Al-mansour et al., Afr J Tradit Complement Altern Med. (2016) 13(1):6-16
http://dx.doi.org/10.4314/ajtcam.v13i1.2

MEDICAL STUDENTS' PERCEPTIONS OF COMPLEMENTARY AND ALTERNATIVE MEDICINE THERAPIES: A PRE- AND POST-EXPOSURE SURVEY IN MAJMAAH UNIVERSITY, SAUDI ARABIA

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Abstract

Background: Evidently, Complementary and Alternative Medicine (CAM) is increasingly a recognized medical practice that efficiently uses multiple treatment therapies and techniques in promoting the health and wellbeing of people as well as preventing and managing a variety of human disorders. Research in CAM, which courses exposure to diverse healthcare professionals, is important from many perspectives including improvement in teaching skills of faculty, enhancing capacity building, and innovative curriculum development. This pre- and post-design cross-sectional study aimed to assess perceptions, training needs, personal usage, use in office practice, and knowledge of two batches of medical students toward CAM therapies in Majmaah University, Saudi Arabia.
Materials and Methods: The second year medical students of the first (year 2012-13) and second (year 2013-2014) batch [n=26 & 39, respectively] were selected for this study. A reliable 16-item self-administered questionnaire was distributed among all students for answering before and after the 48-hour specific 19 CAM therapies course, in terms of CAM therapies are clearly conventional or alternative, training needs, effectiveness, personal use, use in practice, management of two clinical cases by CAM or conventional therapies, and views about which evidence based approach strongly support individual CAM modalities.
Results: Medical students' knowledge and perceptions of CAM therapies significantly improved across some sub-items of CAM questionnaire with a positive trend in the rest of its items including their views about CAM therapies, need for further training, personal use of therapies and advising patients regarding CAM practices strongly supported by randomized clinical controlled trials and published case studies.
Conclusion: CAM course tends to have positive impact on the knowledge and perceptions of medical students, in addition to need for further training, and personal use and use of CAM therapies in practice in line with strong evidence-based data regarding therapeutic efficacy. The preliminary results of this study call for further research in specific CAM modalities with a larger sample in academic settings across the nation.

Key words: Medical students; Complementary and Alternative Medicine; CAM course; CAM therapies; pre-post design study; Saudi Arabia.

Introduction

Unorthodox medical systems have diverse intervention approaches directed toward balancing mind-body-spirit dimension of a whole person with or without disease (Karff, 2009; Haylock, 2010). Traditional therapies that advocate the holistic concept (Lie & Boker, 2006; Qureshi & Al-Bedah, 2013; Ujala et al., 2007) were used effectively in innumerable diseases since ancient times, though research in holistic system approaches remained poorly organized (Chiappelli et al., 2005). However, over the past few decades, research into complementary and alternative medicine [CAM] is beginning to reveal empirically the underlying mechanisms of actions and effectiveness of traditional treatment modalities in various diseases (Cramer, 2014; Akan et al., 2012; Busse et al., 2008; Adrian & Clare, 2003; Liu et al., 2013), which accordingly are cost-effective and efficient with minor adverse effects comparable to placebo (Herman et al., 2012; Bulletin World Health Organization, 2004). A large number of surveys conducted worldwide evidenced the emerging popularity of CAM use mostly in poor population and under-served communities, either adjunctive or alternative, in human diseases attributable to a variety of plausible reasons including patients' dissatisfaction with, poor outcomes, severe adverse effects, free market forces, consumers' demands, and high costs of allopathic medications (Nahin et al., 2007; Davis & Weeks, 2012; Barnes et al., 2008; Halterman-Cox et al., 2009; Wolsako et al., 2000).

In the Eastern world, the bedrock of unorthodox medicine, traditional medical schools were established long time back to meet the increasing demand of health consumers and health providers, and to regulate CAM practices with a focus on clinical research and training issues. Similar developmental trends driven by policy statements of influential bodies (Institute of Medicine, 2005; White House Commission CAM, 2005) have been rapidly emerging in the Western world (Brokaw, 2002). Notably, despite several challenges and barriers (Sierpina et al., 2007; Frenkel & Arye, 2001), CAM curriculum is being increasingly incorporated in many universities of the world to teach medical students about CAM practices (Levine et al., 2003; Bhattacharya, 2000). How medical students and healthcare professionals perceive CAM and also how they develop their related knowledge and practice is relatively an old avenue for research in the Eastern world, though the western world has produced huge data on this particular perspective over few decades (Chaterji et al., 2007).

Local Scenario of CAM

A PubMed search of relevant literature using key word complementary and alternative medicine retrieved a dozen of articles on CAM (Elolemy & Al-Bedah, 2012; Al-Rowais et al., 2010; Al-Zahim et al., 2013; Al-Bedah et al., 2012; Al-Rowais et al., 2012; Al-Bedah et al., 2013; Jazieh et al., 2012; Gad et al., 2013; Al-Faris et al., 2008; Alkharfy, 2010; Awad et al., 2012; Allam et al., 2014; Al-Rukban et al., 2012), however, only few studies assessed the knowledge, attitude and practice (KAP) of health professionals and consumers in Eastern Mediterranean region countries (Elolemy & Al-Bedah, 2012; Al-Bedah et al., 2012; Al-Rowais et al., 2012; Al-Bedah et al., 2013; Alkharfy, 2010). The results

of these studies suggest that CAM therapies especially herb preparations and locally known therapies are used by a substantial number of patients, public and professionals have positive perceptions about CAM, identified some barriers against CAM, they have good knowledge in CAM, and further express to have more knowledge and training in CAM and support its integration into primary healthcare (Elolemy & Al-Bedah, 2012; Al-Bedah et al., 2012; Al-Rowais et al., 2012; Al-Bedah et al., 2013; Alkharfy, 2010) and medical schools (Al-Rukban et al., 2012). We found only one study from Kuwait that assessed KAP of medical and pharmacy students on CAM therapies (Awad et al., 2012).

This study aimed to assess the pre-and post-CAM course impact on perceptions, attitudes, knowledge, personal usage, and use in office practice, training needs, effectiveness issues, evidence-based support, and experience of second year undergraduate medical students in Majmaah University. The CAM course included well-known 19 CAM therapies used commonly across the world.

Rationale

Evidently, biomedicine has consistently utilized medications and medical devices effectively in diverse acute and chronic diseases (Halterman-Cox et al., 2009; Subhose, 2005). However, a proportion of patients due to multiple biopsychosocial and cultural reasons including potentially dangerous complications neither use nor respond to conventional medications and prefer traditional therapies (Haylock, 2010; Bulletin WHO, 2004; Barnes et al., 2008; Halterman-Cox et al., 2009; Wolsako et al., 2000; IOM, 2005; Tilburt & Kaptchuk, 2007; Gogtay et al., 2002), the use of which is increasing globally for health promotion and wellbeing, good quality of life, prevention and therapeutic purposes (Bulletin WHO, 2004; Halterman-Cox et al., 2009; Wolsako et al., 2013). Now, conventional doctors also use traditional therapies in their practice (Gawde et al., 2013), with additional push for its use by international health organizations, funders and research institutions (IOM, 2005; White House Commission CAM, 2005). Furthermore, medical schools and universities have been integrating CAM curriculum into their education system in the Western world (Brokaw, 2002; Levine et al., 2003; Bhattacharya, 2000). All these driving forces were important determinants for adopting CAM curriculum for teaching undergraduate medical students in Majmaah University. Another important rationale is that this CAM course may be adopted by other universities in KSA and Arabian Gulf countries.

