon	122(39.4)	1311(43.1)
Beqaa	43(13.9)	482(15.8)
Nabatieh	24(7.7)	223(7.3)
Total	**310**	**3043**

Table 2. Characteristics of study sample (n=310)

	Frequency	Percentage
Age range		
20-30 years	112	36.1
31-40 years	96	31.0
41-50 years	55	17.7
Above 50 years	47	15.2
Gender		
Male	166	53.5
Female	144	46.5
Employments status		
Full time	72	23.2
Part-time	68	21.9
Pharmacy owner	170	54.8
Highest educational level attained		
Bachelors	169	54.5
Masters	57	18.4
Pharm D	75	24.2
PhD	9	2.9
Which university did you graduate from		
Non-Lebanese Universities	86	27.7
Lebanese Universities	203	65.5
Did not specify	21	6.8
During your university education, did you receive any education/training on CAM-products?		
Yes	227	73.2
No	83	26.8
Did you receive any postgraduate education/training on CAM-products?		
Yes	55	17.7
No	255	82.3
Years of work experience (in community pharmacy)		
1-3 years	71	22.9
4-7 years	68	21.9
8-10 years	35	11.3
Above 10 years	136	43.9
How many pharmacists work in this pharmacy, in addition to yourself ?		
0	20	6.5
1	121	39.0
2	113	36.5
≥3	56	18.1
How long has this pharmacy been opened for?		
1-5 years	77	24.8
6-10 years	70	22.6
11-15 years	37	11.9
16-20 years	38	12.3
>20 years	63	20.3
Don't know	25	8.1

Table 3: General beliefs towards CAM products, their market and availability of resources among a national sample of community pharmacists in Lebanon (n=310)

	n(%)				
	Strongly agree	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
General beliefs toward CAM products					
CAM products are effective	63(20.3)	135(43.5)	81(26.1)	22(7.1)	9(2.9)
CAM products should be sold only in a pharmacies	191(61.6)	58(18.7)	21(6.8)	30(9.7)	10(3.2)
The use of CAM products should not be limited to patients who have failed conventional medicine therapy	77(24.8)	119(38.4)	50(16.1)	41(13.2)	23(7.4)
CAM products have less side effect than conventional medicines	76(24.4)	87(28.1)	54(17.4)	66(21.3)	27(8.7)
Providing information about CAM products is a pharmacist's professional responsibility	170(54.8)	83(26.8)	30(9.7)	21(6.8)	6(1.9)
Beliefs towards CAM products available in the Lebanese market					
CAM products available in the Lebanese market are well standardized and of good quality	25(8.1)	55(17.7)	100(32.3)	80(25.8)	50(16.1)
The market for CAM products in Lebanon is well regulated	15(4.8)	35(11.3)	63(20.3)	98(31.6)	99(31.9)
Media plays a positive role in educating consumers about safe use of CAM products available in the Lebanese market	35(11.3)	39(12.6)	63(20.3)	74(23.9)	99(31.9)
Availability of resources					
Information resources on CAM products are available and easily accessible to the pharmacists	87(28.1)	85(27.4)	56(18.1)	59(19.0)	23(7.4)
Continuous education on CAM products should be mandatory for pharmacists	102(32.9)	90(29.0)	61(19.7)	40(12.9)	17(5.5)

Table 4a. Current practices of dispensing CAM products among a national sample of community pharmacists in Lebanon (n=310)

	Always	Often	Sometimes	Rarely	No
Do you sell CAM products in your pharmacy?	109(35.2)	104(33.5)	70(22.6)	15(4.8)	12(3.9)
Do you get inquiries from patients regarding the use of CAM products?	92(29.7)	92(29.7)	69(22.3)	38(12.3)	19(6.1)
Do you advise patients on safe use of CAM products?	126(40.6)	74(23.9)	72(23.2)	22(7.1)	16(5.2)
Do you ask your patient about their feedback after their use of CAM products?	136(43.9)	57(18.4)	56(18.1)	43(13.9)	18(5.8)
Do you report any adverse effect occurred with patients using CAM products?	30(9.7)	23(7.4)	27(8.7)	43(13.9)	187(60.3)
Do you get referrals from naturopath to your pharmacy?	21(6.8)	38(12.3)	52(16.8)	42(13.5)	157(50.6)
Do you check for CAM product-drug interaction?	121(39.0)	66(21.3)	44(14.2)	38(12.3)	41(13.2)

