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

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2018-025074
Article Type:	Research
Date Submitted by the Author:	29-Jun-2018
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Keywords:	COMPLEMENTARY MEDICINE, Pharmacist, National Cross Sectional Study, Community, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Lebanon

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Manuscripts



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3 **Knowledge, Attitudes and Practices of Pharmacists towards Complementary and**
4 **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-disclosure 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.

Word Count: 3407

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.

For peer review only

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

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3 pharmacy education has lagged behind,¹⁶ leaving many pharmacists unfamiliar with
4 the health effects of CAM.¹⁴
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7 One of the fastest growing markets of CAM products in the world is the Middle East
8 and North Africa Region (MENA). Despite of this growth, CAM products are poorly
9 regulated. For example, in Lebanon, a small country of the MENA, the market for
10 CAM products is largely unregulated and could be subject to abuse by both patient
11 and provider.¹⁷ About one third of Lebanese adults (29.87%) were reported to use
12 CAM products in 2015, with the most prevalent consumed CAM type being herbal
13 supplements.⁵ Higher rates of CAM use were reported among patients with chronic
14 diseases such as infertility (41%),¹⁸ lung cancer (41%),¹⁹ and HIV and AIDS
15 conditions (46.6%).²⁰ A common finding to most studies conducted on CAM use in
16 Lebanon was the low rate of disclosure to the treating physicians.^{5,17,19,21-23} This
17 behavior raised concerns about the safety, efficacy, and their impact on the patient
18 health; especially when it is coupled with poor regulatory frameworks.¹⁷
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27 In Lebanon, the increased prevalence of CAM use, the poorly regulated CAM market,
28 together with the high rate of non-disclose to healthcare providers, underscore the
29 crucial role of pharmacists in ensuring patients' health and safety. The aim of this
30 study is to assess the CAM related attitudes, practices and knowledge of a nationally
31 representative sample of community pharmacists in Lebanon. The findings of this
32 study will inform the practice of pharmacy in the country, as well as the development
33 and integration of CAM modules into mainstream educational programs of pharmacy.
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38 **Methods**

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41 This is a cross-sectional national survey of pharmacists practicing in community
42 pharmacies conducted in Lebanon between September 2017 and February 2018. The
43 sampling unit for this study was the pharmacy. A list of all community pharmacies
44 and their location in Lebanon was obtained from the Order of Pharmacists in Lebanon
45 (OPL). Pharmacies were selected from this list using a stratified random sampling
46 technique. The strata were the six Lebanese governorates. The number of pharmacies
47 selected was proportional to the number of pharmacies in each stratum. Sample size
48 calculations showed that a minimum of 342 pharmacists ought to be recruited in order
49 to estimate a prevalence of 50% with a 95% CI and a margin of error of 5%. In order
50 to account for a 20% refusal rate, 412 pharmacies were selected from the OPL list.
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3 To be included in the study, the pharmacist had to be licensed to practice by the
4 Lebanese Ministry of Public Health and registered in the OPL. The pharmacist had to
5 be working in the selected pharmacy whether as pharmacy owner or as an employee.
6 In addition, the pharmacist had to be conversant in either the English or the Arabic
7 languages. Pharmacists unable or unwilling to give consent for the study were not
8 included. If a pharmacist in a selected pharmacy refused to participate, the pharmacist
9 in the closest pharmacy was approached. In the case when more than one pharmacist
10 in the selected pharmacy was eligible to participate, only one pharmacist was selected
11 at random to take part in the study. The study protocol was approved by the
12 Institutional Review Board at the Beirut Arab University; under the protocol number
13 2018H-0052-P-R-0249.

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16 Data collection was conducted using face to face interviews with the pharmacists. The
17 interviews were conducted by field workers who received extensive training on
18 professional interviewing techniques and administration of the study questionnaire
19 prior to the start of the study.
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23 The questionnaire used in the data collection for this study was comprised of four
24 sections. The first section included questions related to socio-demographic, education
25 and practice characteristics, such as age, sex, employment status (full-time employee,
26 part-time employee, or pharmacy owner), highest level of education attained
27 (Bachelors, Masters, Pharm D or PhD), whether the pharmacist received CAM
28 education/training during his/her university education years, whether the pharmacist
29 pursued post graduate education/training in CAM, years of experience as community
30 pharmacist, the number of pharmacist in the pharmacy and how long was the
31 pharmacy open for. The second section of the questionnaire addressed the
32 pharmacist's attitudes towards CAM. Specific questions were included tackling
33 his/her perception of the regulation of CAM market, the role of media in Lebanon as
34 well as the availability of resource and the need for continuous education in CAM.
35 The third section of the questionnaire included questions assessing the pharmacist's
36 practices in CAM, including selling CAM, advising patient on the safe use of CAM,
37 reporting of CAM toxic effects and checking for CAM-drug interactions. For sections
38 2 and 3, the survey instrument used a 5-point Likert rating scale on which 1
39 represented strongly agree and 5 represented strongly disagree. The last section of the
40 questionnaire addressed the pharmacist's knowledge about CAM covering the uses,
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3 side effect, and interactions of commonly sold CAM products. The content validity of
4 this questionnaire was confirmed by an expert panel consisting of a pharmacist, a
5 nutrition epidemiologist, a biostatistician and a health policy expert. The
6 questionnaire was originally written in English, before being translated to the Arabic
7 language, and then back translated to English. The original and back-translated
8 English versions of the questionnaire were examined to ensure parallel form
9 reliability. The questionnaire was pilot tested on a convenient sample of 16
10 pharmacists to check for clarity and culture sensitivity. Given that there were no
11 changes in the data collection tool following the pilot testing, its results were included
12 in the analysis of this study.
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19 For the summary of the data, descriptive statistics were used, such as frequency and
20 proportions. A knowledge score corresponding to the number of correctly answered
21 questions was generated, with a minimum of zero and a maximum of 10. Statistical
22 Package for Social Sciences (SPSS) software version 20.0 for windows program was
23 utilized to analyze the data.
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28 **Results**

29 Out of 412 pharmacists approached, 357 agreed to participate in this study (86.7%
30 response rate). The two main reasons for refusal to participate were lack of interest
31 (34.5%) and lack of time (27.3%). Other reason for non-participation accounted for
32 18.2%, with an additional 20% not reporting a specific reason (20.0%).
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36 The distributions of the pharmacies in Lebanon and in the study sample are presented
37 in table 1. Overall, the study sample showed comparable distribution of pharmacies
38 among the various governorates to the national distribution.
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42 *Characteristics of study sample.*

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44 Table 2 displayed the various characteristics of the study population. The pharmacists
45 were of varied age groups, with most of them ranging between 20 and 40 years of age
46 (66.4%). The study sample consisted of a slightly higher proportion of males versus
47 females (54.8% male and 45.2% female). More than 50% of the pharmacists
48 approached were the owners of the pharmacy (56.5%), the rest were either working as
49 full-time (22.3%) or part-time (21.2%). As for educational level, 54.2% reported
50 having a Bachelor's degree, while 45.8% of the pharmacist had attained higher
51 degrees; 19.7% a Master's degree, 23.0% a Pharm D and 3.1% a PhD. Sixty-eight
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3 percent of the pharmacists studied in Lebanese universities. More than two in three
4 pharmacists reported receiving education about CAM-products during their university
5 education (72.5%) and only 18% underwent a post-graduation training on CAM-
6 products. Working experience among the pharmacists ranged from 1-3 years (21.5%)
7 to greater than 10 years (44.4%) (Table 2).
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11 12 13 *Attitudes towards CAM products, their market and availability of resources.*

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16 Overall, study participants displayed positive general attitudes towards CAM with
17 63.2% of pharmacists strongly agreeing/agreeing that CAM products are effective and
18 the majority (80.0%) strongly agreeing/agreeing that CAM products should be
19 exclusively sold in pharmacies (Table 3). Only 28.3% disagreed/strongly disagreed
20 that CAM products have less side effects compared to conventional medicines (16.7%
21 were neutral and 55.0% strongly agreed/agreed). Over 80.0% percent strongly
22 agreed/agreed that providing information to customers about CAM products is a
23 pharmacist's professional responsibility (Table 3).
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30 As for the pharmacists' attitudes towards the CAM market in the country, a sizable
31 proportion of survey participants (73%) were not sure about the quality of
32 commercially marketed CAM products in Lebanon, where (42.3%) were
33 disagreeing/strongly disagreeing and 30.7% were neutral. When asked if they think
34 that the market for CAM products in Lebanon is well regulated 61.9% of surveyed
35 community pharmacists disagreed/strongly disagreed. Furthermore, more than half of
36 pharmacists (56.5%) disagreed/strongly disagreed that media plays a positive role in
37 educating patients about CAM (Table 3).
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43 With regards to the availability of resources on the safe use of CAM for pharmacists,
44 only 55.5% of study participants believed that information on CAM products are
45 easily accessible to the pharmacists and 61.9% strongly agreed/agreed that continuous
46 education on CAM should be mandatory for pharmacists (Table 3).
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50 *Current practice of dispensing CAM products.*

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

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

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11 One of the main findings of this study relates to the generally positive attitudes of
12 Lebanese community pharmacists towards CAM products which is similar to other
13 studies in the region²⁴⁻²⁹ and other countries such as USA,¹⁶ Australia,³⁰ Singapore³¹
14 and Ethiopia.² Pharmacists do not only believe in the utility of CAM products but are
15 also willing to assume a leading role by asking for exclusive rights to sell CAM
16 products in pharmacies and under the advice of a community pharmacist. This is in
17 accordance with a recent published study by Gelayee et al. (2017).² Pharmacists
18 believe that they are in ideal position to dispense CAM products, as a completion of
19 their role in dispensing, monitoring, and counseling conventional medicine. This
20 unique position of the pharmacist could be best achieved if equipped with good
21 knowledge and skills.² The positive attitude of surveyed pharmacists could also be
22 shaped by the high demand of patients for CAM products and the high frequency of
23 pharmacies reporting the selling of such products.

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

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

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3 that does go beyond the review and approval of CAM products to the establishment
4 and implementation of the mechanisms to monitor and evaluate the safe use post-
5 market distribution. Such role could be played by the MoPH, the OPL or an arms
6 length organization with a national mandate to ensure safe consumption of CAM
7 products. For instance, in USA the FDA is responsible for the regulation of dietary
8 supplements.³² Manufacturers of CAM products are responsible for the evaluation of
9 the safety and labelling of their products to meet the requirements of FDA regulations.
10 FDA is responsible for taking action against any adulterated CAM products that has
11 reached the market.³² In addition, the FDA allows consumers and healthcare
12 professionals to report any adverse reactions on a designated reporting portal.³⁴
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14 It is further disconcerting that the majority of pharmacists disagree that commercially
15 marketed CAM products in Lebanon are of good quality. This necessitates
16 pharmacists to play a leading role to ensure safe utilization by their customers.
17 Similarly in other studies pharmacists' main concern were the lack of clear
18 regulations and safety governing the sale of CAM products.^{16,31,33} However, the role
19 of the community pharmacist related to the safe use of CAM products may be
20 undermined by the lack of proper education and training on the safe use of CAM
21 products. In fact, close to two thirds of pharmacist believe that the continuous
22 education on CAM should be mandatory for pharmacists. This recommendation
23 concurs with that of many other studies highlighting the need to have additional
24 education and training on the use of CAM products.^{2,14,26-31,33}

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38 Perhaps one of the most disconcerting findings of this study relates to the assessment
39 of Pharmacists' information which revealed deficiencies in their knowledge of CAM-
40 drug interaction and to a lesser extent CAM products side effects. Such knowledge
41 deficiencies were reported by many other studies and appear to be a concern of global
42 nature.^{2,4,16,24-29,31,33,35} This is despite pharmacists being well knowledgeable of the
43 purpose of CAM use. One explanation for this is the means through which CAM
44 companies market their products educating the physicians and pharmacists where they
45 aim to maximize sales and neglect any factor that can affect the promotion of their
46 products. Another explanation could be the lack of scientific resources and its
47 availability and ease access by the pharmacist. The use of scientific resources and
48 updated data should be integrated within the practice habit of the pharmacist to
49 provide evidence based information for CAM products.
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3 The findings on the lack of knowledge on safe use of CAM products, coupled with the
4 majority of pharmacists requesting a mandatory continuous education program, open
5 a remarkable window of opportunity for the Ministry of Public Health (MoPH) to
6 work collaboratively with the Order of Pharmacists to establish a national program for
7 the continuous education of pharmacists on CAM products. Collaborating with
8 academic institutions would enhance the design, implementation and evaluation of
9 such a program. Such programs would enhance the knowledge of pharmacists on the
10 safe use of CAM products, the appropriate reporting of side effects and their general
11 role as CAM counsellors for their customers.
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17 The findings of this study ought to be considered in light of a few of limitations. First,
18 the data collection relied on self-reported answers for practices, attitudes and
19 knowledge. These answers could be subject to errors due to memory recall or social
20 desirability bias. To mitigate this, interviewers were trained to maintain a neutral
21 attitude and avoid leading questions. Second, although a few questionnaires were
22 validated to assess the CAM-related attitude, practice and knowledge among specific
23 population, such as nurses, and medical students,^{36,37} none was available for use
24 among pharmacists. Therefore, the questionnaire used in data collection was
25 developed and vetted by a panel of experts, including a pharmacist, nutrition
26 epidemiologist, biostatistician and a health policy expert. The questionnaire was
27 designed to capture the common traits in attitude, practice and knowledge of
28 pharmacist towards CAM and to address to context specificity of the study. Lastly,
29 despite the fact that the sample of pharmacists considered was nationally
30 representative, the cross sectional nature of the study prevented any inference about
31 the change in CAM attitude, practice or knowledge over time among pharmacists in
32 the country.
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37 The increased popularity and use of CAM products is catalyzing the efforts of many
38 countries to enhance the integration of CAM products and therapies into mainstream
39 medicine. The pharmacist plays a central role should such integration be successful.
40 However, as this study highlights, deliberate efforts to enhance the education of
41 pharmacists and support them with a clear and responsive regulatory framework
42 would be necessary to ensure the safe integration and use of CAM products in
43 Lebanon and elsewhere.
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3 **Acknowledgements** We would like to thank the senior pharmacy students at BAU
4 (promotion 2018/2019) for the data collection and all the pharmacies that took part in
5 the study.
6

7 **Author Contributions** FN, MAH, designed the data collection form and the
8 methodology. MAH managed data collection. SK and HS analyzed the data. FN,
9 MAH, MA and HS wrote the first draft of the manuscript. AE, MA contributed to
10 drafting the paper. The final version was reviewed and approved by all authors.
11
12

13 **Funding** This research received no specific grant from any funding agency in the
14 public, commercial or not-for-profit sectors.
15

16 **Competing interests** None declared.
17

18 **Patient consent** pharmacists consent obtained.
19

20 **Ethical approval** This study protocol was approved by the Institutional Review
21 Board (IRB) at the Beirut Arab University; under the protocol number 2018H-0052-P-
22 R-0249.
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25 **Provenance and peer review** Not commissioned; externally peer reviewed.
26

27 **Data Statement:** The de identified dataset for this study could be made available with
28 the approval of the IRB Board.
29

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For peer review only

References

1. Ernst FR, Grizzle AJ. Drug-related morbidity and mortality: updating the cost-of-illness model. *Journal of the American Pharmaceutical Association*. 2001;41(2):192-199.
2. Asmelashe Gelayee D, Binega Mekonnen G, Asrade Atnafe S, *et al*. Herbal Medicines: Personal Use, Knowledge, Attitude, Dispensing Practice, and the Barriers among Community Pharmacists in Gondar, Northwest Ethiopia. *Evidence-Based Complementary and Alternative Medicine*. 2017;2017.
3. World Health Organization. *FIFTY-SIXTH WORLD HEALTH ASSEMBLY* 2003.
4. Al-Arifi MN. Availability and needs of herbal medicinal information resources at community pharmacy, Riyadh region, Saudi Arabia. *Saudi Pharmaceutical Journal*. 2013;21(4):351-360.
5. Naja F, Alameddine M, Itani L, *et al*. The use of complementary and alternative medicine among lebanese adults: results from a national survey. *Evidence-Based Complementary and Alternative Medicine*. 2015;2015.
6. Iyer P, McFarland R, La Caze A. Expectations and responsibilities regarding the sale of complementary medicines in pharmacies: perspectives of consumers and pharmacy support staff. *International Journal of Pharmacy Practice*. 2017;25(4):292-300.
7. Azaizeh H, Saad B, Khalil K, *et al*. The state of the art of traditional Arab herbal medicine in the Eastern region of the Mediterranean: a review. *Evidence-Based Complementary and Alternative Medicine*. 2006;3(2):229-235.
8. Kwai Ping L. Role of Complementary Medicine in Nursing and Health Care Professionals. *SOJ Nur Health Care* 1 (2): 1-2. *Role of Complementary Medicine in Nursing and Health Care Professionals*. 2015.
9. Kelak JA, Cheah WL, Safii R. Patient's Decision to Disclose the Use of Traditional and Complementary Medicine to Medical Doctor: A Descriptive Phenomenology Study. *Evidence-Based Complementary and Alternative Medicine*. 2018;2018.
10. Hunter D, Oates R, Gawthrop J, *et al*. Complementary and alternative medicine use and disclosure amongst Australian radiotherapy patients. *Supportive Care in Cancer*. 2014;22(6):1571-1578.
11. Shim J-M, Schneider J, Curlin FA. Patterns of user disclosure of complementary and alternative medicine (CAM) use. *Medical care*. 2014;52(8):704-708.
12. Lindly O, Thorburn S, Zuckerman K. Use and Nondisclosure of Complementary Health Approaches Among US Children with Developmental Disabilities. *Journal of Developmental & Behavioral Pediatrics*. 2018;39(3):217-227.
13. Agyei-Baffour P, Kudolo A, Quansah DY, *et al*. Integrating herbal medicine into mainstream healthcare in Ghana: clients' acceptability, perceptions and disclosure of use. *BMC complementary and alternative medicine*. 2017;17(1):513.
14. Kwan D, Hirschhorn K, Boon H. US and Canadian pharmacists' attitudes, knowledge, and professional practice behaviors toward dietary supplements: a systematic review. *BMC complementary and alternative medicine*. 2006;6(1):31.