Significance

Besides improving knowledge and perceptions of medical students about well stablished CAM therapies, the students' feedback about this course will help curriculum developers to further align it with students' expressed needs in CAM therapies course. Medical students exposed to CAM course may practice as CAM doctors and also take up advanced studies in integrative medicine (IM) in the future, that might be an important step in CAM capacity building.

Hypothesis

This study assumes that the exposure of medical students to CAM therapies course will improve their knowledge, perceptions, attitudes and practice of certain CAM therapies.

Method and Material

Setting

The Majmaah University, established in accordance with a decree of the Custodian of the Two Holy Mosques King Abdullah Bin Abdul Aziz Al-Saud and the Prime Minister and Chairman of Higher Education on Ramadan 3, 1430H corresponding to August 24, 2009, is located 180 kilometers north of Riyadh city. Majmaah University serves five provinces with a total population of 250,000 and is the value-added icon to the people of the region in sociocultural, research and education pathways and a beacon of advanced knowledge and enlightenment to prospective students in the region (http://mu.edu.sa/en/about/history).

Study Design, Sample and Data Collection

This cross-sectional study has pre- and post-design. All medical undergraduates of second year from first batch [n=26] of year 2012-13 and second batch [n=39] of year 2013-14, were selected for this study. The total sample was 65 whose pre-and post-test responses were available. A self-administered, validated questionnaire was given to all participants in a classroom who were advised to fill it out before the beginning of the CAM therapy course. They were instructed that if they do not understand any item on the questionnaire, they should feel free to contact one of the team members supervising distribution of this questionnaire. All questionnaires were collected and checked carefully for completeness. If any item on the questionnaire was not answered, then that particular student was instructed to complete it before leaving the classroom. Subsequently, the same questionnaire was again given to the students to fill after the completion of CAM module. All questionnaires were collected and checked carefully for completeness.

CAM Training Course

The Department of Community Medicine of College of Medicine, Majmaah University in collaboration with National Center of Complementary and Alternative Medicine [NCCAM], Riyadh developed a comprehensive course on 19 CAM therapies for the academic year 2013-2014 and its details are described elsewhere (Mansoor et al., 2015). Briefly, this course comprised of mandatory module, core curriculum lectures, problem-based learning, continuing education modules as well as research and clinical fellowship, student assignments with a number of specific objectives and effective 5-level learning outcomes (Mansoor et al., 2015) mainly focused on an overview of most commonly used CAM modalities worldwide, in addition to CAM therapies in vogue locally [Available upon request from AM Al-Bedah]. All teachers familiar with biomedical and CAM therapies associated with effective teaching of CAM to students (Quartey et al., 2012) adopted a number of teaching methods. However, they were requested to align their presentations to the following competency based areas; basic definitions of CAM and IM, history, epidemiological trends, common clinical indicators and applications, adverse effects and drug-drug interactions, research based evidence for efficacy, resources for comprehensive CAM therapies information, and training standards for CAM practitioners (Kligler et al., 2007; Pearson & Chesney, 2007; Lee et al., 2007).

http://dx.doi.org/10.4314/ajtcam.v13i1.2

CAM Questionnaire

We searched relevant international literature for identifying questionnaires used in knowledge, perceptions and practice of CAM research in general but especially pre-and post-surveys related to CAM and Integrative Medicine (Lie & Boker, 2006; Halterman-Cox et al., 2009; Schneider et al., 2003; Furnham & McGill, 2003; Kreitzer et al., 2002). From these researches, we selected an evaluation tool that was used in many surveys [Halterman-Cox et al., 2009; Chaterji et al., 2007; Kreitzer et al., 2002). This questionnaire is about CAM survey of knowledge, practice and attitudes of healthcare professional students (Kreitzer et al., 2002) originated from Kreitzer's University of Minnesota Academic Health Center. The questionnaire used in the present study was adapted following suggestions of three CAM experts, two faculty staff and some second year medical students. Accordingly in first round, the research team simplified the English wordings of some items and sub-items of this questionnaire. This modified questionnaire was pretested on 15 medical students before its application. Students provided no suggestions for any significant changes in the questionnaire. Notably, though all components of this questionnaire were retained, only the following items specifically related to individual defined CAM therapies (http://www.ahna.org/Home/For-Consumers/Holistic-Modalities;https://nccih.nih.gov /health/whatiscam) [Table 1] were used in this study; 4/1) CAM approaches – "alternative" or mainstream?, 5/2) Effectiveness of CAM modalities, 6/3) prior exposure to CAM training, 7/4) further need of training in CAM, 8/5) personal use of CAM, 9/6) CAM approaches in participants' practice, 11/7) evidence based for use of CAM practices, 13/8) a female case of seasonal allergy and choice of CAM therapies, 14/9) in a case of acute appendicitis, which CAM therapies are most effective. Thus we included students' responses on items 4-9, 11, 13, and 14 in this study. The research team used Likert scale for rating participants' responses because studies reported that the open ended questionnaires are filled out completely compared to closed-ended questionnaires (Griffith et al., 1999).

Table 1: CAM therapies

CAM therapies	Brief description
Acupuncture	This therapy uses needles on acupoints and releases blocked qi, due to imbalance in yin and yang forces in the body that passes through meridians. It stimulates functions by evoking the body's natural healing responses through various physiological systems. Like acupuncture, acupressure applies pressure to certain meridian points but without the use of needles.
Aromatherapy	The skilled and controlled use of essential oils, volatile liquids distilled from plants, shrubs, trees, flowers, roots and seeds. They contain oxygenating molecules that transport the nutrients to cells of the body.
Bioelectromagnetic	It involves the use of electromagnetic energy, low-voltage electricity, magnetic fields, or radio waves generated by electric current to diagnose or treat disease, which develops when electromagnetic frequencies/ energy fields within the body go out of balance.
Biofeedback	Biofeedback (Neurofeedback, theramal feedback and electromyography) involves training patients to control at will the involuntary physiological processes such as muscle tension, blood pressure, or heart rate and treats chronic pain, urinary incontinence, hypertension, tension headache, and migraine.
Chiropractic	A healthcare system that focuses on structural alignment of the spine through its manipulation, joints re-establishment, and maintenance of normal functioning of the nervous system, in addition to massage, nutrition, and specialized kinesiology.
Herbal	Herbal medicine, a traditional dietary supplement, is use of plants for medicinal purposes and promotion of health, and the study of such use.
Homeopathy	Advocates the use of substances in accordance to its three tenets: (1) like cures like, (2) the more diluted remedy reflects greater potency, (3) both illness and treatment are specific to the whole person and hence symptoms are body's effort to get rid of disease.
Hypnosis*	The hypnotist use focused attention through guided imagery technique for accessing the unconscious mind of a person for memory recall, treatment of psychiatric and physical disorders, skill enhancement and growth.
Massage	The use of strokes and pressure on the body to decrease tension and provide comfort, increase circulation and body awareness, relieve muscular pain, and overall an excellent therapy to reduce emotional as well as physical stresses.
Music	Music therapy is the clinical and evidence-based use of music interventions in terms of creating, singing, moving to, and/or listening to music to accomplish individualized goals such as physical, emotional, cognitive, and social needs within a therapeutic relationship by a credentialed professional who has completed an approved music therapy program.
Nutritional Therapy	The therapeutic use of dietary supplements in terms of food combining and macrobiotics to treat illness and maintain good health.
Prayer healing**	Prayers, a form of putative biofields subscribe to human beings who are infused with human energy force that has diverse terminologies in different cultures, such as qui in TCM, and this life force regulates a person's spiritual, psychological and physical health and is impacted by yin and yang.
Meditation	An ancient method, a shoot of yoga, of mind relaxation for relieving anxiety, depression and pains and aches of biopsychosocial origin together with achieving eternal peace.
Rolfing***	Rolfing or Rolf therapy or structural integration is a holistic system of bodywork that uses deep manipulation of the body's soft tissue to realign and balance the body's myofacial structure and it improves posture, relieves chronic pain and reduces stress.
Therapeutic touch#	A technique for balancing energy flow in the body through transfer of human energy and based on the principle of balance linked to health meaning thereby growth, order and wholeness. Healing touch applies kinesiology, acupressure, massage and nutrition to maximize whole health and focuses on the uniqueness of an individual to measure muscle strength, like biofeedback, to determine individual needs.
Hijama	Hijama (wet cupping) is a traditional modality that creates a negative pressure in the applied area and rids body of tension and harmful pathogens by drawing out the excess blood lying dormant underneath the skin.
Cauterization	A traditional practice that involves the burning of part of a body to remove or close off a part of it in a process called cautery, which destroys some tissue, in an attempt to mitigate damage, remove an undesired growth, or minimize other potential medical harmful possibilities such as infections
Naturopathy	Proposes that there is a healing power within the body that maintains and restores health and it is strengthened by lifestyle changes, nutrition and dietary supplements, phytomedicine, homeopathy, and TCM.
Osteopathy	Focus on the relationship between body structure and its function, which are subject to a range of disorders and use of various forms of physical manipulation to facilitate the body's self-healing processes, in addition to use of modern therapies.
*Guided imagery, **Spiritual, ***Structural integration, #Healing touch	