Table 4b: To whom do you report any adverse effect that occurred with patients using CAM products?

	n=58	%
Pharmaceutical company	31	53.4
Medical representative	5	8.6
MOPH	3	5.2
OPL	9	15.5
Pharmacists	2	3.4
Physician	8	13.8

Table 5: Evaluation of knowledge among a national sample of pharmacists in Lebanon (n=310)

	True/ False	% answered correctly	% answered incorrect	% answered I don't know
Echinacea is commonly used for the treatment of cold & flu symptoms[52]	T	254(81.9)	22(7.1)	34(11.0)
Echinacea can be used in patients with autoimmune disorders[53]	F	76(24.5)	120(38.7)	114(36.8)
Ginseng may increase blood pressure[54]	F	68(21.9)	218(70.3)	24(7.7)
Valerian should be used cautiously in patients using benzodiazepines[55]	F	60(19.4)	216(69.7)	34(11.0)
Ginkgo can increase the risk of bleeding when combined with warfarin[56,57]	T	190(61.3)	42(13.5)	78(25.2)
Ginkgo can be used to delay dementia[58]	T	258(83.2)	26(8.4)	26(8.4)
Omega-3 is beneficial for patients suffering from cardiovascular disorders[59,60]	T	290(93.5)	9(2.9)	11(3.5)
Omega-3 can be given safely to patient taking Clopidogrel [61,62]	F	59(19.0)	188(60.6)	63(20.3)
Vitamin B complex may delay wound healing[63,64]	F	154(49.7)	41(13.2)	115(37.1)
Vitamin C when taken with Iron (Ferrous salt) increases its absorption[65]	T	243(78.4)	36(11.6)	31(10.0)

Table 6. Simple and multiple linear regression analyses for the association of characteristics of study participants with the knowledge score.

	Crude B, 95% CI	Adjusted B, 95% CI
Age range		
20-30 years	Ref	Ref
31-40 years	-0.04 (-0.45, 0.37)	-0.29 (-0.86, 0.29)
41-50 years	-0.19 (-0.68, 0.30)	-0.53 (-1.27, 0.21)
Above 50 years	-0.51(-1.03, 0.00)	-0.74(-1.57,0.10)
Gender		
Male	Ref	Ref
Female	-0.05 (-0.39,0.29)	-0.19 (-0.55,0.17)
Employments status		
Pharmacy owner	Ref	Ref
Full time	0.38(-0.04,0.79)	0.32 (-0.15,0.78)
Part-time	-0.04 (-0.47,0.38)	-0.08(-0.60,0.45)
Highest educational level attained		
BSc, MSc and PhD	Ref	Ref
Pharm D	0.37 (-0.02,0.76)	0.27 (-0.14,0.68)
Which university did you graduate from		
Non-Lebanese Universities*	Ref	Ref
Lebanese Universities	0.05 (-0.35,0.26)	-0.06(-0.40,0.28)
During your university education, did you receive any education/training on CAM-products?		
No	Ref	Ref
Yes	0.68 (0.31,1.06)	0.68(0.29,1.07)
Did you receive any post graduate education/training on CAM-products?		
No	Ref	Ref
Yes	0.25 (-0.19,0.69)	0.25(-0.20,-0.70)
Years of work experience (in community pharmacy)		
1-3 years	Ref	Ref
4-7 years	-0.28 (-0.78,0.22)	-0.22(-0.75,0.30)
8-10 years	0.37 (-0.24,0.98)	0.67(-0.08,1.42)
Above 10 years	-0.18 (-0.62,0.25)	0.15(-0.60,0.87)
How many pharmacists work in this pharmacy?		
0	Ref	Ref
1	-0.19 (-0.91,0.53)	-0.28(-1.01,0.45)
2	-0.28 (-1.01-0.44)	-0.56(-1.33,0.21)
≥3	-0.05 (-0.83,0.73)	-0.31(-1.16,0.54)
How long has this pharmacy been opened for?		
1-5 years	Ref	Ref
6-10 years	0.13 (-0.36,0.63)	0.11(-0.40,0.62)
11-15 years	0.22 (-0.38,0.82)	0.24(-0.39,0.88)
16-20 years	0.19 (-0.40, 0.79)	0.33(-0.32,0.98)
>20 years	-0.56 (-0.45,0.56)	0.35(-0.25,0.94)
I don't know	-0.39 (-1.08,0.30)	-0.38(-1.10,0.34)