15. Miller LG, Hume A, Harris IM, *et al.* White paper on herbal products. *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy.* 2000;20(7):877-887.
16. Harris IM, Kingston RL, Rodriguez R, *et al.* Attitudes towards complementary and alternative medicine among pharmacy faculty and students. *American journal of pharmaceutical education.* 2006;70(6):129.
17. Alameddine M, Naja F, Abdel-Salam S, *et al.* Stakeholders' perspectives on the regulation and integration of complementary and alternative medicine products in Lebanon: a qualitative study. *BMC complementary and alternative medicine.* 2011;11(1):71.
18. Ghazeeri GS, Awwad JT, Alameddine M, *et al.* Prevalence and determinants of complementary and alternative medicine use among infertile patients in Lebanon: a cross sectional study. *BMC complementary and alternative medicine.* 2012;12(1):129.
19. Naja F, Anouti B, Shatila H, *et al.* Prevalence and Correlates of Complementary and Alternative Medicine Use among Patients with Lung Cancer: A Cross-Sectional Study in Beirut, Lebanon. *Evidence-Based Complementary and Alternative Medicine.* 2017;2017.
20. Abou-Rizk J, Alameddine M, Naja F. Prevalence and characteristics of CAM use among people living with HIV and AIDS in Lebanon: Implications for patient care. *Evidence-Based Complementary and Alternative Medicine.* 2016;2016.
21. Naja F, Alameddine M, Abboud M, *et al.* Complementary and alternative medicine use among pediatric patients with leukemia: the case of Lebanon. *Integrative Cancer Therapies.* 2011;10(1):38-46.
22. Naja F, Fadel RA, Alameddine M, *et al.* Complementary and alternative medicine use and its association with quality of life among Lebanese breast cancer patients: a cross-sectional study. *BMC complementary and alternative medicine.* 2015;15(1):444.
23. Naja F, Mousa D, Alameddine M, *et al.* Prevalence and correlates of complementary and alternative medicine use among diabetic patients in Beirut, Lebanon: a cross-sectional study. *BMC complementary and alternative medicine.* 2014;14(1):185.
24. Khader Y, Sawair FA, Ayoub A, *et al.* Knowledge and attitudes of lay public, pharmacists, and physicians toward the use of herbal products in North Jordan. *The Journal of Alternative and Complementary Medicine.* 2008;14(10):1186-1187.
25. Awad A, Al-Ajmi S, Waheedi M. Knowledge, perceptions and attitudes toward complementary and alternative therapies among Kuwaiti medical and pharmacy students. *Medical principles and Practice.* 2012;21(4):350-354.
26. Abahussain NA, Abahussain EA, Al-Oumi FM. Pharmacists' attitudes and awareness towards the use and safety of herbs in Kuwait. *Pharmacy Practice (Granada).* 2007;5(3):125-129.
27. Duraz AY, Khan SA. Knowledge, attitudes and awareness of community pharmacists towards the use of herbal medicines in muscat region. *Oman medical journal.* 2011;26(6):451.
28. Alkharfy K. Community pharmacists' knowledge, attitudes and practices towards herbal remedies in Riyadh, Saudi Arabia/Connaissances, attitudes et pratiques des pharmaciens communautaires vis-a-vis des médicaments a base

- 1
2
3 de plantes a Riyad (Arabie saoudite). *Eastern Mediterranean Health Journal*.
4 2010;16(9):988.
- 5 29. Fahmy SA, Abdu S, Abuelkhair M. Pharmacists' attitude, perceptions and
6 knowledge towards the use of herbal products in Abu Dhabi, United Arab
7 Emirates. *Pharmacy Practice*. 2010;8(2):109.
- 8 30. Naidu S, Wilkinson JM, Simpson MD. Attitudes of Australian pharmacists
9 toward complementary and alternative medicines. *Annals of*
10 *Pharmacotherapy*. 2005;39(9):1456-1461.
- 11 31. Koh H-L, Teo H-H, Ng H-L. Pharmacists' patterns of use, knowledge, and
12 attitudes toward complementary and alternative medicine. *The Journal of*
13 *Alternative & Complementary Medicine*. 2003;9(1):51-63.
- 14 32. Administration FUSFaD. Dietary Supplements,. 2018;
15 <https://www.fda.gov/Food/DietarySupplements/> (Accessed June 7, 2018).
- 16 33. Kheir N, Gad HY, Abu-Yousef SE. Pharmacists' knowledge and attitudes
17 about natural health products: a mixed-methods study. *Drug, healthcare and*
18 *patient safety*. 2014;6:7.
- 19 34. Administration FUSFaD. Safety reporting Portal
20 [https://www.safetyreporting.hhs.gov/SRP2/en/Home.aspx?sid=24fc405f-](https://www.safetyreporting.hhs.gov/SRP2/en/Home.aspx?sid=24fc405f-58d2-4162-bb1a-f187b3be85df)
21 [58d2-4162-bb1a-f187b3be85df](https://www.safetyreporting.hhs.gov/SRP2/en/Home.aspx?sid=24fc405f-58d2-4162-bb1a-f187b3be85df) (Accessed June 7, 2018).
- 22 35. Bahall M, Legall G. Knowledge, attitudes, and practices among health care
23 providers regarding complementary and alternative medicine in Trinidad and
24 Tobago. *BMC complementary and alternative medicine*. 2017;17(1):144.
- 25 36. Lie D, Boker J. Development and validation of the CAM Health Belief
26 Questionnaire (CHBQ) and CAM use and attitudes amongst medical students.
27 *BMC Medical Education*. 2004;4(1):2.
- 28 37. Belletti G, Shorofi SA, Arbon P, *et al*. Complementary and Alternative
29 Medicine: Italian Validation of a Questionnaire on Nurses' Personal and
30 Professional Use, Knowledge, and Attitudes. *Journal of nursing measurement*.
31 2017;25(2):292-304.
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3 **List of Tables**
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6 **Table 1:** Distribution of Pharmacists across governorates in comparison to national
7 distribution of pharmacies
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	Pharmacies in the study	Pharmacies in Lebanon
	n(%)	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

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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)

BMJ Open

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

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2018-025074.R1
Article Type:	Research
Date Submitted by the Author:	23-Sep-2018
Complete List of Authors:	Hijazi, Mohamad Ali; Beirut Arab University, Department of Pharmaceutical Sciences Shatila, Hibeh; American University of Beirut, Department of Nutrition and Food Sciences El-Lakany, Abdalla; Beirut Arab University, Department of Pharmaceutical Sciences Aboul Ela, Maha; Beirut Arab University, Department of Pharmaceutical Sciences Kharroubi, Samer ; American University of Beirut, Department of Nutrition and Food Sciences Alameddine, Mohamad; American University of Beirut, Faculty of Health Sciences; Mohammed Bin Rashid University of Medicine and Health Sciences College of Medicine Naja, Farah; American University of Beirut, Department of Nutrition and Food Sciences
Primary Subject Heading:	Public health
Secondary Subject Heading:	Health policy, Health services research
Keywords:	COMPLEMENTARY MEDICINE, Pharmacist, National Cross Sectional Study, Community, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Lebanon

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Manuscripts

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

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1 **Abstract**

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

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

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

15 **Results** A total of 341 pharmacists agreed to participate (response rate: 86%). Only
16 pharmacists with complete data were included in this study (n=310). Pharmacists
17 agreed that CAM products are effective (63.8%) and that they should be exclusively
18 sold in pharmacies (80.3%), but disagreed that commercially marketed CAM products
19 are well regulated (63.5%) and that media plays a positive role in educating users
20 about CAM (55.8%). As for practices, 64.5% of pharmacists were always or often
21 advising patients on safe use; however 74.2% of participants rarely or never reported
22 toxic effects. Regarding knowledge, although the majority of pharmacists were aware
23 of the uses of CAM, fewer knew about their side effects and their interactions with
24 drugs. After adjustment for covariates, receiving education/training on CAM products
25 during university was the sole predictor of higher knowledge score ($\beta=0.68$, 95%CI:
26 0.29-1.07).

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

1
2
3 1 Keywords: Complementary medicine, Community, Pharmacist, Health Policy,
4 2 National Cross-sectional survey, Lebanon.

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7 3 Word Count: 4198
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9 **Strength and limitations of this study**

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

2 Complementary and Alternative Medicine (CAM) is a diverse group of medical and
3 health care systems, practices, and products that are not considered part of
4 conventional medicine. CAM may complement mainstream medicine by diversifying
5 the conceptual frameworks of medicine or by satisfying a demand not met by
6 orthodoxy.¹ The United States (US) National Center for Complementary and
7 Integrative Health (NCCIH) divides CAM into two main categories: (1) natural CAM
8 products, such as herbs, vitamins and minerals and probiotics; and (2) mind and body
9 therapies, most common of which are yoga, chiropractic and osteopathic
10 manipulation, meditation, and massage therapy.² In this manuscript, CAM refers to
11 natural CAM products. In recent years there has been a worldwide renaissance of
12 interest in these CAM products whereby their global market exceeded 100 billion
13 USD during year 2017.³ Prevalence rate as high as 70% were reported for natural
14 CAM products' use among the general population in various countries such as Canada
15 and Kuwait.^{4,5} CAM is usually used for general health maintenance, treatment of
16 specific disease states and more frequently for chronic conditions (e.g., anxiety, pain,
17 headaches, depression, and cancer).⁶ Such a widespread use of CAM could be
18 attributed to dissatisfaction with conventional medicine, the increasing cost of
19 conventional medical care, placebo effect, and the desire to be involved in the
20 decision-making process related to one's health.^{7,8} However, it is important to note
21 that the use of natural products might be associated with hazardous health risks related
22 to their toxicity, adverse reactions, improper dosage, or quality of the products (e.g.,
23 contamination, misidentification or lack of standardization).⁹ These risks could be
24 amplified due to the low rate of CAM use disclosure to health care providers for fear
25 of their disapproval, disinterest, or inability to help.¹⁰⁻¹³ Such lack of professional
26 supervision may further expose the consumer to various risks, including adverse
27 reactions or interactions with conventional drugs.^{6,14,15}

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

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

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

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

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

1 **Methods**

2 This is a cross-sectional national survey of pharmacists practicing in community
3 pharmacies which was conducted in Lebanon between September 2017 and February
4 2018. The sampling unit for this study was the pharmacy. A list of all community
5 pharmacies and their location was obtained from the OPL. Pharmacies were selected
6 from this list using a stratified random sampling technique. The strata were the six
7 Lebanese governorates. Within each stratum (governorate), pharmacies were selected
8 at random from the list of all pharmacies within this stratum. The number of
9 pharmacies selected was proportional to the total number of pharmacies in each
10 stratum. Sample size calculations showed that a minimum of 342 pharmacists ought to
11 be recruited in order to estimate a prevalence of 50% with a 95% confidence interval
12 (CI) and a margin of error of 5%. In order to account for a 14% refusal rate, 396
13 pharmacies were selected from the OPL list.

14 To be included in the study, the pharmacist had to be 1) licensed to practice by
15 MoPH, 2) registered in the OPL, 3) working in the selected pharmacy whether as
16 pharmacy owner or as an employee and 4) conversant in either English or Arabic
17 languages. Pharmacists unable or unwilling to give consent for the study were not
18 included. If a pharmacist in a selected pharmacy refused to participate, the pharmacist
19 in the closest pharmacy was approached. In the case when more than one pharmacist
20 in the selected pharmacy were eligible to participate, only one pharmacist was
21 selected at random to take part in the study. The study protocol was approved by the
22 Institutional Review Board at the Beirut Arab University under the protocol number
23 2018H-0052-P-R-0249.

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

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

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

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

17 *Patient and Public Involvement*

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

26 **Results**

27 Out of 396 pharmacists approached, 341 agreed to participate in this study (86.1%
28 response rate). The two main reasons for refusal to participate were lack of interest
29 (34.5%) and lack of time (27.3%). Of the 341 questionnaires, only those with
30 complete data were included in this study (n=310).

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3 1 The distributions of the pharmacies in Lebanon and in the study sample were
4 2 presented in table 1. Overall, compared to the national distribution, the study sample
5 3 showed similar proportions of pharmacies among the various governorates.

8 4 *Characteristics of study sample.*

10 5 Table 2 displayed the various characteristics of the study population. The pharmacists
11 6 were of varied age groups, with most of them ranging between 20 and 40 years of age
12 7 (67.1%). The study sample consisted of a slightly higher proportion of males versus
13 8 females (53.5% male and 46.5% female). More than 50% of the pharmacists
14 9 approached were the owners of the pharmacy (54.8%), the rest was either working as
15 10 full-time (23.2%) or part-time (21.9%). As for the educational level, 54.5% reported
16 11 having a Bachelor's degree, while 45.5% of the pharmacist had attained higher
17 12 degrees: 18.4% a Master's degree, 24.2% a Pharm D and 2.9% a PhD. Sixty-five
18 13 percent of the pharmacists studied in Lebanese universities. More than two in three
19 14 pharmacists (73.2%) reported receiving education about CAM-products during their
20 15 university education and only 17.7% underwent a post-graduation training on CAM-
21 16 products. Working experience among the pharmacists ranged from 1-3 years (22.9%)
22 17 to greater than 10 years (43.9%). (Table 2).

32 18 *Beliefs related to CAM products, their market and availability of resources.*

34 19 Overall, study participants displayed positive general beliefs related to CAM with
35 20 63.8% and 80.3% of pharmacists strongly agreeing or agreeing that CAM products
36 21 are effective and that CAM products should be exclusively sold in pharmacies,
37 22 respectively. (Table 3). Only 30.0% disagreed or strongly disagreed that CAM
38 23 products have less side effects compared to conventional medicines (17.4% were
39 24 neutral and 52.5% strongly agreed or agreed). Over 80.0% strongly agreed or agreed
40 25 that providing information to customers about CAM products is a pharmacist's
41 26 professional responsibility. (Table 3).

48 27 As for the pharmacists' beliefs related to the CAM market in the country, a sizable
49 28 proportion of survey participants (74.2%) were not sure about the quality of
50 29 commercially marketed CAM products in Lebanon, whereby 41.9% were disagreeing
51 30 or strongly disagreeing and 32.3% were neutral. When asked if they think that the
52 31 market for CAM products in Lebanon is well regulated, 63.5% of surveyed
53 32 community pharmacists disagreed or strongly disagreed. Furthermore, more than half

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

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

7 *Current practices of dispensing CAM products.*

8 More than two thirds of pharmacists (68.7%) participating in this study reported that
9 they always/often sell CAM products in their pharmacy and 59.4% reported
10 always/often getting inquiries from patients regarding the use of CAM products.
11 (Table 4). The majority of pharmacists (64.5%) reported that they always/often advise
12 patients on safe use of CAM products and ask for their feedback after use; however,
13 74.2% of pharmacists answered that they rarely or never reported toxic or undesirable
14 effects that occurred with patients using CAM products. (Table 4). Among those who
15 reported the incidence of toxic effect of CAM, 53.4% of pharmacists indicated that
16 they reported it to the pharmaceutical company (provider of CAM) and only 15.5%
17 reported to the OPL, the remaining reported to physician (13.8%), medical
18 representative (8.6%), MOPH (5.2%) and pharmacists (3.5%). (Table 4 b). It is worth
19 noting that 60.3% of pharmacists reported frequently checking for CAM product-drug
20 interaction prior to selling the product (Table 4).