Data Analysis

The recorded responses on pre-and post-course questionnaires were entered into the computer. The SPSS version 21 was used to analyze the data. Pre-test data related to first [n=26] and second [n=39] batches of medical students was merged and similarly post-test data of two batches was also merged. Participants' responses wherever necessary were pooled for analysis purpose. Besides frequency distribution, we used 3 x 2 and 2 x 2 contingency tables for comparing data. Non-parametric tests of Chi square and Fisher's Exact were used for comparing pre- [group 1] and post-test [group 2] responses of medical students. P value ≤ .05 was considered significant.

Ethical Considerations

The research protocol was submitted to the ethics committee of the NCCAM, Riyadh and Majmaah University, and both committees approved the protocol vide no. NCCAM-5 dated 10.12.2013 and MRIEC-NF04/COM-2013 dated 12.12. 2013, respectively. Prior to filling out the questionnaire, the participating students were informed that the team is conducting a survey of attitudes, awareness, and self-perceived skills in CAM therapies use and your input will be used to construct future CAM educational programs for students and residents, and allied health professionals. The research team will maintain your anonymity and confidentiality. Participation in this study is voluntary; however, you may decide not to complete this survey at any time without penalty. Completion of this survey indicates your consent to participate.

Results

CAM Approaches – Alternative or Mainstream

The mean age of male participants was 21.13±.97 (range=7, minimum and maximum age = 20 and 27). No female students were enrolled in this university when this study was conducted. When medical participants' pre- and post- course responses regarding whether or not CAM therapies are clearly mainstream/conventional or clearly alternative or no opinion were analyzed, mixed results were observed. Students significantly recognized bioelectromagnetic, chiropractic, homeopathy, meditation, Rolfing, cauterization, naturopathy and osteopathy post exposure as clearly alternative therapies. Participants were significantly neutral regarding acupuncture, though trend towards clearly mainstream therapy was observed [Table 2].

Table 2: CAM Approaches – Alternative or Mainstream

CAM therapies	Pretest – Group 1						Posttest - Group 2						Exact p
	CM		N		CA		CM		N		CA		
	No.	%	No.	%	No.	%	No	%	No.	%	No.	%	
Acupuncture	18	27.7	21	32.3	26	40	26	40	9	13.9	30	46.2	0.038*
Aromatherapy	6	9.2	35	53.8	24	36.9	9	13.9	22	33.8	34	52.3	0.071
Bioelectromagnetic	10	15.4	38	58.5	17	26.2	14	21.5	21	32.3	30	46.2	0.01*
Biofeedback	10	15.4	37	56.9	18	27.7	10	15.4	31	47.7	24	36.9	0.49
Chiropractic	5	7.7	44	67.7	16	24.6	19	29.2	13	20	33	50.8	0.0001*
Herbal	16	24.6	27	41.5	22	33.8	18	27.7	17	26.2	30	46.2	0.163
Homeopathy	7	10.8	40	61.5	18	27.7	12	18.5	17	26.2	36	55.4	0.0002*
Hypnosis/guided imagery	13	20	26	40	26	40	8	12.3	25	38.5	32	49.2	0.4003
Massage	22	33.8	25	38.5	18	27.7	19	29.2	16	24.6	30	46.2	0.744
Music	11	16.9	34	52.3	20	30.8	12	18.5	37	56.9	16	24.6	0.735
Nutritional supplements	28	43.1	23	35.4	14	21.5	27	41.5	14	21.5	24	36.9	0.889
Prayer/spiritual healing	29	44.6	18	27.7	18	27.7	18	27.7	20	30.8	27	41.5	0.106
Meditation	13	20	40	61.5	12	18.5	11	16.9	29	44.6	25	38.5	0.039*
Rolfing (SI)	5	7.7	45	69.2	15	23.1	6	9.2	26	40	33	50.8	0.002*
Therapeutic/healing touch	9	13.9	34	52.3	22	33.8	12	18.5	24	36.9	29	44.6	0.21
Hijama	15	23.1	24	36.9	26	40	20	30.8	13	20	32	49.2	0.99
Cauterization	7	10.8	45	69.2	13	20	16	24.6	15	23.1	34	52.3	0.00001*
Naturopathy	13	20	35	53.8	17	26.2	18	27.7	16	24.6	31	47.7	0.002*
Osteopathy	19	29.2	36	55.4	10	15.4	22	33.8	20	30.8	23	35.4	0.007*
CM= clearly mainstream, N= neutral, CA=clearly alternative, SI=structural Integration, *significant													

CAM Modalities and Effectiveness

When medical students' pre- and post-course responses with regard to various CAM therapies being effective or not were compared, some trends were observed [Table 3]. Therapies perceived just effective prior to course were considered significantly more effective post course ($p<0.05$) and these were acupuncture, chiropractic, hypnosis, meditation, cauterization, naturopathy, and osteopathy. Therapies perceived just ineffective prior to course were considered significantly more ineffective post course ($p<0.05$) and these were aromatherapy, bioelectromagnetic, biofeedback, homeopathy, prayers, therapeutic touch, and hijama. Another trend in students' perceptions about effectiveness of CAM therapies observed was that no significant changes pre-and post-course were observed with regard to herbs, massage, music, nutritional supplements, and Rolfing (>0.05).

Prior to CAM course, none of the participants were exposed to training in any of the 19 considered CAM therapies in the present research, as they had no CAM course-supported curriculum in Majmaah University. Following CAM course exposure, when they were asked about need of further training, their responses were as follows: 1) no need of further training in CAM (n=12, 18.5%), 2) need sufficient training

http://dx.doi.org/10.4314/ajtcam.v13i1.2

for advising patients about CAM therapies use (n=23, 35.4%) and 3) need sufficient training to personally provide use of CAM therapies to clients seeking healthcare (n=35, 46.1%).