*Including 'Non-specified universities'

جامعة بيروت العربية
BEIRUT ARAB UNIVERSITY

Lebanese Pharmacist Knowledge and Attitudes towards Complementary and Alternative Medicine

Date (dd /mm/ yy): ___/___/___

Subject ID: _____

Interview date:

Interview time:

Interviewer name:

District of the Pharmacy:

- ❑ Beirut
- ❑ South
- ❑ North
- ❑ Mount Lebanon
- ❑ Beqaa
- ❑ Nabatieh

Section A: Socio-demographics

Mark with an (X) for the suitable answer:

- Age range:
  - ❑ 20 – 30 years
  - ❑ 31 – 40 years
  - ❑ 41 – 50 years
  - ❑ Above 50 years

- Gender:
  - ❑ Male
  - ❑ Female

- Employment status
  - ❑ Full-time
  - ❑ Part-time

- Highest educational level attained:
  - ❑ Bachelors
  - ❑ Masters
  - ❑ Pharm D
  - ❑ Ph.D

- Which university did you graduate from:_____

- During your university education, did you receive any education/training on CAM-products?
  - ❑ Yes
  - ❑ No

- Did you receive any post graduate education/training on CAM-products?
  - ❑ Yes
  - ❑ No

- Years of work experience (in community pharmacy):
  - ❑ 1 – 3 years
  - ❑ 4 – 7 years
  - ❑ 8 – 10 years
  - ❑ Above 10 years

- How many pharmacists work in your pharmacy? _____
- How long has this pharmacy been opened for? _____

Section B: Pharmacist Attitudes/ (beliefs) Towards CAM products

Statement	5	4	3	2	1
CAM products are effective					
CAM products should be sold only in a pharmacies					
The use of CAM products should not be limited to patients who have failed traditional prescription therapy					
Providing information about CAM products is a pharmacist's professional responsibility					
Information resources on CAM products are available and easily accessible to the pharmacist					
Continuous education related to CAM products should be mandatory for pharmacists					
CAM products have less side effects than conventional medicines					
CAM products available in the Lebanese market are well standardized and of good quality					
The market for CAM products in Lebanon is well regulated					
Media plays a positive role in educating consumers about safe use of CAM products available in the Lebanese market					
***Scale of 1-5 (5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, 1 = strongly disagree)**					

Section C: Current practice of dispensing CAM products

This is a 5-scale question so mark with an (X) for the suitable answer:

1 (always), 2 (often), 3 (sometimes), 4 (rarely), and 5 (no)

1- Do you sell CAM products in your pharmacy?

☐1 ☐2 ☐3 ☐4 ☐ 5

2- Do you get inquiries from patients regarding the use of CAM products?

☐1 ☐2 ☐3 ☐4 ☐ 5

3- Do you advise patients on safe use of CAM products?

☐1 ☐2 ☐3 ☐4 ☐ 5

4- Do you ask your patient about their feedback after their use of CAM products?

☐1 ☐2 ☐3 ☐4 ☐ 5

5- Do you report any toxic or undesirable effect occurred with patients using CAM products?

☐1 ☐2 ☐3 ☐4 ☐ 5

6- If yes, to whom do you report_____

7- Do you get referrals from natural practitioners to your pharmacy?

☐1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

8- Do you check for CAM product-drug interaction?