21 *Evaluation of pharmacist' self-knowledge*

22 Table 5 displayed the results of self- knowledge in CAM which was composed of 10
23 questions including uses, side effects and drug interactions of commonly sold
24 products in Lebanon. The majority of pharmacists answered correctly the questions
25 related to the uses of *Echinacea*, *Ginkgo biloba*, and Omega-3 (81.9%, 83.2%, and
26 93.5% respectively). However, only 24.5% recognized the effect of Echinacea on
27 autoimmune disorders, 61.3% were aware that ginkgo may increase the risk of
28 bleeding when combined with warfarin, 21.9% knew that ginseng does not affect
29 blood pressure and 50.3% did not know the potential effect of a vitamin B complex
30 supplement on wound healing. On the other hand, 78.4% of the pharmacist knew that
31 vitamin C enhances the absorption of iron. Of further concern are the high proportions
32 of interviewed pharmacists who were not aware of the drug-CAM interactions. For

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3 1 instance, 80.7% did not know that Valerian should be used cautiously in patients
4 2 using benzodiazepines and 80.9% did not answer correctly the concurrence
5 3 administration of omega-3 and Clopidogrel (Table 5).
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9 10 5 *Socio-demographic determinants of CAM-related knowledge*

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12 6 Simple linear regression results indicated that, among all socio-demographic
13 7 characteristics considered in this study, ‘receiving education/training on CAM
14 8 products during university’ was the sole predictor of better knowledge ($\beta=0.68$, 95%
15 9 CI: 0.31,1.06). After adjustment for socio-demographic characteristics, the results of
16 10 the multiple linear regression confirmed this finding ($\beta=0.68$, 95% CI: 0.29, 1.07)
17 11 (Data not shown).
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23 12 **Discussion**

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25 13 This is the first national study to examine the CAM-related, beliefs, practices and
26 14 knowledge of a nationally representative sample of community pharmacists in
27 15 Lebanon. This also presents one of a few regional attempts to solicit the opinion of
28 16 pharmacists at a national scale. The study revealed that the majority of community
29 17 pharmacists acknowledged the importance of CAM products, believed that the market
30 18 should be better regulated and reported needing professional development
31 19 opportunities to enhance their knowledge of CAM products. With regards to practices
32 20 in CAM, pharmacists were found to frequently advise patients on safe use of CAM
33 21 products; however most did not reported toxic effects. Furthermore, the assessment of
34 22 self-knowledge unearthed some deficiencies in pharmacists’ knowledge related to
35 23 potential side effects of CAM products and of CAM-drug interactions. Receiving
36 24 education/training on CAM products during university was the sole predictor of better
37 25 CAM-related knowledge among pharmacists.
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46 26 One of the main findings of this study related to the generally positive beliefs of
47 27 Lebanese community pharmacists towards CAM products which is similar to other
48 28 studies in the region¹⁹⁻²⁴ and other countries such as USA,¹⁸ Australia,³⁶ Singapore³⁷
49 29 and Ethiopia.³ Pharmacists do not only believe in the utility of CAM products but are
50 30 also willing to assume a leading role by asking for exclusive rights to sell CAM
51 31 products in pharmacies and under the advice of a community pharmacists. This is in
52 32 accordance with a recent published study by Gelayee et al. (2017)³, where
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1 pharmacists believed that they are ideally positioned to dispense CAM products, as a
2 completion of their role in dispensing, monitoring, and counseling conventional
3 medicine. This unique position of the pharmacist could be best achieved if equipped
4 with good knowledge and skills.³

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

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

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3 1 Within this context it is important to note that, out of 123 pharmacists who had
4 2 experience with reporting toxic or undesirable effects, only 58 indicated to whom they
5 3 report such effects (47.2%). It is possible that participants were hesitant to answer this
6 4 question because they were not sure of the correct answer. This further highlights the
7 5 need to regulate the reporting of toxic effects and to clearly inform the pharmacists of
8 6 the existing reporting channels.

9 7 In this study, the findings related to beliefs and practices of community pharmacists
10 8 further underscored the need for pharmacists to play a leading role in ensuring safe
11 9 utilization of CAM by their customers. However, such a role of the community
12 10 pharmacist may be undermined by the lack of proper education and training on the
13 11 safe use of CAM products. In fact, in this study, close to two thirds of pharmacists
14 12 believed that the continuous education on CAM should be mandatory for pharmacists.
15 13 This recommendation echoed that of many other studies highlighting the need to have
16 14 additional education and training on the use of CAM products.^{3,16,21-24,36-38}

17 15 Perhaps one of the most disconcerting findings of this study related to the deficiencies
18 16 in the pharmacists' knowledge of CAM-drug interaction and to a lesser extent CAM
19 17 products side effects. This lack of knowledge came along prevalent good intentions of
20 18 community pharmacists to provide the best evidence-based advice to their customers.
21 19 These findings may lead to the advice of pharmacists being suboptimal and could, in
22 20 some instances jeopardize the health and wellbeing of the patients. The knowledge
23 21 deficiencies found in this study were also reported by many other studies in the region
24 22 such as Saudi Arabia,^{6,23} Abu Dhabi,²⁴ Jordan,¹⁹ Kuwait,^{20,21} Oman,²² Qatar,³⁸
25 23 Palestine,^{41,42} and Iran⁴³ as well as other countries such as Ethiopia,³ USA,¹⁸
26 24 Singapore,³⁷ and in Trinidad and Tobago,⁴⁴ and therefore appear to be a concern of
27 25 global. One possible explanation for the observed knowledge deficiencies could be
28 26 due to the biased information propagated by some CAM product companies. This
29 27 information usually aims to maximize sales and neglects any factor that can affect the
30 28 promotion of their products.⁴⁵ Another explanation could be the lack of availability
31 29 and ease access of pharmacists to scientific resources and professional development
32 30 programs.

33 31 The findings on the lack of knowledge on safe use of CAM products, coupled with the
34 32 majority of pharmacists requesting a mandatory continuous education program, open
35 33 a remarkable window of opportunity for the MoPH to work collaboratively with the

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3 1 OPL to establish a national program for the continuous education of pharmacists on
4 2 CAM products. Collaborating with academic institutions would enhance the design,
5 3 implementation and evaluation of such a program. Providing continuous education
6 4 opportunities would enhance the knowledge of pharmacists on the safe use of CAM
7 5 products, the appropriate reporting of side effects and their general role as CAM
8 6 counsellors for their customers. Last but not least, the finding in our regression
9 7 models that receiving education/training on CAM products during university was the
10 8 sole predictor of better knowledge calls on the pharmacy schools to revise their
11 9 curricula in order to ensure proper education and training of pharmacy students on the
12 10 safe use of CAM products. Such revision is necessary to enhance public safety.
13 11 The findings of this study ought to be considered in light of a few limitations. First,
14 12 the data collection relied on self-reported answers for practices, beliefs and
15 13 knowledge. These answers could be subject to errors due to memory recall or social
16 14 desirability bias. To mitigate this, interviewers were trained to maintain a neutral
17 15 attitude and avoid leading questions. Second, although a few questionnaires were
18 16 validated to assess the CAM-related beliefs, practices and knowledge among specific
19 17 populations, such as nurses, and medical students,^{46,47} none was available for use
20 18 among pharmacists. Therefore, the questionnaire used in data collection was
21 19 developed and vetted by a panel of experts, including a pharmacist, nutrition
22 20 epidemiologist, biostatistician and a health policy expert. The questionnaire was
23 21 designed to capture the common traits in beliefs, practices and knowledge of
24 22 pharmacist towards CAM and to address to context specificity of the study. Future
25 23 studies are encouraged to examine the validity and reliability of questionnaires
26 24 assessing CAM-related beliefs, practices and knowledge among pharmacists. Third,
27 25 despite the fact that the sample of pharmacists considered was nationally
28 26 representative, the cross-sectional nature of the study prevented any inference about
29 27 the change in CAM beliefs, practices or knowledge over time among pharmacists in
30 28 the country. Lastly, it remains important to note that this study relied mainly on
31 29 quantitative assessment. Future studies aiming to qualitatively examine pharmacists'
32 30 beliefs, practices and knowledge, with regards to CAM could complement the results
33 31 of quantitative investigations and provide a more complete evaluation of the subject
34 32 matter.

35 33 In conclusion, the findings of this study revealed positive beliefs of pharmacists in
36 34 Lebanon towards CAM and indicated important gaps in their practice and knowledge.

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3 1 Given the central role that the pharmacists play in promoting the safe and efficient use
4 2 of CAM products and in light of the study's findings, deliberate efforts to enhance the
5 3 education of pharmacists and support them with a clear and responsive regulatory
6 4 framework would be necessary to ensure the safe integration and use of CAM
7 5 products in the country.
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13 7 **Acknowledgements** We would like to acknowledge the contribution of Mr. Samer
14 8 Jallad and express our gratitude to the senior pharmacy students at Beirut Arab
15 9 University (promotion 2018/2019) for their contribution to data collection. The
16 10 authors would like to also thank the pharmacists who participated in this study.

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19 11 **Author Contributions** FN, MAH, designed the data collection form and the
20 12 methodology. MAH managed data collection. SK and HS analyzed the data. FN,
21 13 MAH, MA and HS wrote the first draft of the manuscript. AE, ME contributed to
22 14 drafting the paper. The final version was reviewed and approved by all authors.

23
24 15 **Funding** This research received no specific grant from any funding agency in the
25 16 public, commercial or not-for-profit sectors.

26
27 17 **Competing interests** None declared.

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29 18 **Patient consent** pharmacists consent obtained.

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32 19 **Ethical approval** This study protocol was approved by the Institutional Review
33 20 Board (IRB) at the Beirut Arab University; under the protocol number 2018H-0052-P-
34 21 R-0249.

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36 22 **Provenance and peer review** Not commissioned; externally peer reviewed.

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38 23 **Data Statement:** A de-identified data set related to this study could be made available
39 24 with the approval of the IRB committee if necessary.

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1 **References**

- 2 1. Ernst FR, Grizzle AJ. Drug-related morbidity and mortality: updating the cost-of-illness model. *Journal of the American Pharmaceutical Association*. 2001;41(2):192-199.
- 5 2. National Center for Complementary and Integrative Health (NIH). <https://nccih.nih.gov/> (Accessed 24 August, 2018).
- 8 3. Asmelashe Gelayee D, Binega Mekonnen G, Asrade Atnafe S, *et al*. Herbal Medicines: Personal Use, Knowledge, Attitude, Dispensing Practice, and the Barriers among Community Pharmacists in Gondar, Northwest Ethiopia. *Evidence-Based Complementary and Alternative Medicine*. 2017;2017.
- 11 4. Natural Health Products Directorate—Health Canada. Natural Health Product Tracking Survey-2010 Final Report. <http://epe.lac-bac.gc.ca/100/200/301/pwgs-c-tpsgc/por-ef/health/2011/135-09/report.pdf> (Accessed Sep 1, 2018).
- 14 5. Awad A, Al-Shaye D. Public awareness, patterns of use and attitudes toward natural health products in Kuwait: a cross-sectional survey. *BMC complementary and alternative medicine*. 2014;14(1):105.
- 17 6. Al-Arifi MN. Availability and needs of herbal medicinal information resources at community pharmacy, Riyadh region, Saudi Arabia. *Saudi Pharmaceutical Journal*. 2013;21(4):351-360.
- 20 7. Naja F, Alameddine M, Itani L, *et al*. The use of complementary and alternative medicine among lebanese adults: results from a national survey. *Evidence-Based Complementary and Alternative Medicine*. 2015;2015.
- 23 8. Iyer P, McFarland R, La Caze A. Expectations and responsibilities regarding the sale of complementary medicines in pharmacies: perspectives of consumers and pharmacy support staff. *International Journal of Pharmacy Practice*. 2017;25(4):292-300.
- 26 9. Azaizeh H, Saad B, Khalil K, *et al*. The state of the art of traditional Arab herbal medicine in the Eastern region of the Mediterranean: a review. *Evidence-Based Complementary and Alternative Medicine*. 2006;3(2):229-235.
- 29 10. Kwai Ping L. Role of Complementary Medicine in Nursing and Health Care Professionals. *SOJ Nur Health Care* 1 (2): 1-2. *Role of Complementary Medicine in Nursing and Health Care Professionals*. 2015.
- 32 11. Kelak JA, Cheah WL, Safii R. Patient's Decision to Disclose the Use of Traditional and Complementary Medicine to Medical Doctor: A Descriptive Phenomenology Study. *Evidence-Based Complementary and Alternative Medicine*. 2018;2018.
- 35 12. Hunter D, Oates R, Gawthrop J, *et al*. Complementary and alternative medicine use and disclosure amongst Australian radiotherapy patients. *Supportive Care in Cancer*. 2014;22(6):1571-1578.
- 38 13. Shim J-M, Schneider J, Curlin FA. Patterns of user disclosure of complementary and alternative medicine (CAM) use. *Medical care*. 2014;52(8):704-708.
- 41 14. Lindly O, Thorburn S, Zuckerman K. Use and Nondisclosure of Complementary Health Approaches Among US Children with Developmental Disabilities. *Journal of Developmental & Behavioral Pediatrics*. 2018;39(3):217-227.

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2
3 1 15. Agyei-Baffour P, Kudolo A, Quansah DY, *et al.* Integrating herbal medicine
4 2 into mainstream health care in Ghana: clients' acceptability, perceptions and
5 3 disclosure of use. *BMC complementary and alternative medicine.*
6 4 2017;17(1):513.
- 7 5 16. Kwan D, Hirschhorn K, Boon H. US and Canadian pharmacists' attitudes,
8 6 knowledge, and professional practice behaviors toward dietary supplements: a
9 7 systematic review. *BMC complementary and alternative medicine.*
10 8 2006;6(1):31.
- 11 9 17. Miller LG, Hume A, Harris IM, *et al.* White paper on herbal products.
12 10 *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy.*
13 11 2000;20(7):877-887.
- 14 12 18. Harris IM, Kingston RL, Rodriguez R, *et al.* Attitudes towards complementary
15 13 and alternative medicine among pharmacy faculty and students. *American*
16 14 *journal of pharmaceutical education.* 2006;70(6):129.
- 17 15 19. Khader Y, Sawair FA, Ayoub A, *et al.* Knowledge and attitudes of lay public,
18 16 pharmacists, and physicians toward the use of herbal products in North Jordan.
19 17 *The Journal of Alternative and Complementary Medicine.* 2008;14(10):1186-
20 18 1187.
- 21 19 20. Awad A, Al-Ajmi S, Waheedi M. Knowledge, perceptions and attitudes
22 20 toward complementary and alternative therapies among Kuwaiti medical and
23 21 pharmacy students. *Medical principles and Practice.* 2012;21(4):350-354.
- 24 22 21. Abahussain NA, Abahussain EA, Al-Oumi FM. Pharmacists' attitudes and
25 23 awareness towards the use and safety of herbs in Kuwait. *Pharmacy Practice*
26 24 *(Granada).* 2007;5(3):125-129.
- 27 25 22. Duraz AY, Khan SA. Knowledge, attitudes and awareness of community
28 26 pharmacists towards the use of herbal medicines in muscat region. *Oman*
29 27 *medical journal.* 2011;26(6):451.
- 30 28 23. Alkharfy K. Community pharmacists' knowledge, attitudes and practices
31 29 towards herbal remedies in Riyadh, Saudi Arabia/Connaissances, attitudes et
32 30 pratiques des pharmaciens communautaires vis-a-vis des medicaments a base
33 31 de plantes a Riyad (Arabie saoudite). *Eastern Mediterranean Health Journal.*
34 32 2010;16(9):988.
- 35 33 24. Fahmy SA, Abdu S, Abuelkhair M. Pharmacists' attitude, perceptions and
36 34 knowledge towards the use of herbal products in Abu Dhabi, United Arab
37 35 Emirates. *Pharmacy Practice.* 2010;8(2):109.
- 38 36 25. Gruenwald J, Herzberg F. The global nutraceuticals market. *Business Briefing:*
39 37 *Innovative Food Ingredients.* 2002:28-31.
- 40 38 26. Alameddine M, Naja F, Abdel-Salam S, *et al.* Stakeholders' perspectives on
41 39 the regulation and integration of complementary and alternative medicine
42 40 products in Lebanon: a qualitative study. *BMC complementary and alternative*
43 41 *medicine.* 2011;11(1):71.
- 44 42 27. Ghazeeri GS, Awwad JT, Alameddine M, *et al.* Prevalence and determinants
45 43 of complementary and alternative medicine use among infertile patients in
46 44 Lebanon: a cross sectional study. *BMC complementary and alternative*
47 45 *medicine.* 2012;12(1):129.
- 48 46 28. Naja F, Anouti B, Shatila H, *et al.* Prevalence and Correlates of
49 47 Complementary and Alternative Medicine Use among Patients with Lung
50 48 Cancer: A Cross-Sectional Study in Beirut, Lebanon. *Evidence-Based*
51 49 *Complementary and Alternative Medicine.* 2017;2017.

- 1
2
3 1 29. Abou-Rizk J, Alameddine M, Naja F. Prevalence and characteristics of CAM
4 2 use among people living with HIV and AIDS in Lebanon: Implications for
5 3 patient care. *Evidence-Based Complementary and Alternative Medicine*.
6 4 2016;2016.
- 7 5 30. Naja F, Alameddine M, Abboud M, *et al.* Complementary and alternative
8 6 medicine use among pediatric patients with leukemia: the case of Lebanon.
9 7 *Integrative Cancer Therapies*. 2011;10(1):38-46.
- 10 8 31. Naja F, Fadel RA, Alameddine M, *et al.* Complementary and alternative
11 9 medicine use and its association with quality of life among Lebanese breast
12 10 cancer patients: a cross-sectional study. *BMC complementary and alternative*
13 11 *medicine*. 2015;15(1):444.
- 14 12 32. Naja F, Mousa D, Alameddine M, *et al.* Prevalence and correlates of
15 13 complementary and alternative medicine use among diabetic patients in
16 14 Beirut, Lebanon: a cross-sectional study. *BMC complementary and alternative*
17 15 *medicine*. 2014;14(1):185.
- 18 16 33. ORDER OF PHARMACY LEBANON.
- 19 17 34. Song M, Ung COL, Lee VW-y, *et al.* Community pharmacists' perceptions
20 18 about pharmaceutical service of over-the-counter traditional Chinese
21 19 medicine: a survey study in Harbin of China. *BMC complementary and*
22 20 *alternative medicine*. 2017;17(1):9.
- 23 21 35. Chang ZG, Kennedy DT, Holdford DA, *et al.* Pharmacists' knowledge and
24 22 attitudes toward herbal medicine. *Annals of Pharmacotherapy*.
25 23 2000;34(6):710-715.
- 26 24 36. Naidu S, Wilkinson JM, Simpson MD. Attitudes of Australian pharmacists
27 25 toward complementary and alternative medicines. *Annals of*
28 26 *Pharmacotherapy*. 2005;39(9):1456-1461.
- 29 27 37. Koh H-L, Teo H-H, Ng H-L. Pharmacists' patterns of use, knowledge, and
30 28 attitudes toward complementary and alternative medicine. *The Journal of*
31 29 *Alternative & Complementary Medicine*. 2003;9(1):51-63.
- 32 30 38. Kheir N, Gad HY, Abu-Yousef SE. Pharmacists' knowledge and attitudes
33 31 about natural health products: a mixed-methods study. *Drug, health care and*
34 32 *patient safety*. 2014;6:7.
- 35 33 39. Administration FUSFaD. Dietary Supplements,. 2018;
36 34 <https://www.fda.gov/Food/DietarySupplements/> (Accessed June 7, 2018).
- 37 35 40. Administration FUSFaD. Safety reporting Portal
38 36 [https://www.safetyreporting.hhs.gov/SRP2/en/Home.aspx?sid=24fc405f-](https://www.safetyreporting.hhs.gov/SRP2/en/Home.aspx?sid=24fc405f-58d2-4162-bb1a-f187b3be85df)
39 37 [58d2-4162-bb1a-f187b3be85df](https://www.safetyreporting.hhs.gov/SRP2/en/Home.aspx?sid=24fc405f-58d2-4162-bb1a-f187b3be85df) (Accessed June 7, 2018).
- 40 38 41. Shraim NY, Shawahna R, Sorady MA, *et al.* Community pharmacists'
41 39 knowledge, practices and beliefs about complementary and alternative
42 40 medicine in Palestine: a cross-sectional study. *BMC complementary and*
43 41 *alternative medicine*. 2017;17(1):429.
- 44 42 42. Khdour MR, Kurdi M, Hallak HO, *et al.* Pharmacists' Knowledge, Attitudes
45 43 and Practices Towards Herbal Remedies In West Bank, Palestine.
46 44 *International Archives of Medicine*. 2016;9.
- 47 45 43. Bastani P, Jooybar M, Ahmadzadeh M, *et al.* Community pharmacy-based
48 46 survey on pharmacists' knowledge, attitude, and performance regarding
49 47 dietary supplements: Evidence from South of Iran. *Natl J Physiol Pharm*
50 48 *Pharmacol*. 2017;7(4):396-402.