Table 3: CAM modalities and effectiveness

CAM therapies	Pretest – Group 1						Posttest - Group 2						Exact p
	Effective		Neutral		Not Effective		Effective		Neutral		Not Effective		
	No. %		No.%		No. %		No.%		No.%		No. %		
Acupuncture	40	61.5	15	23.1	10	15.4	57	87.7	5	7.7	3	4.6	0.002*
Aromatherapy	19	29.2	23	35.4	23	35.4	22	33.8	6	9.2	37	6.9	0.001*
Bioelectromagnetic	25	38.5	24	36.9	16	24.6	20	30.8	6	9.2	39	60	0.00001*
Biofeedback	21	32.3	24	36.9	20	30.8	20	30.8	2	3.1	43	66.2	0.00001*
Chiropractic	16	24.6	31	47.7	18	27.7	42	64.6	10	15.4	13	20	0.00001*
Herbal	42	64.6	8	12.3	15	23.1	52	80	5	7.7	8	12.3	0.143
Homeopathy	22	33.8	30	46.2	13	20	36	55.4	5	7.7	24	36.9	0.00001*
Hypnosis/guided imagery	17	26.2	22	33.8	26	40	26	40	7	10.8	32	49.2	0.006*
Massage	45	69.2	6	9.2	14	21.5	51	78.5	3	4.6	11	16.9	0.42
Music	23	35.4	14	21.5	28	43.1	15	23.1	11	16.9	39	60	0.145
Nutritional supplements	44	67.7	8	12.3	13	20	44	67.7	3	4.6	18	27.7	0.214
Prayer/spiritual healing	48	73.8	7	10.8	10	15.4	59	90.8	1	1.5	5	7.7	0.026*
Meditation	20	30.8	20	30.8	25	38.5	30	46.2	3	4.6	32	49.2	0.0004*
Rolfing (SI)	20	30.8	17	26.2	28	43.1	18	27.7	13	20	34	52.3	0.543
Therapeutic/healing touch	26	40	22	33.8	17	26.2	18	27.7	11	16.9	36	55.4	0.002*
Hijama	47	72.3	7	10.8	11	16.9	58	89.2	1	1.5	6	9.2	0.02*
Cauterization	2	3.1	30	46.2	9	13.9	42	64.6	1	1.5	22	33.8	0.00001*
Naturopathy	25	38.5	25	38.5	15	23.1	39	60	2	3.1	24	36.9	0.00001*
Osteopathy	26	40	26	40	13	20	40	61.5	4	6.2	21	32.3	0.00001*
SI=structural Integration, *significant.													

Personal Use of CAM Therapies

When participants were asked pre- and post-course about the personal use of CAM therapies, majority of medical students did not use CAM therapies personally, either prior to (46 % to 91%) or after the completion of the course (35% to 91%) and hence, no significant differences were observed [Table 4]. Medical students prior to course exposure reported significant negative effects of meditation compared to post-course (P<0.017) and conversely their positive outcome related to meditation doubled post-course compared to pre-course. With regard to personal use of hijama, medical students' perceptions and positive outcome significantly increased post-course exposure compared to pre-course (P<0.03) and correspondingly negative outcome decreased by about five times post exposure.

Table 4: Personal use of CAM therapies

CAM therapies	Pretest – Group 1						Posttest - Group 2						Exact p*
	NU		UP+		UN-		NU		UP+		UN-		
	No. %		No.%		No. %		No.%		No.%		No. %		
Acupuncture	59	90.8	3	4.6	3	4.6	57	90.7	4	6.2	4	6.2	0.664
Aromatherapy	54	83.1	6	9.2	5	7.7	52	80	11	16.9	2	3.1	0.247
Bioelectromagnetic	59	90.8	3	4.6	3	4.6	56	89.2	6	9.2	3	4.6	0.583
Biofeedback	58	9.2	5	7.7	2	3.1	52	80	6	9.2	7	10.7	0.202
Chiropractic	55	4.6	5	7.7	5	7.7	55	84.6	6	9.2	4	6.2	0.903
Herbal	32	9.2	21	32.3	12	18.4	26	40	28	43.1	11	16.9	0.435
Homeopathy	56	6.2	4	6.2	5	7.7	59	90.8	6	9.2	0	00	0.064
Hypnosis/guided imagery	54	3.1	5	7.7	6	9.2	52	80	6	9.2	7	10.7	0.902
Massage	32	9.2	26	40	6	9.2	40	61.5	17	26.2	8	12.4	0.217
Music	51	78.5	7	10.7	7	10.7	54	83.1	8	12.4	3	4.6	0.416
Nutritional supplements	39	60	17	6.2	9	13.8	39	60	21	32.3	5	7.7	0.457
Prayer/spiritual healing	30	46.2	34	2.3	1	1.5	23	35.4	38	58.5	4	6.2	0.229
Meditation	51	78.5	3	4.6	11	16.9	56	89.2	7	10.7	2	3.1	**0.017**
Rolfing (SI)	54	83.1	5	7.7	6	9.2	55	84.6	6	9.2	4	6.2	0.778
Therapeutic/healing touch	49	75.4	8	2.4	8	12.4	56	89.2	4	6.2	5	7.7	0.287
Hijama	47	72.3	8	2.4	10	15.4	49	75.4	14	21.4	2	3.1	**0.03**
Cauterization	54	83.1	5	7.7	6	9.2	52	80	7	10.7	6	9.2	0.83
Naturopathy	52	80	6	9.2	7	10.7	54	83.1	5	7.7	6	9.2	0.902
Osteopathy	52	80	5	7.7	8	12.4	56	89.2	7	10.7	2	3.1	0.129
NU= would or would not consider using it, UP= Used with positive/neutral outcomes, UN=Used with negative outcomes, SI=structural Integration, *Fisher Exact Test													

http://dx.doi.org/10.4314/ajtcam.v13i1.2

Use of CAM in Students' Practices

When medical participants were asked how they will use CAM therapies or refer patients to trained CAM practitioners, their pre- and post- course responses showed that they would either use significantly acupuncture, chiropractic, herbal medications, prayers/spiritual healing, hijama, and naturopathy in the management of patients in their office practice or recommend their patients to trained practitioners through their referral network [Table 5].

Table 5: Use of CAM in students' practice

CAM therapies	Pretest – Group 1				Posttest - Group 2				Exact p
	NO	%	YES	%	NO	%	YES	%	
Acupuncture	31	47.7	34	52.3	11	16.9	54	83.1	**0.0001**
Aromatherapy	28	43.1	37	56.9	22	33.8	43	66.2	0.2794
Bioelectromagnetic	29	44.6	36	55.4	27	41.5	38	58.5	0.7231
Biofeedback	27	41.5	38	58.5	25	38.5	40	61.5	0.7203
Chiropractic	33	50.8	32	49.2	10	15.4	55	84.6	**0.00001**
Herbal	27	41.5	38	58.5	8	12.3	57	87.7	**0.0001**
Homeopathy	25	38.5	40	61.5	26	40	39	60	0.8574
Hypnosis/guided imagery	31	47.7	34	52.3	30	46.2	35	53.8	0.8604
Massage	14	21.5	51	78.5	12	18.4	53	81.5	0.661
Music	37	56.9	28	43.1	45	69.3	20	30.8	0.1459
Nutritional supplements	19	29.2	46	70.8	17	26.2	48	73.8	0.695
Prayer/spiritual healing	16	24.6	49	75.4	6	9.2	59	90.8	**0.0193**
Meditation	23	35.4	42	64.6	25	38.5	40	61.5	0.7162
Rolfing (SI)	27	41.5	38	58.5	30	46.2	35	53.8	0.5959
Therapeutic/healing touch	26	40	39	60	30	46.2	35	53.8	0.4786
Hijama	16	24.6	49	5.4	5	7.7	60	92.3	**0.0087**
Cauterization	30	46.2	35	53.8	25	38.5	40	61.5	0.3747
Naturopathy	32	49.2	33	50.8	19	29.2	46	70.8	**0.019**
Osteopathy	32	49.2	33	0.8	25	38.5	40	61.5	0.2159