☐1 ☐2 ☐3 ☐4 ☐ 5

Sector D: Evaluation of knowledge related to CAM products

Statement	True	False	I don't know
Echinacea is commonly used for the treatment of cold & flu symptoms			
Echinacea can be used in patients with autoimmune disorders			
Ginseng may increase blood pressure			
Valerian should be used cautiously in patients using benzodiazepines			
Ginkgo can increase the risk of bleeding when combined with warfarin			
Ginkgo can be used to delay dementia			
Omega-3 is beneficial for patients suffering from cardiovascular disorders			
Omega-3 can be given safely to patient taking clopidogrel			
Vitamin B complex may delay wound healing			
Vitamin C when taken with Iron (Ferrous salt) increases its absorption			

Beliefs, Practices and Knowledge of Community Pharmacists Regarding Complementary and Alternative Medicine: National Cross-Sectional Study in Lebanon

STROBE Statement—Checklist of items

	Item No	Recommendation	Completed
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Beliefs, Practices and Knowledge of Community Pharmacists towards Complementary and Alternative Medicine: National Cross-Sectional Study in Lebanon
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	See Abstract sections: Objective, Design, Methods and Setting, and Results.
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Scientific background: Page 4 and 5 Rationale: In Lebanon, the increased prevalence of CAM use, the poorly regulated CAM market, together with the high rate of non-disclose to health care providers, underscore the crucial role of pharmacists in ensuring patients' health and safety.
Objectives	3	State specific objectives, including any pre specified hypotheses	The objective of this study was to assess the CAM- related beliefs, practices and knowledge of a nationally representative sample of community pharmacists in Lebanon. A secondary objective of the study was to investigate socio-demographic determinants of CAM- related knowledge in the study sample
Methods			
Study design	4	Present key elements of study design early in the paper	This is a cross-sectional national survey of pharmacists practicing in community pharmacies conducted in Lebanon between September 2017 and February 2018
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Pharmacists practicing in community pharmacies conducted in Lebanon between September 2017 and February 2018 The sampling unit for this study was the pharmacy. A list of all community pharmacies and their location in Lebanon was obtained from the Order of Pharmacists in Lebanon (OPL).
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	Pharmacies were selected from this list using a stratified random sampling technique. The strata were the six Lebanese governorates. Within each stratum (governorate), pharmacies were selected at random from the list of all pharmacies within this stratum. The number of pharmacies selected was proportional to the number of pharmacies in each stratum.

			To be included in the study, the pharmacist had to be licensed to practice by the Lebanese Ministry of Public Health and registered in the OPL The pharmacist had to be working in the selected pharmacy whether as pharmacy owner or as an employee. In addition, the pharmacist had to be conversant in either the English or the Arabic languages.
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Socio-demographic, education and practice characteristics, such as age, sex, employment status (full-time employee, part-time employee, or pharmacy owner), highest level of education attained (Bachelors, Masters, Pharm D or PhD), whether the pharmacist received CAM education/training during his/her university education years, whether the pharmacist pursued post graduate education/training in CAM, years of experience as community pharmacist, the number of pharmacist in the pharmacy and how long was the pharmacy open. The pharmacist's beliefs related to CAM: his/her perception of the regulation of CAM products' market in Lebanon, the role of media educating consumers about the safe use of CAM products as well as the availability of resource and the need for continuous education in CAM. The pharmacist's practices in CAM: selling CAM, advising patient on the safe use of CAM, reporting of CAM toxic effects and checking for CAM-drug interactions. Pharmacist's knowledge about CAM products: uses, side effect, and interactions of commonly sold CAM products in Lebanon.
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	All variables were derived for one source: the multi-component questionnaire.
Bias	9	Describe any efforts to address potential sources of bias	In order to decrease recall bias, data was collected through face to face interviews whereby interviewers were trained to pose probing questions assisting the pharmacist to accurately recall information. Furthermore, in order to minimize the effect of social desirability bias, interviewers were trained to maintain a neutral attitude vis-a-vis the answers of the pharmacists.
Study size	10	Explain how the study size was arrived at	The number of pharmacies selected was proportional to the number of pharmacies in each stratum. Sample size calculations showed that a minimum of 342 pharmacists ought to be recruited in order to estimate a prevalence of 50% with a 95% CI and a margin of error of 5%. In order to account for a 14% refusal rate, 396 pharmacies were selected from the OPL list. Out of 396 pharmacists approached, 341 agreed to participate in this study (86.1% response rate). Of the 341 questionnaires, only those with complete data were included in this study (n=310).
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	For the summary of the data, descriptive statistics were used, such as frequency and proportions. A knowledge score corresponding to the number of correctly answered questions was generated, with a minimum of zero and a maximum of 10.

Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	For the summary of the data, descriptive statistics were used, such as frequency and proportions. A knowledge score corresponding to the number of correctly answered questions was generated, with a minimum of zero and a maximum of 10. Simple and multiple linear regression analyses were used to investigate the associations socio-demographic factors with knowledge, using the knowledge score as dependent variable and the socio demographic factors as independent variables. P-value < 0.05 was considered statistically significant. Statistical Package for Social Sciences (SPSS) software version 20.0 for windows program was utilized to analyse the data.
		(*b*) Describe any methods used to examine subgroups and interactions	N/A
		(*c*) Explain how missing data were addressed	Only those with complete data were included in this study
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	N/A
		(*e*) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Out of 396 pharmacists approached, 341 agreed to participate in this study (86.1% response rate). Of the 341 questionnaires, only those with complete data were included in this study (n=310).
		(b) Give reasons for non-participation at each stage	The two main reasons for refusal to participate were lack of interest (34.5%) and lack of time (27.3%).
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 2 displayed the various characteristics of the study population. The pharmacists were of varied age groups, with most of them ranging between 20 and 40 years of age (66.467.1%). The study sample consisted of a slightly higher proportion of males versus females (54.853.5% male and 45.246.5% female). More than 50% of the pharmacists approached were the owners of the pharmacy (5654.85%), the rest were either working as full-time (232.23%) or part-time (21.92%). As for educational level, 54.52% reported having a Bachelor's degree, while 45.58% of the pharmacist had attained higher degrees; 19.718.4% a Master's degree, 23.024.2% a Pharm D and 3.12.9% a PhD. Sixty-eight five percent of the pharmacists studied in Lebanese universities. More than two in three pharmacists reported receiving education about CAM-products during their university education (72.573.2%) and only 1817.7% underwent a post-graduation training on CAM-products. Working experience among the pharmacists ranged from 1-3 years (21.522.9%) to greater than 10 years (44.443.9%) (Table 2).

		(b) Indicate number of participants with missing data for each variable of interest	Any questionnaire with missing data was removed
Outcome data	15*	Report numbers of outcome events or summary measures	N/A
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Simple linear regression results indicated that 'receiving education/training on CAM products during university' was the sole predictor of better knowledge (ß=0.68, 95% CI: 0.31,1.06), among all socio-demographic characteristics considered in this study. After adjustment for socio-demographic characteristics, the results of the multiple linear regression confirmed this finding (ß=0.68, 95% CI: 0.29, 1.07)
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	See results section
Discussion			
Key results	18	Summarise key results with reference to study objectives	First paragraph of the Discussion section
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	The findings of this study ought to be considered in light of a few of limitations. First, the data collection relied on self-reported answers for practices, beliefs and knowledge. These answers could be subject to errors due to memory recall or social desirability bias. To mitigate this, interviewers were trained to maintain a neutral attitude and avoid leading questions. Second, although a few questionnaires were validated to assess the CAM-related belief attitude, practice and knowledge among specific population, such as nurses, and medical students, none was available for use among pharmacists. Therefore, the questionnaire used in data collection was developed and vetted by a panel of experts, including a pharmacist, nutrition epidemiologist, biostatistician and a health policy expert. The questionnaire was designed to capture the common traits in belief, practice and knowledge of pharmacist towards CAM and to address to context specificity of the study. Future studies are encouraged to examine the validity and reliability of questionnaires assessing CAM-related attitude, beliefs, practices and knowledge among pharmacists Third, despite the fact that the sample of pharmacists considered was nationally representative, the cross sectional nature of the study prevented any inference about the change in CAM belief, practice or knowledge over time among pharmacists in the country. Lastly, it remains important to note that this study relied mainly on quantitative assessment. Future studies aiming to qualitatively examine pharmacists' beliefs, practices and knowledge, with regards to CAM could complement the results of quantitative investigations and provide a more

			complete evaluation of the subject matter.
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Done. See Discussion section
Generalisability	21	Discuss the generalisability (external validity) of the study results	Done. See Discussion section
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.