- 1
2
3 1 44. Bahall M, Legall G. Knowledge, attitudes, and practices among health care
4 2 providers regarding complementary and alternative medicine in Trinidad and
5 3 Tobago. *BMC complementary and alternative medicine*. 2017;17(1):144.
6 4 45. Ekor M. The growing use of herbal medicines: issues relating to adverse
7 5 reactions and challenges in monitoring safety. *Frontiers in pharmacology*.
8 6 2014;4:177.
9 7 46. Lie D, Boker J. Development and validation of the CAM Health Belief
10 8 Questionnaire (CHBQ) and CAM use and attitudes amongst medical students.
11 9 *BMC Medical Education*. 2004;4(1):2.
12 10 47. Belletti G, Shorofi SA, Arbon P, *et al*. Complementary and Alternative
13 11 Medicine: Italian Validation of a Questionnaire on Nurses' Personal and
14 12 Professional Use, Knowledge, and Attitudes. *Journal of nursing measurement*.
15 13 2017;25(2):292-304.
16 14 48. Karsch-Voelk M, Barrett B, Kiefer D, *et al*. Echinacea for preventing and
17 15 treating the common cold. *The Cochrane database of systematic reviews*.
18 16 2014;2:CD000530.
19 17 49. Lee AN, Werth VP. Activation of autoimmunity following use of
20 18 immunostimulatory herbal supplements. *Archives of dermatology*.
21 19 2004;140(6):723-727.
22 20 50. Hur M-H, Lee MS, Yang HJ, *et al*. Ginseng for reducing the blood pressure in
23 21 patients with hypertension: a systematic review and meta-analysis. *J Ginseng*
24 22 *Res*. 2010;34(4):342-347.
25 23 51. Kelber O, Nieber K, Kraft K. Valerian: no evidence for clinically relevant
26 24 interactions. *Evidence-Based Complementary and Alternative Medicine*.
27 25 2014;2014.
28 26 52. Ge B, Zhang Z, Zuo Z. Updates on the clinical evidenced herb-warfarin
29 27 interactions. *Evidence-Based Complementary and Alternative Medicine*.
30 28 2014;2014.
31 29 53. Stoddard GJ, Archer M, Shane-McWhorter L, *et al*. Ginkgo and warfarin
32 30 interaction in a large veterans administration population. Paper presented at:
33 31 AMIA Annual Symposium Proceedings2015.
34 32 54. Weinmann S, Roll S, Schwarzbach C, *et al*. Effects of Ginkgo biloba in
35 33 dementia: systematic review and meta-analysis. *BMC geriatrics*.
36 34 2010;10(1):14.
37 35 55. Rangel-Huerta OD, Gil A. Omega 3 fatty acids in cardiovascular disease risk
38 36 factors: An updated systematic review of randomised clinical trials. *Clinical*
39 37 *Nutrition*. 2017.
40 38 56. Imantaeva GM, Mussagalieva AT. Omega-3 Polyunsaturated Fatty Acids in
41 39 Treatment of Patients with Coronary Heart Disease and Type 2 Diabetes
42 40 Mellitus. *International Journal of BioMedicine*. 2012;2(1):31-33.
43 41 57. Watson PD, Joy PS, Nkonde C, *et al*. Comparison of bleeding complications
44 42 with omega-3 fatty acids + aspirin + clopidogrel--versus--aspirin + clopidogrel
45 43 in patients with cardiovascular disease. *The American journal of cardiology*.
46 44 2009;104(8):1052-1054.
47 45 58. OPR M. Medicines Safety Update No. 2; 2010. 2010.
48 46 59. Neiva RF, Al-Shammari K, Nociti FH, Jr., *et al*. Effects of vitamin-B complex
49 47 supplementation on periodontal wound healing. *Journal of periodontology*.
50 48 2005;76(7):1084-1091.
51 49 60. Posthauer ME, Dorner B, Collins N. Nutrition: a critical component of wound
52 50 healing. *Advances in skin & wound care*. 2010;23(12):560-572; quiz 573-564.

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61. Lane DJ, Richardson DR. The active role of vitamin C in mammalian iron metabolism: much more than just enhanced iron absorption! *Free radical biology & medicine*. 2014;75:69-83.

For peer review only

1 **List of Tables**

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3 **Table 1:** Distribution of pharmacies across governorates in this study in comparison

4 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

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

	Frequency	Percentage ²
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)

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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

1 **Table 5:** Evaluation of self-knowledge among a national sample of pharmacists in
 2 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)

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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	<u>Scientific background</u> : Page 4 and 5 <u>Rationale</u> : In Lebanon, the increased prevalence of CAM use, the poorly regulated CAM market, together with the high rate of non-disclosure 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.

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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.

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.

All variables were derived for one source: the multi-component questionnaire.

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.

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).

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.

Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
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
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why

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4	Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding
5			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.
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12			(b) Describe any methods used to examine subgroups and interactions
13			N/A
14			(c) Explain how missing data were addressed
15			Only those with complete data were included in this study
16			(d) If applicable, describe analytical methods taking account of sampling strategy
17			N/A
18			(e) Describe any sensitivity analyses
19			
20	Results		
21	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
22			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).
23			
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25			(b) Give reasons for non-participation at each stage
26			The two main reasons for refusal to participate were lack of interest (34.5%) and lack of time (27.3%).
27			(c) Consider use of a flow diagram
28			N/A
29	Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
30			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).
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		(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 (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	Simple linear regression results indicated that ‘receiving education/training on CAM products during university’ was the sole predictor of better knowledge ($\beta=0.68$, 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 ($\beta=0.68$, 95% CI: 0.29, 1.07)
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

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2018-025074.R2
Article Type:	Research
Date Submitted by the Author:	14-Dec-2018
Complete List of Authors:	Hijazi, Mohamad Ali; Beirut Arab University, Department of Pharmaceutical Sciences Shatila, Hibeh; American University of Beirut, Department of Nutrition and Food Sciences El-Lakany, Abdalla; Beirut Arab University, Department of Pharmaceutical Sciences Aboul Ela, Maha; Beirut Arab University, Department of Pharmaceutical Sciences Kharroubi, Samer ; American University of Beirut, Department of Nutrition and Food Sciences Alameddine, Mohamad; American University of Beirut, Faculty of Health Sciences; Mohammed Bin Rashid University of Medicine and Health Sciences College of Medicine Naja, Farah; American University of Beirut, Department of Nutrition and Food Sciences
Primary Subject Heading:	Public health
Secondary Subject Heading:	Health policy, Health services research
Keywords:	COMPLEMENTARY MEDICINE, Pharmacist, National Cross Sectional Study, Community, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Lebanon

SCHOLARONE™
Manuscripts

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3 1 **Beliefs, Practices and Knowledge of Community Pharmacists Regarding**
4 **Complementary and Alternative Medicine: National Cross-Sectional Study in**
5 **Lebanon**
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3 **1 Abstract**
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5 **2 Introduction** Pharmacists are uniquely positioned to provide patients with evidence-
6 based information in order to ensure effective and safe use of Complementary and
7 Alternative Medicine (CAM) products.
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10 **3 Objective** Assess beliefs, practices and knowledge related to CAM products among
11 community pharmacists in Lebanon.
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14 **4 Design, methods and setting** Using stratified random sampling, a nationally
15 representative survey was conducted among community pharmacists in Lebanon.
16 Through face-to-face interviews, pharmacists completed a multicomponent
17 questionnaire consisting of four sections: 1) socio-demographic characteristics, 2)
18 beliefs related to regulation of CAM products, role of media in promoting their safe
19 use, availability of resources and continuing education, 3) practices including selling
20 CAM products, providing advice for patients and reporting adverse effects and 4)
21 knowledge about specific CAM products, their uses, side effects, and interactions.
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24 **5 Results** A total of 341 pharmacists agreed to participate (response rate: 86%). Only
25 pharmacists with complete data were included in this study (n=310). Pharmacists
26 agreed that CAM products are effective (63.8%) and that they should be exclusively
27 sold in pharmacies (80.3%), but disagreed that commercially marketed CAM products
28 are well regulated (63.5%) and that media plays a positive role in educating users
29 about these products (55.8%). As for practices, 64.5% of pharmacists were always or
30 often advising patients on safe use; however 74.2% of participants rarely or never
31 reported adverse effects. Regarding knowledge, although the majority of pharmacists
32 were aware of the uses of CAM products, fewer knew about their side effects and
33 their interactions with drugs. After adjustment for covariates, receiving
34 education/training on CAM products during university was the sole predictor of
35 higher knowledge score ($\beta=0.68$, 95%CI: 0.29-1.07).
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38 **6 Conclusions** This study revealed positive beliefs of pharmacists in Lebanon towards
39 CAM products and indicated important gaps in their practice and knowledge.
40 Deliberate efforts to enhance the education of pharmacists are warranted to ensure the
41 safe integration and use of CAM products in Lebanon.
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3 1 Keywords: Complementary medicine, Alternative Medicine, Community, Pharmacist,
4
5 2 Health Policy, Lebanon.

6
7 3 Word Count: 4198
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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.

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1 Introduction

2 Complementary and Alternative Medicine (CAM) is a diverse group of medical and
3 health care systems, practices, and products that are not considered part of
4 conventional medicine. CAM may complement mainstream medicine by diversifying
5 the conceptual frameworks of medicine or by satisfying a demand that has not been
6 met by orthodoxy.¹ The United States (US) National Center for Complementary and
7 Integrative Health (NCCIH) divides CAM into two main categories: (1) CAM
8 products, such as herbs, vitamins and minerals and probiotics; and (2) mind and body
9 therapies, including yoga, chiropractic and osteopathic manipulation, meditation,
10 and massage therapy.² In recent years there has been a worldwide renaissance of
11 interest in these CAM products whereby their global market exceeded 100 billion
12 USD during year 2017.³ Prevalence rate as high as 70% were reported for natural
13 CAM products' use among the general population in various countries such as Canada
14 and Kuwait.^{4,5} CAM products are usually used for general health maintenance,
15 treatment of specific disease states and more frequently for chronic conditions (e.g.,
16 anxiety, pain, headaches, depression, and cancer).⁶ Such a widespread use of CAM
17 products could be attributed to dissatisfaction with conventional medicine, the
18 increasing cost of conventional medical care, placebo effect, and the desire to be
19 involved in the decision-making process related to one's health.^{7,8} However, it is
20 important to note that the use of CAM products might be associated with hazardous
21 health risks related to their adverse effects, improper dosage, or quality of the
22 products (e.g., contamination, misidentification or lack of standardization).⁹ These
23 risks could be amplified due to the low rate of disclosure to health care providers for
24 fear of their disapproval, disinterest, or inability to help.¹⁰⁻¹³ Such lack of professional
25 supervision may further expose the consumer to various risks, including adverse
26 reactions or interactions with conventional drugs.^{6,14,15}

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

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

7 The Middle East and North Africa (MENA) region hosts a growing market of CAM
8 products.¹⁹⁻²⁵ However, in many countries of the region, including Lebanon this
9 market remained poorly regulated and subject to abuse by both patient and provider.²⁶
10 About one third of Lebanese adults (29.87%) were reported to use CAM in 2015, with
11 the most prevalent being CAM products, specifically herbal supplements.⁷ Higher
12 rates of use were reported among patients with chronic diseases such as infertility
13 (41%),²⁷ lung cancer (41%),²⁸ and HIV and AIDS conditions (46.6%).²⁹ A common
14 finding to most of the aforementioned studies was the low rate of disclosure to the
15 treating physicians.^{7,26,28,30-32} This raised concerns about CAM safety, efficacy, and
16 impact on the patient health; especially when its use is coupled with poor regulatory
17 frameworks.²⁶

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

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

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1 **Methods**

2 This is a cross-sectional national survey of pharmacists practicing in community
3 pharmacies which was conducted in Lebanon between September 2017 and February
4 2018. The sampling unit for this study was the pharmacy. A list of all community
5 pharmacies and their location was obtained from the OPL. Pharmacies were selected
6 from this list using a stratified random sampling technique. The strata were the six
7 Lebanese governorates. Within each stratum (governorate), pharmacies were selected
8 at random from the list of all pharmacies within this stratum. The number of
9 pharmacies selected was proportional to the total number of pharmacies in each
10 stratum. Sample size calculations showed that a minimum of 342 pharmacists ought to
11 be recruited in order to estimate a prevalence of 50% with a 95% confidence interval
12 (CI) and a margin of error of 5%. In order to account for a 14% refusal rate, 396
13 pharmacies were selected from the OPL list.

14 To be included in the study, the pharmacist had to be 1) licensed to practice by
15 MoPH, 2) registered in the OPL, 3) working in the selected pharmacy either as
16 pharmacy owner or as an employee and 4) conversant in either English or Arabic
17 languages. Pharmacists who were unable or unwilling to give consent for the study
18 were not included. If a pharmacist in a selected pharmacy refused to participate, the
19 pharmacist in the closest pharmacy was approached. In the case when more than one
20 pharmacist in the selected pharmacy was eligible to participate, only one pharmacist
21 was selected at random. The study protocol was approved by the Institutional Review
22 Board at the Beirut Arab University under the protocol number 2018H-0052-P-R-
23 0249.

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

1 The design of the questionnaire used in the data collection for this study was informed
2 by a thorough review of relevant literature^{16,23,24,34} and by a careful examination of
3 the local context. The content validity of this questionnaire was confirmed by an
4 expert panel consisting of a pharmacist, a nutrition epidemiologist, a biostatistician
5 and a health policy expert. The questionnaire was originally written in English, before
6 being translated to the Arabic language, and then back translated to English. The
7 original and back-translated English versions of the questionnaire were examined to
8 ensure parallel form reliability. The questionnaire was comprised of four sections. The
9 first section included questions related to socio-demographic, education and practice
10 characteristics, such as age, sex, employment status (full-time employee, part-time
11 employee, or pharmacy owner), highest level of education attained (Bachelors,
12 Masters, Pharm D or PhD), whether the pharmacist received education/training
13 related to CAM during his/her university education years or post-graduation, years of
14 experience as community pharmacist, the number of pharmacists in the pharmacy and
15 how long was the pharmacy open for. The latter question was included because, in the
16 local context, the longer the duration the pharmacy has been opened for, the more
17 likely its clientele would develop a personalised relationship with the pharmacist
18 allowing for a better communication of their health needs and concerns. The second
19 section of the questionnaire addressed the pharmacist's beliefs related to CAM
20 products. Specific questions were included tackling his/her perception of the
21 regulation of CAM products' market in Lebanon, the role of media in educating
22 consumers about the safe use of these products as well as the availability of resources
23 and the need for continuous education. Section 3 included questions assessing the
24 pharmacist's practices in relation to CAM products, such as selling, advising patient
25 on safe use, reporting of adverse effects and checking for drug interactions. For
26 sections 2 and 3, the survey instrument used a 5-point Likert rating scale in which 1
27 represented strongly agree and 5 represented strongly disagree. The last section of the
28 questionnaire addressed the pharmacist's knowledge about CAM products. A total of
29 ten questions were selected to address the uses, side effects and drug interactions of
30 commonly sold CAM products in the Lebanese market. According to a previous
31 investigation by the authors, vitamin C was the most commonly sold CAM product
32 (25%), followed by ginseng (22%), vitamin B (13%), Gingko (14%), Omega 3 fatty
33 acids (9.5%), Echinacea (9.5%) and Valerian (7.4%).³⁵ The formulation of the
34 questions around these products was carried out by an expert panel of pharmacists

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

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

22 *Patient and Public Involvement*

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

1 **Results**

2 Out of 396 pharmacists approached, 341 agreed to participate in this study (86.1%
3 response rate). The two main reasons for refusal to participate were lack of interest
4 (34.5%) and lack of time (27.3%). Of the 341 questionnaires, only those with
5 complete data were included in this study (n=310).