NO = Would not recommend, would endorse but not personally provide or refer, YES = would provide personally, would refer to a CAM practitioner, SI=structural Integration,

Evidence for Use of CAM Practices

Medical students' were required to recommend a conventional or CAM therapy in light of research based evidence, and their pre- and post-course responses showed that randomized controlled clinical trials (RCCTs) in humans and published case studies stood the test of significantly supporting the use of CAM or conventional therapies [Table 6]. This means that the therapeutic efficacy of CAM therapies based on RCCTs and case series studies was the significant indicator for using CAM therapies in their practice.

Table 6: Evidence for use of CAM practices

Types of Evidence	Pretest – Group 1				Posttest - Group 2				P value
	YES	%	NO	%	YES	%	NO	%	
Proven Mechanism	63	96.9	2	3.1	61		4	6.2	>0.05
Proposed mechanism of action	60	92.3	5	7.7	58		7	10.8	>0.05
RCCTs involving animals	59	90.8	6	9.2	57		8	12.3	>0.05
RCCTs involving humans	56	86.2	9	13.8	64		1	1.5	**<0.05**
Epidemiological studies	60	92.3	5	7.7	62		3	4.5	>0.05
Published case studies	57	87.7	8	12.3	64		1	1.5	**<0.05**
Successful use in my practice	61	93.8	4	6.2	62		3	4.5	>0.05
Colleagues recommendations	56	86.2	9	13.8	60		5	7.7	>0.05
Personal experience	59	90.8	6	9.2	57		8	12.3	>0.05
Patient reports	60	92.3	5	7.7	61		4	6.2	>0.05
Clinical trials	59	90.8	6	9.2	62		3	4.5	>0.05

YES=Essential, somewhat essential, somewhat important, NO=Unimportant, RCCTs=Randomized controlled clinical trials,

Two Case Scenarios

Participants were required to choose between CAM or allopathic therapies in the management of children with seasonal allergies and acute appendicitis both during pre- and post- course survey [Table 7]. Unorthodox modalities were significantly recommended for the care of children with seasonal allergies [p=0.0006] but no significant changes were observed in the recommendation of therapies in a clinical case of acute appendicitis [p=0.44].

http://dx.doi.org/10.4314/ajtcam.v13i1.2

Table 7: Distribution of responses (multiple by individual participant) by allopathic versus non-allopathic therapies for the care of patients with seasonal allergies and acute appendicitis

Therapies	Seasonal Allergies				Exact p	Acute Appendicitis				Exact p
	Pretest – Group 1		Posttest - Group 2			Pretest – Group 1		Posttest - Group 2		
	No.	%	No	%		No	%	No	%	
Allopathic	36	55.4	17	26.2	0.0006 **	44 67.7		48	73.8	0.44* **
Unorthodox*	29	44.6	48	73.8		21	32.3	17	26.2	

*Included acupuncture, homeopathic medicine, naturopathic medicine, chiropractic, prayer/spiritual healing, energetic healing, traditional Chinese medicine, and other. **Significant, *** Non-significant

Discussion

This explorative study mainly focuses on medical students' perceptions related to specific CAM therapies included in the course: alternative/conventional aspects, effectiveness and need of training, personal use, recommendations to use in practice, several levels of evidence supporting CAM and two simulated clinical scenarios to be managed by alternative or conventional therapeutic modalities. Although faculty taught medical students about common CAM approaches, there were significant associations between prior and post course perceptions of participants reflecting poor knowledge and also improvements in relation to certain CAM modalities. Their prior knowledge in CAM therapies was poor because 8% to 45 % of participants reported CAM therapies to be clearly conventional/clearly main stream and another 28% to 69% did not take either side, conventional or alternative. Although a survey by Yeo and colleagues was devoid of pre-post design, they reported that the first to fifth year medical students showed poor knowledge of common CAM therapies (Yeo et al., 2010) and similar trend is reported in medical schools in Wales where 32% of undergraduate entry students had no familiarity with CAMs compared with 51% graduate entry students (Taylor & Blackwell, 2010). Notably, in a web-based survey, even physicians at an academic medical center were unfamiliar with 3 of 13 CAM modalities (23%) and 2.7 of10 herbs (27%) (Wahner-Roedler et al., 2006) that might be attributed to the number of CAM therapies included in the study, the widest field of complementary medicine therapies and lack of training in CAM. In a cross-sectional study, Yildirim and colleagues reported that both students of nursing and medicine showed limited knowledge of CAM therapies (Yıldırım et al., 2010). In another survey in academic setting, 74% of faculty and 53% of students considered chiropractic a mainstream therapy and similar views in varying percentages were expressed regarding nutritional supplements (48% & 53%), massage (45% & 33%) and herbal medicines (13% & 28%), whereas aromatherapy and bioelectromagnetic therapies were considered clearly alternative by more than 50% of faculty and pharmacy students (Harris et al., 2006), these findings partially consistent with the present study.

CAM therapies are reported to be safe, highly cost-effective, cost savings (Herman et al., 2012; Bull WHO, 2004), and are easily accessible to all healthcare users (Gale, 2014; Bazargan et al., 2008). Nonetheless, medical students and professionals tend to have poor knowledge and underutilize CAM therapies worldwide. This trend is attributable to controversies surrounding CAM therapies; relatively unknown mechanisms of action, placebo effect, interactions with orthodox medications, and relative lack of evidence based data about therapeutic efficacy in various diseases (Pearson & Chesney, 2007; Harris et al., 2006; Hartley et al., 2014 a, b; Amri & Haramati, 2010). However, the auto-medication of CAM therapies by public and consumers at large is on the rise across the world (El-Nimr et al. 2015). Nonetheless, World literature on CAM modalities suggests that these therapies, such as acupuncture could be effectively used as adjuncts in a variety of diseases such as primary hyperlipidemia (Sun & Song, 2015) and also as alternatives in other conditions such as depression and depressive symptoms arising from chronic medical conditions including cancer (Yim et al., 2009). This empirical information needs to be disseminated among healthcare providers and consumers for judicious use of CAM therapies in health practices at primary, secondary and tertiary healthcare levels (White House CCAM, 2010). In light of this research, it is slightly surprising that while medical students were knowing that this course is about CAM therapies, then why they did not choose all CAM therapies as clearly alternative/complementary at least post exposure? However, this might be due to partially ineffective teaching of CAM course by faculty, students' minimal motivation to familiarize with CAM therapies, wider field and the number of CAM therapies and poor understanding of relationship of mainstream conventional medicine with CAM and mainstream inclusion of complementary medicine (Wiese, 2010; Tabish, 2008).