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

9 *Characteristics of study sample.*

10 Table 2 displayed the various characteristics of the study population. The pharmacists
11 were of varied age groups, with most of them aged below 40 years (67.1%). The study
12 sample consisted of a slightly higher proportion of males versus females (53.5% male
13 and 46.5% female). More than half of the pharmacists approached were the owners of
14 the pharmacy (54.8%), while the rest was either working as full-time (23.2%) or part-
15 time (21.9%). As for the educational level, 54.5% reported having a Bachelor's
16 degree, while 45.5% of the pharmacist had attained higher degrees: 18.4% a Master's
17 degree, 24.2% a Pharm D and 2.9% a PhD. Sixty-five percent of the pharmacists
18 studied in Lebanese universities. More than two in three pharmacists (73.2%) reported
19 receiving education about CAM-products during their university education and only
20 17.7% underwent a post-graduation training on CAM products. Working experience
21 among the pharmacists ranged from 1-3 years (22.9%) to greater than 10 years
22 (43.9%). (Table 2).

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

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

1 As for the pharmacists' beliefs related to the CAM products' market in the country, a
2 sizable proportion of survey participants (41.9%) disagreed or strongly disagreed that
3 CAM products in the Lebanese market are well standardized and of good quality.

4 When asked if they think that the market for CAM products in Lebanon is well
5 regulated, 63.5% of surveyed community pharmacists disagreed or strongly disagreed.
6 Furthermore, more than half of pharmacists (55.8%) disagreed or strongly disagreed
7 that media plays a positive role in educating patients about CAM products. (Table 3).

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

12 *Current practices of dispensing CAM products.*

13 More than two thirds of pharmacists (68.7%) participating in this study reported that
14 they always/often sell CAM products in their pharmacy and 59.4% reported
15 always/often getting inquiries from patients regarding the use of CAM products.
16 (Table 4). The majority of pharmacists (64.5%) reported that they always/often advise
17 patients on safe use of CAM products and ask for their feedback after use; however,
18 74.2% of pharmacists answered that they rarely or never reported adverse effects that
19 occurred with patients using CAM products. (Table 4). Among those who reported the
20 incidence of adverse effects, 53.4% of pharmacists indicated that they reported it to
21 the pharmaceutical company (provider of CAM) and only 15.5% reported to the OPL,
22 while the remaining reported to physician (13.8%), medical representative (8.6%),
23 and MOPH (5.2%). A couple of pharmacists reported the adverse effects to other
24 pharmacists working with them in the same pharmacy (Table 4 b). It is worth noting
25 that 60.3% of pharmacists reported frequently checking for CAM product-drug
26 interaction prior to selling the product. (Table 4).

27 *Evaluation of pharmacists' knowledge*

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

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3 1 61.3% were aware that ginkgo may increase the risk of bleeding when combined with
4 2 warfarin, 21.9% knew that ginseng does not affect blood pressure and 50.3% did not
5 3 know the potential effect of a vitamin B complex supplement on wound healing. On
6 4 the other hand, 78.4% of the pharmacist knew that vitamin C enhances the absorption
7 5 of iron. Of further concern were the high proportions of interviewed pharmacists who
8 6 were not aware of the interactions between drugs and CAM products. For instance,
9 7 80.7% did not know that Valerian should be used cautiously in patients using
10 8 benzodiazepines and 80.9% did not answer correctly the concurrence administration
11 9 of omega-3 and Clopidogrel. (Table 5).

10 *Socio-demographic determinants of knowledge*

11 Overall the score for knowledge ranged between 1 and 9 in the study population, with
12 a mean of 5.32 ± 1.43 . Simple linear regression results indicated that, among all socio-
13 demographic characteristics considered in this study, 'receiving education/training on
14 CAM products during university' was the sole predictor of better knowledge ($\beta=0.68$,
15 95% CI: 0.31,1.06). After adjustment for socio-demographic characteristics, the
16 results of the multiple linear regression confirmed this finding ($\beta=0.68$, 95% CI: 0.29,
17 1.07). (Table 6).

18 **Discussion**

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

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3 1 One of the main findings of this study was related to the generally positive beliefs of
4 2 Lebanese community pharmacists towards CAM products which is similar to other
5 3 studies in the region¹⁹⁻²⁴ and other countries such as USA,¹⁸ Australia,³⁷ Singapore³⁸
6 4 and Ethiopia.³ The results of this study showed that pharmacists believed in the utility
7 5 of CAM products and were willing to assume a leading role by asking for exclusive
8 6 rights to sell these products in pharmacies and under the advice of community
9 7 pharmacists. This is in accordance with a recent study by Gelayee et al. (2017)³,
10 8 where pharmacists believed that they are ideally positioned to dispense CAM
11 9 products, as part of their role in dispensing, monitoring, and counseling conventional
12 10 medicine. This unique position of the pharmacist could be best achieved if equipped
13 11 with good knowledge and skills.³
14 12 The general positive beliefs of pharmacists towards CAM products were contrasted by
15 13 doubts with regards to the quality of available CAM products and the regulations
16 14 through which the market of these products is governed. Similarly in other studies
17 15 pharmacists' main concerns was the lack of clear regulations and safety governing the
18 16 sale of CAM products.^{18,38,39} on that front, surveyed pharmacists were both critical of
19 17 the regulatory framework for CAM products and of the counterproductive and
20 18 misleading role played by media. With respect to the regulation of media, Lebanon
21 19 could perhaps learn from the experience of the United States' Food and Drug
22 20 Administration (FDA) which prohibits manufacturers and distributors of CAM
23 21 products from marketing adulterated or misbranded products.⁴⁰ From a regulatory
24 22 point of view, there is no counterpart for the FDA in Lebanon. The MoPH has had
25 23 some initiatives to protect consumers' health but more efforts are needed to ensure
26 24 public safety.²⁶
27 25 A remarkable finding in this study related to over 50% of surveyed pharmacists
28 26 reporting adverse effects of CAM products to the distributing companies rather than
29 27 doing so to the MoPH. Such a practice does not only jeopardize public safety but also
30 28 raises ethical questions related to the obvious conflict of interest in reporting adverse
31 29 effects to the company benefiting from the sales of CAM products. Similar findings
32 30 were reported in Qatar.³⁹ These findings call for the establishment of a more robust
33 31 regulatory framework that reaches beyond the review and approval of CAM products
34 32 to the establishment and implementation of the mechanisms to monitor and evaluate
35 33 the safe use post-market distribution. Such role could be played by the MoPH, the
36 34 OPL or an arm's length organization with a national mandate to ensure safe

1 consumption of CAM products. For instance, in US, the FDA is responsible for the
2 regulation of dietary supplements.⁴⁰ Manufacturers of CAM products are responsible
3 for the evaluation of the safety and labelling of their products to meet the
4 requirements of FDA regulations. FDA is responsible for taking action against any
5 adulterated CAM products that has reached the market.⁴⁰ In addition, the FDA allows
6 consumers and health care professionals to report any adverse reactions on a
7 designated reporting portal.⁴¹ Within this context it is important to note that, out of
8 123 pharmacists who had experience with reporting adverse effects, only 58 indicated
9 to whom they report such effects (47.2%). It is possible that participants were hesitant
10 to answer this question because they were not sure about the correct answer. This
11 further highlights the need to regulate the reporting of adverse effects and to clearly
12 inform the pharmacists of the existing reporting channels.

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

22 Perhaps one of the most disconcerting findings of this study was related to the
23 deficiencies in the pharmacists' knowledge of potential interactions among CAM
24 products and drugs and to a lesser extent CAM products' side effects. This lack of
25 knowledge came along prevalent good intentions of community pharmacists to
26 provide the best evidence-based advice to their customers. These findings may lead to
27 the advice of pharmacists being suboptimal and could, in some instances jeopardize
28 the health and wellbeing of the patients. The knowledge deficiencies found in this
29 study were also reported by many studies in the region such as Saudi Arabia,^{6,23} Abu
30 Dhabi,²⁴ Jordan,¹⁹ Kuwait,^{20,21} Oman,²² Qatar,³⁹ Palestine,^{42,43} and Iran⁴⁴ as well as
31 other countries such as Ethiopia,³ USA,¹⁸ Singapore,³⁸ and in Trinidad and Tobago,⁴⁵
32 and therefore appear to be a global concern. One possible explanation for the
33 observed knowledge deficiencies could be due to the biased information propagated
34 by some CAM product companies. This information usually aims to maximize sales

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

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

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

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

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

19 **Acknowledgements** We would like to acknowledge the contribution of Mr. Samer
20 Jallad and express our gratitude to the senior pharmacy students at Beirut Arab
21 University (promotion 2018/2019) for their contribution to data collection. The
22 authors would like to also thank the pharmacists who participated in this study.

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

27 **Funding** This research received no specific grant from any funding agency in the
28 public, commercial or not-for-profit sectors.

29 **Competing interests** None declared.

30 **Patient consent** pharmacists consent obtained.

31 **Ethical approval** This study protocol was approved by the Institutional Review
32 Board (IRB) at the Beirut Arab University; under the protocol number 2018H-0052-P-
33 R-0249.

34 **Provenance and peer review** Not commissioned; externally peer reviewed.

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3 1 **Data Statement:** A de-identified data set related to this study could be made available
4 with the approval of the IRB committee if necessary.
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1. Ernst FR, Grizzle AJ. Drug-related morbidity and mortality: updating the cost-of-illness model. *Journal of the American Pharmaceutical Association*. 2001;41(2):192-199.
2. National Center for Complementary and Integrative Health (NIH). <https://nccih.nih.gov/> (Accessed 24 August, 2018).
3. Asmelashe Gelayee D, Binega Mekonnen G, Asrade Atnafe S, *et al*. Herbal Medicines: Personal Use, Knowledge, Attitude, Dispensing Practice, and the Barriers among Community Pharmacists in Gondar, Northwest Ethiopia. *Evidence-Based Complementary and Alternative Medicine*. 2017;2017.
4. Natural Health Products Directorate—Health Canada. Natural Health Product Tracking Survey-2010 Final Report. <http://epe.lac-bac.gc.ca/100/200/301/pwgsc-tpsgc/por-ef/health/2011/135-09/report.pdf> (Accessed Sep 1, 2018).
5. Awad A, Al-Shaye D. Public awareness, patterns of use and attitudes toward natural health products in Kuwait: a cross-sectional survey. *BMC complementary and alternative medicine*. 2014;14(1):105.
6. Al-Arifi MN. Availability and needs of herbal medicinal information resources at community pharmacy, Riyadh region, Saudi Arabia. *Saudi Pharmaceutical Journal*. 2013;21(4):351-360.
7. Naja F, Alameddine M, Itani L, *et al*. The use of complementary and alternative medicine among lebanese adults: results from a national survey. *Evidence-Based Complementary and Alternative Medicine*. 2015;2015.
8. Iyer P, McFarland R, La Caze A. Expectations and responsibilities regarding the sale of complementary medicines in pharmacies: perspectives of consumers and pharmacy support staff. *International Journal of Pharmacy Practice*. 2017;25(4):292-300.
9. Azaizeh H, Saad B, Khalil K, *et al*. The state of the art of traditional Arab herbal medicine in the Eastern region of the Mediterranean: a review. *Evidence-Based Complementary and Alternative Medicine*. 2006;3(2):229-235.
10. Kwai Ping L. Role of Complementary Medicine in Nursing and Health Care Professionals. *SOJ Nur Health Care* 1 (2): 1-2. *Role of Complementary Medicine in Nursing and Health Care Professionals*. 2015.
11. Kelak JA, Cheah WL, Safii R. Patient's Decision to Disclose the Use of Traditional and Complementary Medicine to Medical Doctor: A Descriptive Phenomenology Study. *Evidence-Based Complementary and Alternative Medicine*. 2018;2018.
12. Hunter D, Oates R, Gawthrop J, *et al*. Complementary and alternative medicine use and disclosure amongst Australian radiotherapy patients. *Supportive Care in Cancer*. 2014;22(6):1571-1578.
13. Shim J-M, Schneider J, Curlin FA. Patterns of user disclosure of complementary and alternative medicine (CAM) use. *Medical care*. 2014;52(8):704-708.
14. Lindly O, Thorburn S, Zuckerman K. Use and Nondisclosure of Complementary Health Approaches Among US Children with Developmental Disabilities. *Journal of Developmental & Behavioral Pediatrics*. 2018;39(3):217-227.

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53
54
55
56
57
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59
60
- 1 15. Agyei-Baffour P, Kudolo A, Quansah DY, *et al.* Integrating herbal medicine into mainstream health care in Ghana: clients' acceptability, perceptions and disclosure of use. *BMC complementary and alternative medicine*. 2017;17(1):513.
 - 2 16. Kwan D, Hirschhorn K, Boon H. US and Canadian pharmacists' attitudes, knowledge, and professional practice behaviors toward dietary supplements: a systematic review. *BMC complementary and alternative medicine*. 2006;6(1):31.
 - 3 17. Miller LG, Hume A, Harris IM, *et al.* White paper on herbal products. *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy*. 2000;20(7):877-887.
 - 4 18. Harris IM, Kingston RL, Rodriguez R, *et al.* Attitudes towards complementary and alternative medicine among pharmacy faculty and students. *American journal of pharmaceutical education*. 2006;70(6):129.
 - 5 19. Khader Y, Sawair FA, Ayoub A, *et al.* Knowledge and attitudes of lay public, pharmacists, and physicians toward the use of herbal products in North Jordan. *The Journal of Alternative and Complementary Medicine*. 2008;14(10):1186-1187.
 - 6 20. Awad A, Al-Ajmi S, Waheedi M. Knowledge, perceptions and attitudes toward complementary and alternative therapies among Kuwaiti medical and pharmacy students. *Medical principles and Practice*. 2012;21(4):350-354.
 - 7 21. Abahussain NA, Abahussain EA, Al-Oumi FM. Pharmacists' attitudes and awareness towards the use and safety of herbs in Kuwait. *Pharmacy Practice (Granada)*. 2007;5(3):125-129.
 - 8 22. Duraz AY, Khan SA. Knowledge, attitudes and awareness of community pharmacists towards the use of herbal medicines in muscat region. *Oman medical journal*. 2011;26(6):451.
 - 9 23. Alkharfy K. Community pharmacists' knowledge, attitudes and practices towards herbal remedies in Riyadh, Saudi Arabia/Connaissances, attitudes et pratiques des pharmaciens communautaires vis-a-vis des médicaments a base de plantes a Riyad (Arabie saoudite). *Eastern Mediterranean Health Journal*. 2010;16(9):988.
 - 10 24. Fahmy SA, Abdu S, Abuelkhair M. Pharmacists' attitude, perceptions and knowledge towards the use of herbal products in Abu Dhabi, United Arab Emirates. *Pharmacy Practice*. 2010;8(2):109.
 - 11 25. Gruenwald J, Herzberg F. The global nutraceuticals market. *Business Briefing: Innovative Food Ingredients*. 2002:28-31.
 - 12 26. Alameddine M, Naja F, Abdel-Salam S, *et al.* Stakeholders' perspectives on the regulation and integration of complementary and alternative medicine products in Lebanon: a qualitative study. *BMC complementary and alternative medicine*. 2011;11(1):71.
 - 13 27. Ghazeeri GS, Awwad JT, Alameddine M, *et al.* Prevalence and determinants of complementary and alternative medicine use among infertile patients in Lebanon: a cross sectional study. *BMC complementary and alternative medicine*. 2012;12(1):129.
 - 14 28. Naja F, Anouti B, Shatila H, *et al.* Prevalence and Correlates of Complementary and Alternative Medicine Use among Patients with Lung Cancer: A Cross-Sectional Study in Beirut, Lebanon. *Evidence-Based Complementary and Alternative Medicine*. 2017;2017.