According to this research, CAM therapies reported to be significantly effective were acupuncture, chiropractic, hypnosis, meditation, cauterization, naturopathy, and osteopathy. Conversely aromatherapy, bioelectromagnetic, biofeedback, homeopathy, prayers, therapeutic touch, and hijama were perceived significantly less effective. In additional, no significant changes pre- and post-course were observed related to herbs, massage, music, nutritional supplements, and Rolfing. These findings are inconsistent with other studies (Awad et al., 2012). Awad and colleagues reported that the most effective CAM therapies perceived by students were massage, herbal products, prayers, roqia, and on the contrary cauterization was the most harmful (Awad et al., 2012). In the same vein, Harris and colleagues reported that more than 50% of pharmacy students reported that moderately or highly effective therapies were acupuncture, chiropractic, herbal medicine, massage, nutritional supplements, and prayer/spiritual healing. Only 10% students viewed CAM therapies to be effective, some of which were aromatherapy, bioelectromagnetic therapies, and homeopathy, the results consistent with the present study (Harris et al., 2006). Furnham and McGill reported that the third year medical students perceived CAM therapies as being less effective compared to first year students and they were also less enthusiastic in receiving training in complementary and alternative techniques (Furnham & McGill, 2003).

According to this study, none of the participants prior to CAM training course were exposed to training in any of the 19 considered CAM therapies which is consistent with other studies (Taylor & Blackwell, 2010). However, post-CAM course 18.5% of participants expressed no need of further training in CAM, 35.4% and 46% of students expressed a need for sufficient training for advising patients and to personally provide use of CAM therapies to clients seeking healthcare, respectively. In a survey, Harris et al reported that 67% of pharmacy students and faculty reported no CAM training in all modalities (Harris et al., 2006). Another study reported that preclinical medical students were least familiar with all 5 CAM therapies compared to hospital physicians and general practitioners (Perkin et al., 1994). In a survey of first [n=111] and second year [n=155] medical students and 15 CAM therapies, Chaterji and colleagues reported that unlike the present study most students expressed level of desired training related to “sufficient to advise patients about use,” for 11 modalities and the greatest level of training was desired for 4 therapies including acupuncture, chiropractic, herbal medicine, and nutritional supplements (Chaterji et al, 2007). Similarly, Taylor and Blackwell reported that a significant number of students wished to familiarize with CAMs (Taylor & Blackwell, 2010). In another survey, medical students most preferred CAM disciplines were acupuncture, phytotherapy and homeopathy for studying purpose (Nicolao et al., 2010). In a survey, Awad and colleagues also found that most students expressed the need for education in CAM therapies to advise their patients (Awad et al., 2012).

According to this survey, most students endorsed "no would not consider using it" or "no would consider using it" and 4.6% to 52% of medical students personally used CAM therapies with positive outcome whereas 3% to 18% used with negative outcomes and this trend varied 6% to 59% and 0% to 17% post-exposure, respectively. Post-course, students significantly expressed to personally use meditation and hijama associated with positive outcomes. In a systematic review, only 10% medical students were found to consult CAM practitioners compared to nursing (45%) and pharmacy students (18%) (Frass et. al, 2012). In a survey of first to fifth year medical students, acupuncture was the most familiar therapy endorsed by 57% of students (Yeo et al., 2010). Notably, pharmacists commonly reported of using herbal products for personal use in United Arab Emirates (Fahmy et al., 2010). In United States of America, college students also commonly used herbal supplements and CAM therapies attributed to avoidant coping style and support seeking and intrinsic self – regulation, respectively (LaCille & Kuvaas, 2011). In a National Health Interview Survey of personal use of CAM among employed adults [n=14,329] and health care workers [n=1,280], Johnson and colleagues found that health care workers use CAM more than general population and healthcare providers used CAM personally more than other occupations (Johnson et al., 2012). Awad and colleagues reported that 55.2% of students used CAM especially herbal products (37.6%), mostly by female students (Awad et al., 2012). The lower use of CAM therapies by medical students as shown in the present study and other studies involving third year medical students could be due to unfamiliarity with CAM therapies, their intensive exposure to conventional courses, cohort effect and faculty emphasis more on modern medicine efficacy than CAM modalities (Akan et al., 2012; DeSylvia et al., 2011).

According to this survey, medical students reported variable views regarding how they will use CAM therapies or refer patients to trained CAM practitioners, their pre- and post- course responses varied significantly. Like other surveys of first, second and third year students (DeSylvia et al., 2011), they would either use significantly acupuncture, chiropractic, herbal medications, prayers/spiritual healing, and naturopathy in the management of patients in their office practice or recommend their patients to trained practitioners through their referral network. Hijama was not considered in this survey (DeSylvia et al., 2011). Notably, evidence based data is emerging regarding the efficacy and safety of herbal therapies used in various diseases including hyperlipidemia, pains associate with cancers and arthritis (Hasani-Ranjbar et al., 2010; Leea et al., 2015; Dhippayom et al., 2015). This survey reported that medical students endorsed CAM therapies use based on evidence derived from randomized controlled trials and published case studies partially consistent with other studies (Hasani-Ranjbar et al., 2010; Resnick et al., 2008). In a systematic review, Resnick and colleagues reported that the efficacy of CAM therapies should be based on randomized, double-blind, placebo-controlled trials together with monitoring of adverse effects and accordingly herbal therapies and antioxidants were found to be efficacious in allergic rhinitis (Hasani-Ranjbar et al., 2010; Resnick et al., 2008), the latter finding is also substantiated by the present study. The participants would significantly use CAM therapies in the management of allergic rhinitis. However, no significant changes post-exposure were observed in the usage of CAM therapies in acute appendicitis. However, acupuncture is increasingly recognized in the western world following a write-up on the success of acupuncture anesthesia in *The New York Times* by James Reston, a columnist, who underwent an emergency appendectomy in China and acupuncture relieved him of postoperative pain (Reston, 1971). Hunt and Ernst (2011) and Leea and associates (2015) reported robust evidence for hypnosis, herbal therapies and acupuncture in the management of childhood conditions (Leea et al., 2015; Hunt & Ernst, 2011). Notably, traditional Chinese Medicine (TCM) including some herbal formulas and acupuncture is efficacious and safe in children with asthma and allergic rhinitis (Dhippayom et al., 2015; Li, 2009). In a prospective, multi-center, observational study, homeopathic therapy was found to be effective in adults and children with seasonal allergic disorders (Resnick et al., 2008; Trompetter et al., 2015). Different forms of TCM acupuncture, especially its non-invasive type; laser acupuncture has been used effectively for several conditions in anaesthesia practice (Lee & Shan, 2006; Wong & Fung, 1991; Wang et al., 2013). Notably, the present study differs in design with aforementioned studies, which support the present study results. In Saudi context, the commonly used and supported CAM therapies include cupping (hijama), cautery, recitation from holy Quran, acupuncture, herbal preparations, apitherapy, i.e., use of honey and bee products including toxin, camel urine, aromatherapy, massage, biofeedback, therapeutic touch and exercise, though there are many forms of CAM interventions used worldwide (Karff, 2009; Haylock, 2010; Lie & Boker, 2006; Qureshi & Al-Bedah, 2013; Ujala et al., 2007; Cramer, 2014; Akan et al., 2012; Busse et al., 2008). Notably, most of medical students expressed a need for further training in CAM therapies to advise patients in opting for most effective CAM therapies in line with evidence-based research and this trend is consistent with other studies (Resnick et al., 2008; Trompetter et al., 2015). The long-term implications of this finding are many including CAM capacity building in relation to clinical practice, research, teaching and training.