- 1
2
3 1 29. Abou-Rizk J, Alameddine M, Naja F. Prevalence and characteristics of CAM
4 2 use among people living with HIV and AIDS in Lebanon: Implications for
5 3 patient care. *Evidence-Based Complementary and Alternative Medicine*.
6 4 2016;2016.
7 4
8 5 30. Naja F, Alameddine M, Abboud M, *et al.* Complementary and alternative
9 6 medicine use among pediatric patients with leukemia: the case of Lebanon.
10 7 *Integrative Cancer Therapies*. 2011;10(1):38-46.
11 8 31. Naja F, Fadel RA, Alameddine M, *et al.* Complementary and alternative
12 9 medicine use and its association with quality of life among Lebanese breast
13 10 cancer patients: a cross-sectional study. *BMC complementary and alternative*
14 11 *medicine*. 2015;15(1):444.
15 11
16 12 32. Naja F, Mousa D, Alameddine M, *et al.* Prevalence and correlates of
17 13 complementary and alternative medicine use among diabetic patients in
18 14 Beirut, Lebanon: a cross-sectional study. *BMC complementary and alternative*
19 15 *medicine*. 2014;14(1):185.
20 15
21 16 33. ORDER OF PHARMACY LEBANON.
22 17 34. Song M, Ung COL, Lee VW-y, *et al.* Community pharmacists' perceptions
23 18 about pharmaceutical service of over-the-counter traditional Chinese
24 19 medicine: a survey study in Harbin of China. *BMC complementary and*
25 20 *alternative medicine*. 2017;17(1):9.
26 21 35. Hijazi M A-EM, Ellakany A. Overview of CAM Products in Lebanon:
27 22 Results from Community Pharmacists survey. *unpublished data*.
28 23 36. Chang ZG, Kennedy DT, Holdford DA, *et al.* Pharmacists' knowledge and
29 24 attitudes toward herbal medicine. *Annals of Pharmacotherapy*.
30 25 2000;34(6):710-715.
31 25
32 26 37. Naidu S, Wilkinson JM, Simpson MD. Attitudes of Australian pharmacists
33 27 toward complementary and alternative medicines. *Annals of*
34 28 *Pharmacotherapy*. 2005;39(9):1456-1461.
35 29 38. Koh H-L, Teo H-H, Ng H-L. Pharmacists' patterns of use, knowledge, and
36 30 attitudes toward complementary and alternative medicine. *The Journal of*
37 31 *Alternative & Complementary Medicine*. 2003;9(1):51-63.
38 31
39 32 39. Kheir N, Gad HY, Abu-Yousef SE. Pharmacists' knowledge and attitudes
40 33 about natural health products: a mixed-methods study. *Drug, health care and*
41 34 *patient safety*. 2014;6:7.
42 34
43 35 40. Administration FUSFaD. Dietary Supplements,. 2018;
44 36 <https://www.fda.gov/Food/DietarySupplements/> (Accessed June 7, 2018).
45 37 41. Administration FUSFaD. Safety reporting Portal
46 38 [https://www.safetyreporting.hhs.gov/SRP2/en/Home.aspx?sid=24fc405f-](https://www.safetyreporting.hhs.gov/SRP2/en/Home.aspx?sid=24fc405f-58d2-4162-bb1a-f187b3be85df)
47 39 [58d2-4162-bb1a-f187b3be85df](https://www.safetyreporting.hhs.gov/SRP2/en/Home.aspx?sid=24fc405f-58d2-4162-bb1a-f187b3be85df) (Accessed June 7, 2018).
48 40 42. Shraim NY, Shawahna R, Sorady MA, *et al.* Community pharmacists'
49 41 knowledge, practices and beliefs about complementary and alternative
50 42 medicine in Palestine: a cross-sectional study. *BMC complementary and*
51 43 *alternative medicine*. 2017;17(1):429.
52 43
53 44 43. Khmour MR, Kurdi M, Hallak HO, *et al.* Pharmacists' Knowledge, Attitudes
54 45 and Practices Towards Herbal Remedies In West Bank, Palestine.
55 46 *International Archives of Medicine*. 2016;9.
56 47 44. Bastani P, Jooybar M, Ahmadzadeh M, *et al.* Community pharmacy-based
57 48 survey on pharmacists' knowledge, attitude, and performance regarding
58 49 dietary supplements: Evidence from South of Iran. *Natl J Physiol Pharm*
59 50 *Pharmacol*. 2017;7(4):396-402.
60 50

- 1
2
3 1 45. Bahall M, Legall G. Knowledge, attitudes, and practices among health care
4 2 providers regarding complementary and alternative medicine in Trinidad and
5 3 Tobago. *BMC complementary and alternative medicine*. 2017;17(1):144.
6 4 46. Ekor M. The growing use of herbal medicines: issues relating to adverse
7 5 reactions and challenges in monitoring safety. *Frontiers in pharmacology*.
8 6 2014;4:177.
9 7 47. Kamal S, Holmberg C, Russell J, *et al*. Perceptions and attitudes of Egyptian
10 8 health professionals and policy-makers towards pharmaceutical sales
11 9 representatives and other promotional activities. *PloS one*.
12 10 2015;10(10):e0140457.
13 11 48. Hajjar R, Bassatne A, Cheaito MA, *et al*. Characterizing the interaction
14 12 between physicians, pharmacists and pharmaceutical representatives in a
15 13 middle-income country: A qualitative study. *PloS one*. 2017;12(9):e0184662.
16 14 49. Manchanda P, Honka E. The effects and role of direct-to-physician marketing
17 15 in the pharmaceutical industry: an integrative review. *Yale J Health Pol'y L &*
18 16 *Ethics*. 2005;5:785.
19 17 50. Lie D, Boker J. Development and validation of the CAM Health Belief
20 18 Questionnaire (CHBQ) and CAM use and attitudes amongst medical students.
21 19 *BMC Medical Education*. 2004;4(1):2.
22 20 51. Belletti G, Shorofi SA, Arbon P, *et al*. Complementary and Alternative
23 21 Medicine: Italian Validation of a Questionnaire on Nurses' Personal and
24 22 Professional Use, Knowledge, and Attitudes. *Journal of nursing measurement*.
25 23 2017;25(2):292-304.
26 24 52. Karsch-Voelk M, Barrett B, Kiefer D, *et al*. Echinacea for preventing and
27 25 treating the common cold. *The Cochrane database of systematic reviews*.
28 26 2014;2:CD000530.
29 27 53. Lee AN, Werth VP. Activation of autoimmunity following use of
30 28 immunostimulatory herbal supplements. *Archives of dermatology*.
31 29 2004;140(6):723-727.
32 30 54. Hur M-H, Lee MS, Yang HJ, *et al*. Ginseng for reducing the blood pressure in
33 31 patients with hypertension: a systematic review and meta-analysis. *J Ginseng*
34 32 *Res*. 2010;34(4):342-347.
35 33 55. Kelber O, Nieber K, Kraft K. Valerian: no evidence for clinically relevant
36 34 interactions. *Evidence-Based Complementary and Alternative Medicine*.
37 35 2014;2014.
38 36 56. Ge B, Zhang Z, Zuo Z. Updates on the clinical evidenced herb-warfarin
39 37 interactions. *Evidence-Based Complementary and Alternative Medicine*.
40 38 2014;2014.
41 39 57. Stoddard GJ, Archer M, Shane-McWhorter L, *et al*. Ginkgo and warfarin
42 40 interaction in a large veterans administration population. Paper presented at:
43 41 AMIA Annual Symposium Proceedings2015.
44 42 58. Weinmann S, Roll S, Schwarzbach C, *et al*. Effects of Ginkgo biloba in
45 43 dementia: systematic review and meta-analysis. *BMC geriatrics*.
46 44 2010;10(1):14.
47 45 59. Rangel-Huerta OD, Gil A. Omega 3 fatty acids in cardiovascular disease risk
48 46 factors: An updated systematic review of randomised clinical trials. *Clinical*
49 47 *Nutrition*. 2017.
50 48 60. Imantaeva GM, Mussagalieva AT. Omega-3 Polyunsaturated Fatty Acids in
51 49 Treatment of Patients with Coronary Heart Disease and Type 2 Diabetes
52 50 Mellitus. *International Journal of BioMedicine*. 2012;2(1):31-33.

- 1
2
3 1 61. Watson PD, Joy PS, Nkonde C, *et al.* Comparison of bleeding complications
4 2 with omega-3 fatty acids + aspirin + clopidogrel--versus--aspirin + clopidogrel
5 3 in patients with cardiovascular disease. *The American journal of cardiology.*
6 4 2009;104(8):1052-1054.
7 5 62. OPR M. Medicines Safety Update No. 2; 2010. 2010.
8 6 63. Neiva RF, Al-Shammari K, Nociti FH, Jr., *et al.* Effects of vitamin-B complex
9 7 supplementation on periodontal wound healing. *Journal of periodontology.*
10 8 2005;76(7):1084-1091.
11 9 64. Posthauer ME, Dorner B, Collins N. Nutrition: a critical component of wound
12 10 healing. *Advances in skin & wound care.* 2010;23(12):560-572; quiz 573-564.
13 11 65. Lane DJ, Richardson DR. The active role of vitamin C in mammalian iron
14 12 metabolism: much more than just enhanced iron absorption! *Free radical*
15 13 *biology & medicine.* 2014;75:69-83.
16 14
17 15
18 16
19 17
20 18
21 19
22 20
23 21
24 22
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26 24
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3 **1 List of Tables**
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3 **Table 1:** Distribution of pharmacies across governorates in this study in comparison
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4 to national distribution of pharmacies
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	Pharmacies in the study	Pharmacies in Lebanon
	n(%)	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

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

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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)

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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

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1 **Table 5:** Evaluation of knowledge among a national sample of pharmacists in
 2 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)

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1 **Table 6.** Simple and multiple linear regression analyses for the association of
 2 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)

3 *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
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		
2	Explain the scientific background and rationale for the investigation being reported	<u>Scientific background</u> : Page 4 and 5 <u>Rationale</u> : In Lebanon, the increased prevalence of CAM use, the poorly regulated CAM market, together with the high rate of non-disclosure to health care providers, underscore the crucial role of pharmacists in ensuring patients' health and safety.
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		
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
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).
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.

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4	Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding
5			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.
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12			(b) Describe any methods used to examine subgroups and interactions
13			N/A
14			(c) Explain how missing data were addressed
15			Only those with complete data were included in this study
16			(d) If applicable, describe analytical methods taking account of sampling strategy
17			N/A
18			(e) Describe any sensitivity analyses
19			
20	Results		
21	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
22			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).
23			
24			
25			(b) Give reasons for non-participation at each stage
26			The two main reasons for refusal to participate were lack of interest (34.5%) and lack of time (27.3%).
27			(c) Consider use of a flow diagram
28			N/A
29	Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
30			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).
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		(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 (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	Simple linear regression results indicated that ‘receiving education/training on CAM products during university’ was the sole predictor of better knowledge ($\beta=0.68$, 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 ($\beta=0.68$, 95% CI: 0.29, 1.07)
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

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complete evaluation of the subject matter.

Done. See Discussion section

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
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Generalisability	21	Discuss the generalisability (external validity) of the study results	Done. See Discussion section
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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.
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*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

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2018-025074.R3
Article Type:	Research
Date Submitted by the Author:	03-Jan-2019
Complete List of Authors:	Hijazi, Mohamad Ali; Beirut Arab University, Department of Pharmaceutical Sciences Shatila, Hibeh; American University of Beirut, Department of Nutrition and Food Sciences El-Lakany, Abdalla; Beirut Arab University, Department of Pharmaceutical Sciences Aboul Ela, Maha; Beirut Arab University, Department of Pharmaceutical Sciences Kharroubi, Samer ; American University of Beirut, Department of Nutrition and Food Sciences Alameddine, Mohamad; American University of Beirut, Faculty of Health Sciences; Mohammed Bin Rashid University of Medicine and Health Sciences College of Medicine Naja, Farah; American University of Beirut, Department of Nutrition and Food Sciences
Primary Subject Heading:	Public health
Secondary Subject Heading:	Health policy, Health services research
Keywords:	COMPLEMENTARY MEDICINE, Pharmacist, National Cross Sectional Study, Community, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Lebanon

SCHOLARONE™
Manuscripts

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3 1 **Beliefs, Practices and Knowledge of Community Pharmacists Regarding**
4 **Complementary and Alternative Medicine: National Cross-Sectional Study in**
5 **Lebanon**
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11 5 Mohamad Ali Hijazi¹, Hibeh Shatila², Abdalla El-Lakany³, Maha Aboul Ela⁴, Samer
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1
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3 **1 Abstract**
4

5 **2 Introduction** Pharmacists are uniquely positioned to provide patients with evidence-
6 based information in order to ensure effective and safe use of Complementary and
7 Alternative Medicine (CAM) products.
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10 **3 Objective** Assess beliefs, practices and knowledge related to CAM products among
11 community pharmacists in Lebanon.
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14 **4 Design, methods and setting** Using stratified random sampling, a nationally
15 representative survey was conducted among community pharmacists in Lebanon.
16 Through face-to-face interviews, pharmacists completed a multicomponent
17 questionnaire consisting of four sections: 1) socio-demographic characteristics, 2)
18 beliefs related to regulation of CAM products, role of media in promoting their safe
19 use, availability of resources and continuing education, 3) practices including selling
20 CAM products, providing advice for patients and reporting adverse effects and 4)
21 knowledge about specific CAM products, their uses, side effects, and interactions.
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24 **5 Results** A total of 341 pharmacists agreed to participate (response rate: 86%). Only
25 pharmacists with complete data were included in this study (n=310). Pharmacists
26 agreed that CAM products are effective (63.8%) and that they should be exclusively
27 sold in pharmacies (80.3%), but disagreed that commercially marketed CAM products
28 are well regulated (63.5%) and that media plays a positive role in educating users
29 about these products (55.8%). As for practices, 64.5% of pharmacists were always or
30 often advising patients on safe use; however 74.2% of participants rarely or never
31 reported adverse effects. Regarding knowledge, although the majority of pharmacists
32 were aware of the uses of CAM products, fewer knew about their side effects and
33 their interactions with drugs. After adjustment for covariates, receiving
34 education/training on CAM products during university was the sole predictor of
35 higher knowledge score ($\beta=0.68$, 95%CI: 0.29-1.07).
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38 **6 Conclusions** This study revealed positive beliefs of pharmacists in Lebanon towards
39 CAM products and indicated important gaps in their practice and knowledge.
40 Deliberate efforts to enhance the education of pharmacists are warranted to ensure the
41 safe integration and use of CAM products in Lebanon.
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3 1 Keywords: Complementary medicine, Alternative Medicine, Community, Pharmacist,
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5 2 Health Policy, Lebanon.

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7 3 Word Count: 4198
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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.

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1 Introduction

2 Complementary and Alternative Medicine (CAM) is a diverse group of medical and
3 health care systems, practices, and products that are not considered part of
4 conventional medicine. CAM may complement mainstream medicine by diversifying
5 the conceptual frameworks of medicine or by satisfying a demand that has not been
6 met by orthodoxy.¹ The United States (US) National Center for Complementary and
7 Integrative Health (NCCIH) divides CAM into two main categories: (1) CAM
8 products, such as herbs, vitamins and minerals and probiotics; and (2) mind and body
9 therapies, including yoga, chiropractic and osteopathic manipulation, meditation,
10 and massage therapy.² In recent years there has been a worldwide renaissance of
11 interest in these CAM products whereby their global market exceeded 100 billion
12 USD during year 2017.³ Prevalence rate as high as 70% were reported for natural
13 CAM products' use among the general population in various countries such as Canada
14 and Kuwait.^{4,5} CAM products are usually used for general health maintenance,
15 treatment of specific disease states and more frequently for chronic conditions (e.g.,
16 anxiety, pain, headaches, depression, and cancer).⁶ Such a widespread use of CAM
17 products could be attributed to dissatisfaction with conventional medicine, the
18 increasing cost of conventional medical care, placebo effect, and the desire to be
19 involved in the decision-making process related to one's health.^{7,8} However, it is
20 important to note that the use of CAM products might be associated with hazardous
21 health risks related to their adverse effects, improper dosage, or quality of the
22 products (e.g., contamination, misidentification or lack of standardization).⁹ These
23 risks could be amplified due to the low rate of disclosure to health care providers for
24 fear of their disapproval, disinterest, or inability to help.¹⁰⁻¹³ Such lack of professional
25 supervision may further expose the consumer to various risks, including adverse
26 reactions or interactions with conventional drugs.^{6,14,15}

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

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3 1 ACCP's stated that "the pharmacist's involvement in herbal products is an extension
4 of their roles in pharmaceutical care, clinical pharmacy practices and collaborative
5 2 health care teams".¹⁷ Despite this marked commitment to promoting the safe use of
6 3 CAM products by pharmacists, the integration of CAM into the curricula of pharmacy
7 4 education has lagged behind,¹⁸ leaving many pharmacists unfamiliar with the health
8 5 effects of CAM products.¹⁶
9 6

10 7 The Middle East and North Africa (MENA) region hosts a growing market of CAM
11 8 products.¹⁹⁻²⁵ However, in many countries of the region, including Lebanon this
12 9 market remained poorly regulated and subject to abuse by both patient and provider.²⁶
13 10 About one third of Lebanese adults (29.87%) were reported to use CAM in 2015, with
14 11 the most prevalent being CAM products, specifically herbal supplements.⁷ Higher
15 12 rates of use were reported among patients with chronic diseases such as infertility
16 13 (41%),²⁷ lung cancer (41%),²⁸ and HIV and AIDS conditions (46.6%).²⁹ A common
17 14 finding to most of the aforementioned studies was the low rate of disclosure to the
18 15 treating physicians.^{7,26,28,30-32} This raised concerns about CAM safety, efficacy, and
19 16 impact on the patient health; especially when its use is coupled with poor regulatory
20 17 frameworks.²⁶
21 18

22 19 In Lebanon, the high prevalence of use of CAM products and their poorly regulated
23 20 market, in addition to the high rate of non-disclosure to health care providers,
24 21 underscore the crucial role of pharmacists in ensuring patients' health and safety. The
25 22 Lebanese Ministry of Public Health (MoPH) regulates the profession of pharmacy,
26 23 through granting two licensures: 1) the license to practice for pharmacists and 2) the
27 24 license to open a pharmacy. For the latter, the pharmacist ought to be registered
28 25 within the Order of Pharmacists in Lebanon (OPL).³³
29 26

30 27 The primary objective of this study was to assess the beliefs, practices and knowledge
31 28 related to CAM products among a nationally representative sample of community
32 29 pharmacists in Lebanon. A secondary objective of the study was to investigate the
33 30 socio-demographic determinants of knowledge related to CAM products among study
34 31 participants. The findings of this study will inform the practice of pharmacy in the
35 32 country, as well as the development and integration of CAM modules into mainstream
36 33 educational programs of pharmacy.
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1 **Methods**

2 This is a cross-sectional national survey of pharmacists practicing in community
3 pharmacies which was conducted in Lebanon between September 2017 and February
4 2018. The sampling unit for this study was the pharmacy. A list of all community
5 pharmacies and their location was obtained from the OPL. Pharmacies were selected
6 from this list using a stratified random sampling technique. The strata were the six
7 Lebanese governorates. Within each stratum (governorate), pharmacies were selected
8 at random from the list of all pharmacies within this stratum. The number of
9 pharmacies selected was proportional to the total number of pharmacies in each
10 stratum. Sample size calculations showed that a minimum of 342 pharmacists ought to
11 be recruited in order to estimate a prevalence of 50% with a 95% confidence interval
12 (CI) and a margin of error of 5%. In order to account for a 14% refusal rate, 396
13 pharmacies were selected from the OPL list.