Limitations

There are several limitations to this cross-sectional research. There were many statistically negative results but with positive trends in knowledge, attitudes and practice of medical students in this survey. However, this means that after gaining some knowledge, medical students formed favorable attitude towards CAM practice. The research team suggests that teachers should focus additionally on those areas of CAM-KAP, which were not significantly changed following exposure of Majmaah University medical students to CAM course in future. This is a survey of second year male medical students in one university and hence its results are not generalizable to female medical students and other universities in KSA. We did not use any other test of significance because pre- and post-test data of individual participant was not aligned and individual participant's anonymity preservation on pre-and post-test questionnaire. Overall, the preliminary results of this research should be interpreted cautiously. The strength of this study is that 100% students filled out the questionnaire. Secondly, this survey makes some sense of Majmaah University medical students' responses regarding their improved general attitude, knowledge and practice views about CAM and possibly their improved KAP of CAM may persist and increase over the years of medical training (Lie & Boker, 2006; Fujiwara et al., 2011) but opposite may also happen (Akan et al., 2012).

Conclusion

In summary, the preliminary findings of this survey are partially compatible with international data on medical students' knowledge, and perceptions of CAM modalities and CAM course tends to have positive impact on attitude, personal usage and use in office practice of CAM therapies by medical students of Majmaah University.

Competing interest: None declared.

Authors' Contribution

Drs Abdullah Al-Bedah and Mohammed Al-Rukban conceptualized the paper design, Drs Mohammed Almansour, Mohamed Khalil,

Ibrahim Elsubai, Elsadiq Yousif Mohmed, Waqas Sami Mahmoud, Naseem Qureshi and Ahmed Olemy made the literature search and helped in analyzing the data, Drs Asim Abdulamonim, Abdullah Almudaiheem, and Mishari Alqaed helped in adaptation of the questionnaire and pretested it and also translated the questionnaire into Arabic with back translation into English to be used in future research. Dr. Naseem Qureshi drafted the paper and revised a number of times. All authors contributed to the final version of the paper, read it and approved for publication.

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Acknowledgements

The NCCAM and the deanship of scientific research and the Basic Health and Science Research Center, Majmaah University supported this study. College of Medicine, Majmaah University distributed the questionnaires to two batches of second year medical students, collected the data and entered in the computer for analysis. Teachers affiliated to NCCAM and Majmaah University developed CAM curriculum and delivered the course to medical students.

Reference

1. Adrian, F., Clare, MG. (2003). Medical students' attitudes towards complementary and alternative medicine. J Compl. Altern. Med., 9(2): 275-284.
2. Akan, H., Izbirak, G., Kasper, EC., Aydin, S., Demircan, N., Bucaktepe, PG., Ozer, C., Sahin, HA., Hayran, O. (2012). Knowledge and attitudes towards complementary and alternative medicine among medical students in Turkey. BMC Compl. Altern. Med., 12: 115.
3. Al-Bedah, AMN., Elolemy, AT., Khalil, MKM. (2012). Knowledge and attitude of health professionals in Riyadh region, Saudi Arabia, toward complementary and alternative medicine. J. Family Community Med., 19(2) 93-99.
4. Al-Bedah, AM., Khalil, MK., Elolemy, AT. Al Mudaiheem, AA., Al Eidi, S., Al-Yahia, OA., Al-Gabbany, SA., Henary, BY. (2013). The use of and out-of-pocket spending on complementary and alternative medicine in Qassim province, Saudi Arabia. Ann. Saudi Med., 33(3): 282-289.
5. Al-Faris, EA., Al-Rowais, N., Mohamed, AG., Al-Rukban, MO., Al-Kurdi, A., Balla Al-Noor, MA., Al-Harby, S., Sheikh, A. (2008). Prevalence and pattern of alternative medicine use: the results of a household survey. Ann. Saudi Med., 28: 4-10.
6. Alkharfy, KM. (2010). Community pharmacists' knowledge, attitudes and practices towards herbal remedies in Riyadh, Saudi Arabia. East. Mediterr. Health J., 16(9): 988-993.
7. Al-Rowais, N., Mohammad, AG., Al-Rukban, M., Abdulghani, HM. (2010). Traditional healers in Riyadh region: reasons and health problems for seeking their advice. A household survey. J. Altern. Complement. Med., 16: 199-204.
8. Al-Rowais, A., Al Bedah, AM., Khalil MK., El Olemy, AT., Khalil, AA., Alrasheid, MH., Al Khashan, H., Al Yousef, M., Abdel Razak Ba Fart, A. (2012). Knowledge and attitudes of primary care physicians towards complementary and alternative medicine in the Riyadh region, Saudi Arabia. Forsch. Komplement. Med., 19: 7-12.
9. Allam, S., Moharam, M., Alarfaj, G. (2014). Assessing Patients' Preference for Integrating Herbal Medicine within Primary Care Services in Saudi Arabia. J. Evid. Based Complement. Altern. Med., 19(3): 205-210.
10. Amri H, Haramati A. (2010). Using basic science to develop an innovative program in complementary and alternative medicine. J Int Assoc Med Sci Edu, 20: 48-55.
11. Al-Rukban, MO., AlBedah, AM., Khalil, MK., El-Olemy, AT., Khalil, AA., Alrasheid, MH. (2012). Status of complementary and alternative medicine in the curricula of health colleges in Saudi Arabia. Complement Ther Med. 20(5):334-339.
12. Al-Zahim, AA., Al-Maliki, NY., Al-Abdulkarim, FM Al-Sofayan, SA., Abunab, HA., Abdo, AA. (2013). Use of alternative medicine by Saudi liver disease patients attending a tertiary care center: prevalence and attitudes. Saudi J. Gastroenterol., 19: 75-80.
13. Awad, AI., Al-Ajmi, S., Waheedi, MA. (2012). Knowledge, perceptions and attitudes toward complementary and alternative therapies among Kuwaiti medical and pharmacy students. Med. Princ. Pract., 21(4): 350-354.
14. Barnes, PM., Bloom, B., Nahin, RL. (2008). Complementary and alternative medicine use among adults and children: United States, 2007. Natl. Health Stat Report, 12: 1-23.
15. Bazargan, CO, Ani DW, Hindman, DW., Bazargan-Hejazi, S., Baker, RS,, Bell, D., Rodriquez, M. 008). Correlates of complementary and alternative medicine utilization in depressed, underserved African American and Hispanic patients in primary care settings. J Altern Complement Med., 14(5): 537–544.
16. Bhattacharya, B. (2000). Programs in the United States with complementary and alternative medical education opportunities: an ongoing listing. J. Altern. Complement. Med., 6: 77-90.
17. Brokaw, J.J. Tunnicliff, G., Raess, BU., Saxon, DW. (2002). The teaching of complementary and alternative medicine in U.S. medical schools: a survey of course directors. Acad. Med., 77(9): 876-881.
18. Busse, J.W., Kulkarni, AV., Badwall, P., Guyatt, GH. (2008). Attitudes towards fibromyalgia: A survey of Canadian chiropractic, naturopathic, physical therapy and occupational therapy students. BMC Compl. Altern. Med., 8: 24. doi:10.1186/1472-6886-8-24.
19. Chaterji, R., Tractenberg, RE., Amri, H., Lumpkin, M., Amorosi, SB., Haramati, A. (2007). A large sample survey of first- and second-year medical student attitudes toward complementary and alternative medicine in the curriculum and in practice. Altern. Ther. Health Med., 13(1): 30-35.
20. Chiappelli, F., Prolo, P., Cajulis, OS. (2005). Evidence-based Research in Complementary and Alternative Medicine I: History. eCAM., 2(4): 453–458.
21. Cramer, H., Lauche, R., Dobos, G. (2014). Characteristics of randomized controlled trials of yoga: a bibliometric analysis. BMC Compl. Altern. Med., 328.
22. Davis, MA., Weeks, WB. (2012). The concentration of out-of-pocket expenditures on complementary and alternative medicine in the United States. Altern. Ther. Health Med., 18: 36-42.