14 To be included in the study, the pharmacist had to be 1) licensed to practice by
15 MoPH, 2) registered in the OPL, 3) working in the selected pharmacy either as
16 pharmacy owner or as an employee and 4) conversant in either English or Arabic
17 languages. Pharmacists who were unable or unwilling to give consent for the study
18 were not included. If a pharmacist in a selected pharmacy refused to participate, the
19 pharmacist in the closest pharmacy was approached. In the case when more than one
20 pharmacist in the selected pharmacy was eligible to participate, only one pharmacist
21 was selected at random. The study protocol was approved by the Institutional Review
22 Board at the Beirut Arab University under the protocol number 2018H-0052-P-R-
23 0249.

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

1 The design of the questionnaire used in the data collection for this study was informed
2 by a thorough review of relevant literature^{16,23,24,34} and by a careful examination of
3 the local context. The content validity of this questionnaire was confirmed by an
4 expert panel consisting of a pharmacist, a nutrition epidemiologist, a biostatistician
5 and a health policy expert. The questionnaire was originally written in English, before
6 being translated to the Arabic language, and then back translated to English. The
7 original and back-translated English versions of the questionnaire were examined to
8 ensure parallel form reliability. The questionnaire was comprised of four sections. The
9 first section included questions related to socio-demographic, education and practice
10 characteristics, such as age, sex, employment status (full-time employee, part-time
11 employee, or pharmacy owner), highest level of education attained (Bachelors,
12 Masters, Pharm D or PhD), whether the pharmacist received education/training
13 related to CAM during his/her university education years or post-graduation, years of
14 experience as community pharmacist, the number of pharmacists in the pharmacy and
15 how long was the pharmacy open for. The latter question was included because, in the
16 local context, the longer the duration the pharmacy has been opened for, the more
17 likely its clientele would develop a personalised relationship with the pharmacist
18 allowing for a better communication of their health needs and concerns. The second
19 section of the questionnaire addressed the pharmacist's beliefs related to CAM
20 products. Specific questions were included tackling his/her perception of the
21 regulation of CAM products' market in Lebanon, the role of media in educating
22 consumers about the safe use of these products as well as the availability of resources
23 and the need for continuous education. Section 3 included questions assessing the
24 pharmacist's practices in relation to CAM products, such as selling, advising patient
25 on safe use, reporting of adverse effects and checking for drug interactions. For
26 sections 2 and 3, the survey instrument used a 5-point Likert rating scale in which 1
27 represented strongly agree and 5 represented strongly disagree. The last section of the
28 questionnaire addressed the pharmacist's knowledge about CAM products. A total of
29 ten questions were selected to address the uses, side effects and drug interactions of
30 commonly sold CAM products in the Lebanese market. According to a previous
31 investigation by the authors, vitamin C was the most commonly sold CAM product
32 (25%), followed by ginseng (22%), vitamin B (13%), Gingko (14%), Omega 3 fatty
33 acids (9.5%), Echinacea (9.5%) and Valerian (7.4%).³⁵ The formulation of the
34 questions around these products was carried out by an expert panel of pharmacists

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

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

22 *Patient and Public Involvement*

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

1 **Results**

2 Out of 396 pharmacists approached, 341 agreed to participate in this study (86.1%
3 response rate). The two main reasons for refusal to participate were lack of interest
4 (34.5%) and lack of time (27.3%). Of the 341 questionnaires, only those with
5 complete data were included in this study (n=310).

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

9 *Characteristics of study sample.*

10 Table 2 displayed the various characteristics of the study population. The pharmacists
11 were of varied age groups, with most of them aged below 40 years (67.1%). The study
12 sample consisted of a slightly higher proportion of males versus females (53.5% male
13 and 46.5% female). More than half of the pharmacists approached were the owners of
14 the pharmacy (54.8%), while the rest was either working as full-time (23.2%) or part-
15 time (21.9%). As for the educational level, 54.5% reported having a Bachelor's
16 degree, while 45.5% of the pharmacist had attained higher degrees: 18.4% a Master's
17 degree, 24.2% a Pharm D and 2.9% a PhD. Sixty-five percent of the pharmacists
18 studied in Lebanese universities. More than two in three pharmacists (73.2%) reported
19 receiving education about CAM-products during their university education and only
20 17.7% underwent a post-graduation training on CAM products. Working experience
21 among the pharmacists ranged from 1-3 years (22.9%) to greater than 10 years
22 (43.9%). (Table 2).

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

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

1 As for the pharmacists' beliefs related to the CAM products' market in the country, a
2 sizable proportion of survey participants (41.9%) disagreed or strongly disagreed that
3 CAM products in the Lebanese market are well standardized and of good quality.

4 When asked if they think that the market for CAM products in Lebanon is well
5 regulated, 63.5% of surveyed community pharmacists disagreed or strongly disagreed.
6 Furthermore, more than half of pharmacists (55.8%) disagreed or strongly disagreed
7 that media plays a positive role in educating patients about CAM products. (Table 3).

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

12 *Current practices of dispensing CAM products.*

13 More than two thirds of pharmacists (68.7%) participating in this study reported that
14 they always/often sell CAM products in their pharmacy and 59.4% reported
15 always/often getting inquiries from patients regarding the use of CAM products.
16 (Table 4). The majority of pharmacists (64.5%) reported that they always/often advise
17 patients on safe use of CAM products and ask for their feedback after use; however,
18 74.2% of pharmacists answered that they rarely or never reported adverse effects that
19 occurred with patients using CAM products. (Table 4). Among those who reported the
20 incidence of adverse effects, 53.4% of pharmacists indicated that they reported it to
21 the pharmaceutical company (provider of CAM) and only 15.5% reported to the OPL,
22 while the remaining reported to physician (13.8%), medical representative (8.6%),
23 and MOPH (5.2%). A couple of pharmacists reported the adverse effects to other
24 pharmacists working with them in the same pharmacy (Table 4 b). It is worth noting
25 that 60.3% of pharmacists reported frequently checking for CAM product-drug
26 interaction prior to selling the product. (Table 4).

27 *Evaluation of pharmacists' knowledge*

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

1 61.3% were aware that ginkgo may increase the risk of bleeding when combined with
2 warfarin, 21.9% knew that ginseng does not affect blood pressure and 50.3% did not
3 know the potential effect of a vitamin B complex supplement on wound healing. On
4 the other hand, 78.4% of the pharmacist knew that vitamin C enhances the absorption
5 of iron. Of further concern were the high proportions of interviewed pharmacists who
6 were not aware of the interactions between drugs and CAM products. For instance,
7 80.7% did not know that Valerian should be used cautiously in patients using
8 benzodiazepines and 80.9% did not answer correctly the concurrence administration
9 of omega-3 and Clopidogrel. (Table 5).

10 *Socio-demographic determinants of knowledge*

11 Overall the score for knowledge ranged between 1 and 9 in the study population, with
12 a mean of 5.32 ± 1.43 . Simple linear regression results indicated that, among all socio-
13 demographic characteristics considered in this study, 'receiving education/training on
14 CAM products during university' was the sole predictor of better knowledge ($\beta=0.68$,
15 95% CI: 0.31,1.06). After adjustment for covariates, receiving education/training on
16 CAM products during university was also positively correlated with higher
17 knowledge score ($\beta=0.68$, 95%CI: 0.29-1.07); that is, receiving any education/training
18 on CAM-products increases the mean knowledge score by 0.68 while adjusting for
19 socio-demographic characteristics. (Table 6).

20 **Discussion**

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

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3 1 drugs. Receiving education/training on CAM products during university was the sole
4 2 predictor of better knowledge among pharmacists.

5 3 One of the main findings of this study was related to the generally positive beliefs of
6 4 Lebanese community pharmacists towards CAM products which is similar to other
7 5 studies in the region¹⁹⁻²⁴ and other countries such as USA,¹⁸ Australia,³⁷ Singapore³⁸
8 6 and Ethiopia.³ The results of this study showed that pharmacists believed in the utility
9 7 of CAM products and were willing to assume a leading role by asking for exclusive
10 8 rights to sell these products in pharmacies and under the advice of community
11 9 pharmacists. This is in accordance with a recent study by Gelayee et al. (2017)³,
12 10 where pharmacists believed that they are ideally positioned to dispense CAM
13 11 products, as part of their role in dispensing, monitoring, and counseling conventional
14 12 medicine. This unique position of the pharmacist could be best achieved if equipped
15 13 with good knowledge and skills.³

16 14 The general positive beliefs of pharmacists towards CAM products were contrasted by
17 15 doubts with regards to the quality of available CAM products and the regulations
18 16 through which the market of these products is governed. Similarly in other studies
19 17 pharmacists' main concerns was the lack of clear regulations and safety governing the
20 18 sale of CAM products.^{18,38,39} On that front, surveyed pharmacists were both critical of
21 19 the regulatory framework for CAM products and of the counterproductive and
22 20 misleading role played by media. With respect to the regulation of media, Lebanon
23 21 could perhaps learn from the experience of the United States' Food and Drug
24 22 Administration (FDA) which prohibits manufacturers and distributors of CAM
25 23 products from marketing adulterated or misbranded products.⁴⁰ From a regulatory
26 24 point of view, there is no counterpart for the FDA in Lebanon. The MoPH has had
27 25 some initiatives to protect consumers' health but more efforts are needed to ensure
28 26 public safety.²⁶

29 27 A remarkable finding in this study related to over 50% of surveyed pharmacists
30 28 reporting adverse effects of CAM products to the distributing companies rather than
31 29 doing so to the MoPH. Such a practice does not only jeopardize public safety but also
32 30 raises ethical questions related to the obvious conflict of interest in reporting adverse
33 31 effects to the company benefiting from the sales of CAM products. Similar findings
34 32 were reported in Qatar.³⁹ These findings call for the establishment of a more robust
35 33 regulatory framework that reaches beyond the review and approval of CAM products
36 34 to the establishment and implementation of the mechanisms to monitor and evaluate

1 the safe use post-market distribution. Such role could be played by the MoPH, the
2 OPL or an arm's length organization with a national mandate to ensure safe
3 consumption of CAM products. For instance, in US, the FDA is responsible for the
4 regulation of dietary supplements.⁴⁰ Manufacturers of CAM products are responsible
5 for the evaluation of the safety and labelling of their products to meet the
6 requirements of FDA regulations. FDA is responsible for taking action against any
7 adulterated CAM products that has reached the market.⁴⁰ In addition, the FDA allows
8 consumers and health care professionals to report any adverse reactions on a
9 designated reporting portal.⁴¹ Within this context it is important to note that, out of
10 123 pharmacists who had experience with reporting adverse effects, only 58 indicated
11 to whom they report such effects (47.2%). It is possible that participants were hesitant
12 to answer this question because they were not sure about the correct answer. This
13 further highlights the need to regulate the reporting of adverse effects and to clearly
14 inform the pharmacists of the existing reporting channels.

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

24 Perhaps one of the most disconcerting findings of this study was related to the
25 deficiencies in the pharmacists' knowledge of potential interactions among CAM
26 products and drugs and to a lesser extent CAM products' side effects. This lack of
27 knowledge came along prevalent good intentions of community pharmacists to
28 provide the best evidence-based advice to their customers. These findings may lead to
29 the advice of pharmacists being suboptimal and could, in some instances jeopardize
30 the health and wellbeing of the patients. The knowledge deficiencies found in this
31 study were also reported by many studies in the region such as Saudi Arabia,^{6,23} Abu
32 Dhabi,²⁴ Jordan,¹⁹ Kuwait,^{20,21} Oman,²² Qatar,³⁹ Palestine,^{42,43} and Iran⁴⁴ as well as
33 other countries such as Ethiopia,³ USA,¹⁸ Singapore,³⁸ and in Trinidad and Tobago,⁴⁵
34 and therefore appear to be a global concern. One possible explanation for the

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3 1 observed knowledge deficiencies could be due to the biased information propagated
4 2 by some CAM product companies. This information usually aims to maximize sales
5 3 and neglects any factor that can affect the promotion of their products.⁴⁶ A few studies
6 4 showed that personal sale visits of certain products' companies to pharmacists (called
7 5 "detailing") could drive prescriptions in favor of the product being promoted. This is
8 6 true even though pharmacists' may be aware of the potential conflict of interest these
9 7 visits precipitate.⁴⁷⁻⁴⁹ Another explanation could be the lack of availability and ease
10 8 access of pharmacists to scientific resources and professional development programs.

11 9 The findings on the lack of knowledge on safe use of CAM products, coupled with the
12 10 majority of pharmacists requesting a mandatory continuous education program, open
13 11 a remarkable window of opportunity for the MoPH to work collaboratively with the
14 12 OPL to establish a national program for the continuous education of pharmacists on
15 13 CAM products. Collaborating with academic institutions would enhance the design,
16 14 implementation and evaluation of such a program. Providing continuous education
17 15 opportunities would enhance the knowledge of pharmacists on the safe use of CAM
18 16 products, the appropriate reporting of side effects and their general role as counsellors
19 17 for their customers. Last but not least, the finding in our regression models that
20 18 receiving education/training on CAM products during university was the sole
21 19 predictor of better knowledge calls on the pharmacy schools to revise their curricula
22 20 in order to ensure proper education and training of pharmacy students on the safe use
23 21 of CAM products. Such revision is necessary to enhance public safety.

24 22 The findings of this study ought to be considered in light of a few limitations. First,
25 23 the data collection relied on self-reported answers for practices, beliefs and
26 24 knowledge. These answers could be subject to errors due to memory recall or social
27 25 desirability bias. To mitigate this, interviewers were trained to maintain a neutral
28 26 attitude and avoid leading questions. Second, although a few questionnaires were
29 27 validated to assess the beliefs, practices and knowledge related to CAM products
30 28 among specific populations, such as nurses, and medical students,^{50,51} none was
31 29 available for use among pharmacists. Therefore, the questionnaire used in data
32 30 collection was developed and vetted by a panel of experts, including a pharmacist,
33 31 nutrition epidemiologist, biostatistician and a health policy expert. The questionnaire
34 32 was designed to capture the common traits in beliefs, practices and knowledge of
35 33 pharmacist towards CAM products and to address to context specificity of the study.

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3 1 It is important to note that a couple of the questions in the questionnaire were double
4 barreled and could have been better broken into two questions each to ensure clarity
5 2 and accuracy of answer. Future studies are encouraged to examine the validity and
6 3 and accuracy of answer. Future studies are encouraged to examine the validity and
7 4 reliability of questionnaires assessing beliefs, practices and knowledge of CAM
8 5 products among pharmacists. Third, despite the fact that the sample of pharmacists
9 6 considered was nationally representative, the cross-sectional nature of the study
10 7 prevented any inference about the change in beliefs, practices or knowledge over time
11 8 among pharmacists in the country. Lastly, this study relied mainly on quantitative
12 9 assessment. Future studies aiming to qualitatively examine pharmacists' beliefs,
13 10 practices and knowledge, with regards to CAM products could complement the results
14 11 of quantitative investigations and provide a more complete evaluation of the subject
15 12 matter.

16 13 In conclusion, the findings of this study revealed positive beliefs of pharmacists in
17 14 Lebanon towards CAM products and indicated important gaps in their practice and
18 15 knowledge. Given the central role that the pharmacists play in promoting the safe and
19 16 efficient use of CAM products and in light of the study's findings, deliberate efforts to
20 17 enhance the education of pharmacists and support them with a clear and responsive
21 18 regulatory framework would be necessary to ensure the safe integration and use of
22 19 CAM products in the country.

23 20
24 21 **Acknowledgements** We would like to acknowledge the contribution of Mr. Samer
25 22 Jallad and express our gratitude to the senior pharmacy students at Beirut Arab
26 23 University (promotion 2018/2019) for their contribution to data collection. The
27 24 authors would like to also thank the pharmacists who participated in this study.

28 25 **Author Contributions** FN, MAH, designed the data collection form and the
29 26 methodology. MAH managed data collection. SK and HS analyzed the data. FN,
30 27 MAH, MA and HS wrote the first draft of the manuscript. AE, MAE contributed to
31 28 drafting the paper. The final version was reviewed and approved by all authors.

32 29 **Funding** This research received no specific grant from any funding agency in the
33 30 public, commercial or not-for-profit sectors.

34 31 **Competing interests** None declared.

35 32 **Patient consent** pharmacists consent obtained.

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3 1 **Ethical approval** This study protocol was approved by the Institutional Review
4 Board (IRB) at the Beirut Arab University; under the protocol number 2018H-0052-P-
5 R-0249.
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8 4 **Provenance and peer review** Not commissioned; externally peer reviewed.
9

10 5 **Data Statement:** A de-identified data set related to this study could be made available
11 with the approval of the IRB committee if necessary.
12

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1 1 **References**

- 2 2 1. Ernst FR, Grizzle AJ. Drug-related morbidity and mortality: updating the cost-
3 3 of-illness model. *Journal of the American Pharmaceutical Association*.
4 4 2001;41(2):192-199.
- 5 5 2. National Center for Complementary and Integrative Health (NIH).
6 6 <https://nccih.nih.gov/> (Accessed 24 August, 2018).
- 7 7 3. Asmelashe Gelayee D, Binega Mekonnen G, Asrade Atnafe S, *et al*. Herbal
8 8 Medicines: Personal Use, Knowledge, Attitude, Dispensing Practice, and the
9 9 Barriers among Community Pharmacists in Gondar, Northwest Ethiopia.
10 10 *Evidence-Based Complementary and Alternative Medicine*. 2017;2017.
- 11 11 4. Natural Health Products Directorate—Health Canada. Natural Health Product
12 12 Tracking Survey-2010 Final Report. [http://epe.lac-](http://epe.lac-bac.gc.ca/100/200/301/pwgsc-tpsgc/por-ef/health/2011/135-09/report.pdf)
13 13 [bac.gc.ca/100/200/301/pwgsc-tpsgc/por-ef/health/2011/135-09/report.pdf](http://epe.lac-bac.gc.ca/100/200/301/pwgsc-tpsgc/por-ef/health/2011/135-09/report.pdf)
14 14 (Accessed Sep 1, 2018).
- 15 15 5. Awad A, Al-Shaye D. Public awareness, patterns of use and attitudes toward
16 16 natural health products in Kuwait: a cross-sectional survey. *BMC*
17 17 *complementary and alternative medicine*. 2014;14(1):105.
- 18 18 6. Al-Arifi MN. Availability and needs of herbal medicinal information
19 19 resources at community pharmacy, Riyadh region, Saudi Arabia. *Saudi*
20 20 *Pharmaceutical Journal*. 2013;21(4):351-360.
- 21 21 7. Naja F, Alameddine M, Itani L, *et al*. The use of complementary and
22 22 alternative medicine among lebanese adults: results from a national survey.
23 23 *Evidence-Based Complementary and Alternative Medicine*. 2015;2015.
- 24 24 8. Iyer P, McFarland R, La Caze A. Expectations and responsibilities regarding
25 25 the sale of complementary medicines in pharmacies: perspectives of
26 26 consumers and pharmacy support staff. *International Journal of Pharmacy*
27 27 *Practice*. 2017;25(4):292-300.
- 28 28 9. Azaizeh H, Saad B, Khalil K, *et al*. The state of the art of traditional Arab
29 29 herbal medicine in the Eastern region of the Mediterranean: a review.
30 30 *Evidence-Based Complementary and Alternative Medicine*. 2006;3(2):229-
31 31 235.
- 32 32 10. Kwai Ping L. Role of Complementary Medicine in Nursing and Health Care
33 33 Professionals. *SOJ Nur Health Care* 1 (2): 1-2. *Role of Complementary*
34 34 *Medicine in Nursing and Health Care Professionals*. 2015.
- 35 35 11. Kelak JA, Cheah WL, Safii R. Patient's Decision to Disclose the Use of
36 36 Traditional and Complementary Medicine to Medical Doctor: A Descriptive
37 37 Phenomenology Study. *Evidence-Based Complementary and Alternative*
38 38 *Medicine*. 2018;2018.
- 39 39 12. Hunter D, Oates R, Gawthrop J, *et al*. Complementary and alternative
40 40 medicine use and disclosure amongst Australian radiotherapy patients.
41 41 *Supportive Care in Cancer*. 2014;22(6):1571-1578.
- 42 42 13. Shim J-M, Schneider J, Curlin FA. Patterns of user disclosure of
43 43 complementary and alternative medicine (CAM) use. *Medical care*.
44 44 2014;52(8):704-708.
- 45 45 14. Lindly O, Thorburn S, Zuckerman K. Use and Nondisclosure of
46 46 Complementary Health Approaches Among US Children with Developmental
47 47 Disabilities. *Journal of Developmental & Behavioral Pediatrics*.
48 48 2018;39(3):217-227.

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53
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55
56
57
58
59
60
15. Agyei-Baffour P, Kudolo A, Quansah DY, *et al.* Integrating herbal medicine into mainstream health care in Ghana: clients' acceptability, perceptions and disclosure of use. *BMC complementary and alternative medicine*. 2017;17(1):513.
 16. Kwan D, Hirschhorn K, Boon H. US and Canadian pharmacists' attitudes, knowledge, and professional practice behaviors toward dietary supplements: a systematic review. *BMC complementary and alternative medicine*. 2006;6(1):31.
 17. Miller LG, Hume A, Harris IM, *et al.* White paper on herbal products. *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy*. 2000;20(7):877-887.
 18. Harris IM, Kingston RL, Rodriguez R, *et al.* Attitudes towards complementary and alternative medicine among pharmacy faculty and students. *American journal of pharmaceutical education*. 2006;70(6):129.
 19. Khader Y, Sawair FA, Ayoub A, *et al.* Knowledge and attitudes of lay public, pharmacists, and physicians toward the use of herbal products in North Jordan. *The Journal of Alternative and Complementary Medicine*. 2008;14(10):1186-1187.
 20. Awad A, Al-Ajmi S, Waheedi M. Knowledge, perceptions and attitudes toward complementary and alternative therapies among Kuwaiti medical and pharmacy students. *Medical principles and Practice*. 2012;21(4):350-354.
 21. Abahussain NA, Abahussain EA, Al-Oumi FM. Pharmacists' attitudes and awareness towards the use and safety of herbs in Kuwait. *Pharmacy Practice (Granada)*. 2007;5(3):125-129.
 22. Duraz AY, Khan SA. Knowledge, attitudes and awareness of community pharmacists towards the use of herbal medicines in muscat region. *Oman medical journal*. 2011;26(6):451.
 23. Alkharfy K. Community pharmacists' knowledge, attitudes and practices towards herbal remedies in Riyadh, Saudi Arabia/Connaissances, attitudes et pratiques des pharmaciens communautaires vis-a-vis des médicaments a base de plantes a Riyad (Arabie saoudite). *Eastern Mediterranean Health Journal*. 2010;16(9):988.
 24. Fahmy SA, Abdu S, Abuelkhair M. Pharmacists' attitude, perceptions and knowledge towards the use of herbal products in Abu Dhabi, United Arab Emirates. *Pharmacy Practice*. 2010;8(2):109.
 25. Gruenwald J, Herzberg F. The global nutraceuticals market. *Business Briefing: Innovative Food Ingredients*. 2002:28-31.
 26. Alameddine M, Naja F, Abdel-Salam S, *et al.* Stakeholders' perspectives on the regulation and integration of complementary and alternative medicine products in Lebanon: a qualitative study. *BMC complementary and alternative medicine*. 2011;11(1):71.
 27. Ghazeeri GS, Awwad JT, Alameddine M, *et al.* Prevalence and determinants of complementary and alternative medicine use among infertile patients in Lebanon: a cross sectional study. *BMC complementary and alternative medicine*. 2012;12(1):129.
 28. Naja F, Anouti B, Shatila H, *et al.* Prevalence and Correlates of Complementary and Alternative Medicine Use among Patients with Lung Cancer: A Cross-Sectional Study in Beirut, Lebanon. *Evidence-Based Complementary and Alternative Medicine*. 2017;2017.

- 1
2
3 1 29. Abou-Rizk J, Alameddine M, Naja F. Prevalence and characteristics of CAM
4 2 use among people living with HIV and AIDS in Lebanon: Implications for
5 3 patient care. *Evidence-Based Complementary and Alternative Medicine*.
6 4 2016;2016.
7 4
8 5 30. Naja F, Alameddine M, Abboud M, *et al.* Complementary and alternative
9 6 medicine use among pediatric patients with leukemia: the case of Lebanon.
10 7 *Integrative Cancer Therapies*. 2011;10(1):38-46.
11 8 31. Naja F, Fadel RA, Alameddine M, *et al.* Complementary and alternative
12 9 medicine use and its association with quality of life among Lebanese breast
13 10 cancer patients: a cross-sectional study. *BMC complementary and alternative*
14 11 *medicine*. 2015;15(1):444.
15 11
16 12 32. Naja F, Mousa D, Alameddine M, *et al.* Prevalence and correlates of
17 13 complementary and alternative medicine use among diabetic patients in
18 14 Beirut, Lebanon: a cross-sectional study. *BMC complementary and alternative*
19 15 *medicine*. 2014;14(1):185.
20 15
21 16 33. ORDER OF PHARMACY LEBANON.
22 17 34. Song M, Ung COL, Lee VW-y, *et al.* Community pharmacists' perceptions
23 18 about pharmaceutical service of over-the-counter traditional Chinese
24 19 medicine: a survey study in Harbin of China. *BMC complementary and*
25 20 *alternative medicine*. 2017;17(1):9.
26 21 35. Hijazi M A-EM, Ellakany A. Overview of CAM Products in Lebanon:
27 22 Results from Community Pharmacists survey. *unpublished data*.
28 23 36. Chang ZG, Kennedy DT, Holdford DA, *et al.* Pharmacists' knowledge and
29 24 attitudes toward herbal medicine. *Annals of Pharmacotherapy*.
30 25 2000;34(6):710-715.
31 25
32 26 37. Naidu S, Wilkinson JM, Simpson MD. Attitudes of Australian pharmacists
33 27 toward complementary and alternative medicines. *Annals of*
34 28 *Pharmacotherapy*. 2005;39(9):1456-1461.
35 29 38. Koh H-L, Teo H-H, Ng H-L. Pharmacists' patterns of use, knowledge, and
36 30 attitudes toward complementary and alternative medicine. *The Journal of*
37 31 *Alternative & Complementary Medicine*. 2003;9(1):51-63.
38 31
39 32 39. Kheir N, Gad HY, Abu-Yousef SE. Pharmacists' knowledge and attitudes
40 33 about natural health products: a mixed-methods study. *Drug, health care and*
41 34 *patient safety*. 2014;6:7.
42 34
43 35 40. Administration FUSFaD. Dietary Supplements,. 2018;
44 36 <https://www.fda.gov/Food/DietarySupplements/> (Accessed June 7, 2018).
45 37 41. Administration FUSFaD. Safety reporting Portal
46 38 [https://www.safetyreporting.hhs.gov/SRP2/en/Home.aspx?sid=24fc405f-](https://www.safetyreporting.hhs.gov/SRP2/en/Home.aspx?sid=24fc405f-58d2-4162-bb1a-f187b3be85df)
47 39 [58d2-4162-bb1a-f187b3be85df](https://www.safetyreporting.hhs.gov/SRP2/en/Home.aspx?sid=24fc405f-58d2-4162-bb1a-f187b3be85df) (Accessed June 7, 2018).
48 40 42. Shraim NY, Shawahna R, Sorady MA, *et al.* Community pharmacists'
49 41 knowledge, practices and beliefs about complementary and alternative
50 42 medicine in Palestine: a cross-sectional study. *BMC complementary and*
51 43 *alternative medicine*. 2017;17(1):429.
52 43
53 44 43. Khmour MR, Kurdi M, Hallak HO, *et al.* Pharmacists' Knowledge, Attitudes
54 45 and Practices Towards Herbal Remedies In West Bank, Palestine.
55 46 *International Archives of Medicine*. 2016;9.
56 47 44. Bastani P, Jooybar M, Ahmadzadeh M, *et al.* Community pharmacy-based
57 48 survey on pharmacists' knowledge, attitude, and performance regarding
58 49 dietary supplements: Evidence from South of Iran. *Natl J Physiol Pharm*
59 50 *Pharmacol*. 2017;7(4):396-402.
60

- 1
2
3 1 45. Bahall M, Legall G. Knowledge, attitudes, and practices among health care
4 2 providers regarding complementary and alternative medicine in Trinidad and
5 3 Tobago. *BMC complementary and alternative medicine*. 2017;17(1):144.
6 4 46. Ekor M. The growing use of herbal medicines: issues relating to adverse
7 5 reactions and challenges in monitoring safety. *Frontiers in pharmacology*.
8 6 2014;4:177.
9 7 47. Kamal S, Holmberg C, Russell J, *et al*. Perceptions and attitudes of Egyptian
10 8 health professionals and policy-makers towards pharmaceutical sales
11 9 representatives and other promotional activities. *PloS one*.
12 10 2015;10(10):e0140457.
13 11 48. Hajjar R, Bassatne A, Cheaito MA, *et al*. Characterizing the interaction
14 12 between physicians, pharmacists and pharmaceutical representatives in a
15 13 middle-income country: A qualitative study. *PloS one*. 2017;12(9):e0184662.
16 14 49. Manchanda P, Honka E. The effects and role of direct-to-physician marketing
17 15 in the pharmaceutical industry: an integrative review. *Yale J Health Pol'y L &*
18 16 *Ethics*. 2005;5:785.
19 17 50. Lie D, Boker J. Development and validation of the CAM Health Belief
20 18 Questionnaire (CHBQ) and CAM use and attitudes amongst medical students.
21 19 *BMC Medical Education*. 2004;4(1):2.
22 20 51. Belletti G, Shorofi SA, Arbon P, *et al*. Complementary and Alternative
23 21 Medicine: Italian Validation of a Questionnaire on Nurses' Personal and
24 22 Professional Use, Knowledge, and Attitudes. *Journal of nursing measurement*.
25 23 2017;25(2):292-304.
26 24 52. Karsch-Voelk M, Barrett B, Kiefer D, *et al*. Echinacea for preventing and
27 25 treating the common cold. *The Cochrane database of systematic reviews*.
28 26 2014;2:CD000530.
29 27 53. Lee AN, Werth VP. Activation of autoimmunity following use of
30 28 immunostimulatory herbal supplements. *Archives of dermatology*.
31 29 2004;140(6):723-727.
32 30 54. Hur M-H, Lee MS, Yang HJ, *et al*. Ginseng for reducing the blood pressure in
33 31 patients with hypertension: a systematic review and meta-analysis. *J Ginseng*
34 32 *Res*. 2010;34(4):342-347.
35 33 55. Kelber O, Nieber K, Kraft K. Valerian: no evidence for clinically relevant
36 34 interactions. *Evidence-Based Complementary and Alternative Medicine*.
37 35 2014;2014.
38 36 56. Ge B, Zhang Z, Zuo Z. Updates on the clinical evidenced herb-warfarin
39 37 interactions. *Evidence-Based Complementary and Alternative Medicine*.
40 38 2014;2014.
41 39 57. Stoddard GJ, Archer M, Shane-McWhorter L, *et al*. Ginkgo and warfarin
42 40 interaction in a large veterans administration population. Paper presented at:
43 41 AMIA Annual Symposium Proceedings2015.
44 42 58. Weinmann S, Roll S, Schwarzbach C, *et al*. Effects of Ginkgo biloba in
45 43 dementia: systematic review and meta-analysis. *BMC geriatrics*.
46 44 2010;10(1):14.
47 45 59. Rangel-Huerta OD, Gil A. Omega 3 fatty acids in cardiovascular disease risk
48 46 factors: An updated systematic review of randomised clinical trials. *Clinical*
49 47 *Nutrition*. 2017.
50 48 60. Imantaeva GM, Mussagalieva AT. Omega-3 Polyunsaturated Fatty Acids in
51 49 Treatment of Patients with Coronary Heart Disease and Type 2 Diabetes
52 50 Mellitus. *International Journal of BioMedicine*. 2012;2(1):31-33.

- 1
2
3 1 61. Watson PD, Joy PS, Nkonde C, *et al.* Comparison of bleeding complications
4 2 with omega-3 fatty acids + aspirin + clopidogrel--versus--aspirin + clopidogrel
5 3 in patients with cardiovascular disease. *The American journal of cardiology.*
6 4 2009;104(8):1052-1054.
7 5 62. OPR M. Medicines Safety Update No. 2; 2010. 2010.
8 6 63. Neiva RF, Al-Shammari K, Nociti FH, Jr., *et al.* Effects of vitamin-B complex
9 7 supplementation on periodontal wound healing. *Journal of periodontology.*
10 8 2005;76(7):1084-1091.
11 9 64. Posthauer ME, Dorner B, Collins N. Nutrition: a critical component of wound
12 10 healing. *Advances in skin & wound care.* 2010;23(12):560-572; quiz 573-564.
13 11 65. Lane DJ, Richardson DR. The active role of vitamin C in mammalian iron
14 12 metabolism: much more than just enhanced iron absorption! *Free radical*
15 13 *biology & medicine.* 2014;75:69-83.
16 14
17 15
18 16
19 17
20 18
21 19
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24 22
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3 **1 List of Tables**
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3 **Table 1:** Distribution of pharmacies across governorates in this study in comparison
4 to national distribution of pharmacies

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	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

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

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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)

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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

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1 **Table 5:** Evaluation of knowledge among a national sample of pharmacists in
 2 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)

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1 **Table 6.** Simple and multiple linear regression analyses for the association of
 2 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)

3 *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?

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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	<u>Scientific background</u> : Page 4 and 5 <u>Rationale</u> : In Lebanon, the increased prevalence of CAM use, the poorly regulated CAM market, together with the high rate of non-disclosure 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.

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4	Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding
5			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.
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12			(b) Describe any methods used to examine subgroups and interactions
13			N/A
14			(c) Explain how missing data were addressed
15			Only those with complete data were included in this study
16			(d) If applicable, describe analytical methods taking account of sampling strategy
17			N/A
18			(e) Describe any sensitivity analyses
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20	Results		
21	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
22			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).
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25			(b) Give reasons for non-participation at each stage
26			The two main reasons for refusal to participate were lack of interest (34.5%) and lack of time (27.3%).
27			(c) Consider use of a flow diagram
28			N/A
29	Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
30			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).
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		(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 (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	Simple linear regression results indicated that ‘receiving education/training on CAM products during university’ was the sole predictor of better knowledge ($\beta=0.68$, 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 ($\beta=0.68$, 95% CI: 0.29, 1.07)
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

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complete evaluation of the subject matter.

Done. See Discussion section

Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
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Generalisability	21	Discuss the generalisability (external validity) of the study results
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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
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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.