23. DeSylvia, D., Stuber, M., Fung, CC., Bazargan-Hejazi, S., Cooper, E. (2011). The knowledge, attitudes and usage of complementary and alternative medicine of medical students. Evidence-Based Complement Altern Med. Article ID 728902, 5 pages, 2011.doi:10.1093/ecam/nen075.
24. Dhippayom, T., Kongkaew, C., Chaiyakunapruk, N., Dilokthornsakul, P., Sruamsiri, R., Saokaew, S., Chuthaputti, A. (2015). Clinical Effects of Thai Herbal Compress: A Systematic Review and Meta-Analysis. Evidence-Based Complementary and Alternative Medicine. Article ID 942378, 14 pages, 2015. doi:10.1155/2015/942378.
25. El-Nimr, N. A., Wahdan, I. M. H., Wahdan, A.M.H & Kotb, R. E. (2015). Self-medication with drugs and complementary and alternative medicines in Alexandria, Egypt: prevalence, patterns and determinants. EMHJ, 21 (4), 256-265.
26. Elolemy, AT., Al-Bedah, AMN. (2012). Public knowledge, attitude and practice of complementary and alternative medicine in Riyadh region, Saudi Arabia. Oman Med. J. 27: 20-26.
27. Fahmy, SA., Abdu, S., Abuelkhair, M. (2010). Pharmacists' attitude, perceptions and knowledge towards the use of herbal products in Abu Dhabi, United Arab Emirates. Pharmacy Practice (Internet), 8:109-115.
28. Frass, M, Strassl, RP., Friehs, H., Müllner, M., Kundi, M., Kaye, AD. (2012) Use and Acceptance of Complementary and Alternative Medicine Among the General Population and Medical Personnel: A Systematic Review. The Ochsner Journal, 12: 45-56.
29. Frenkel, M., Arye, EB. (2001)(.The growing need to teach about complementary and alternative medicine; questions and challenges. Acad. Med., 76; 251-254.
30. Fujiwara, K., Imnishi, J., Watanabe, S., Ozasa, K., Sakurada, K. (2011). Changes in attitudes of Japanese doctors toward complementary and alternative medicine-comparison of surveys in 1999 and 2005 in Kyoto. Evidence-Based Complementary and Alternative Medicine; ID 608921, 7 pages.
31. Furnham, A., McGill, C. (2003). Medical students' attitudes about complementary and alternative medicine. J. Altern. Complement. Med., 9(2): 275-284.
32. Gad, A., Al-Faris, E., Al-Rowais, N., Al-Rukban, M. (2013). Use of complementary and alternative medicine for children: a parents' perspective. Complement. Ther. Med., 21(5): 496-500.
33. Gale, N. (2014). The sociology of traditional, complementary and alternative medicine. Sociology Compass, 8/6: 805-822.
34. Gawde, SR., Shetty, YC., Pawar, DB. (2013). Knowledge, attitude, and practices toward Ayurvedic medicine use among allopathic resident doctors: A cross-sectional study at a tertiary care hospital in India. Perspect. Clin. Res. 4(3): 175-180.
35. Gogtay, NJ., Bhatt, HA., Dalvi, SS., Kshirsagar, NA. (2002).The use and safety of non-allopathic Indian medicines. Drug Safety, 25: 1005-1019.
36. Griffith, LE., Cook, DJ., Guyatt, GH., Charles, CA. (1999). Comparison of open and closed questionnaire formats in obtaining demographic information from Canadian general internists. J. Clin. Epidemiol., 52: 997-1005.
37. Halterman-Cox, M., Sierpina, VS., Sadoski, M., Sanders, C. (2009). CAM attitudes in first- and second- year medical students: a pre-and post-test course survey. Integrative Medicine, 7(6): 34-42.
38. Harris, IM., Kingston, RL., Rodriguez, R., Choudary, V. (2006).Attitudes towards Complementary and Alternative Medicine among Pharmacy Faculty and Students. American Journal Pharmaceutical Education, 70(6): 129.
39. Hartley, L,, Flowers, N., Lee, MS., Ernst, E., Rees, K. (2014). Tai chi for primary prevention of cardiovascular disease. Cochrane Database Syst Rev. 2014 Apr 9;4:CD010366. doi: 10.1002/14651858.CD010366.pub2.
40. Hartley, L., Mavrodaris, A., Flowers, N., Ernst, E., Rees, K. (2014). Transcendental meditation for the primary prevention of cardiovascular disease. Cochrane Database Syst Rev., 12: CD010359. doi: 10.1002/14651858.CD010359.pub2. Epub 2014 Dec 1.
41. Hasani-Ranjbar, S., Nayebi, N., Moradi, L., Mehri, A., Larijani, B., Abdollahi, M. (2010). The efficacy and safety of herbal medicines used in the treatment of hyperlipidemia; a systematic review. Current Pharmaceutical Design, 16:2935-2947.
42. Haylock, PJ. (2010). Advanced cancer: a mind-body-spirit approach to life and living. Semin. Oncol. Nurs.,26(3): 183-194.
43. Herman, PM., Poindexter, BL., Witt, CM., Eisenberg DM. (2012). Are complementary therapies and integrative care cost-effective? A systematic review of economic evaluations. BMJ Open;2:e001046.doi:10.1136/bmjopen-2012-001046.
44. http://www.ahna.org/Home/For-Consumers/Holistic-Modalities (accessed on March 12, 2015).
45. https://nccih.nih.gov/health/whatiscam (Accessed on March 12,2015).
46. Hunt, K., Ernst, E. (2011). The evidence-base for complementary medicine in children: a critical overview of systematic reviews. Arch Dis Child, 96: 769-776 doi:10.1136/adc.2009.179036.
47. Institute of Medicine of the National Academies. (2005). Complementary and Alternative Medicine in the United States. Washington, DC: National Academies Press. Available at: http://www.nap.edu/catalog.php?record_id=11182#toc. (Accessed on December 29, 2014).
48. Jazieh, AR., Al Sudairy, R., Abulkhair, O., Alaskar, A., Al Safi, F., Sheblaq, N., Young, S., Issa, M., Tamim, H (2012). Use of complementary and alternative medicine by patients with cancer in Saudi Arabia. J. Altern. Complement. Med.,18(11): 1045-1049.
49. Johnson, PJ., Ward, A., Knutson, L., Sendelbach, S. (2012). Personal use of complementary and alternative medicine (CAM) by U.S. health care workers. Health Service Research 42: 211-227.
50. Karff, SE. (2009). Recognizing the Mind/Body/Spirit Connection in Medical Care. Virtual Mentor (American Medical Association Journal of Ethics), 11(10): 788-792.
51. Kligler, B., Koithan, M., Maizes, V., Hayes, M., Schneider, C., Lebensohn, P., Hadley, S. (2007). Competency-based evaluation tools for integrative medicine training in family medicine residency: a pilot study. BMC Med. Educ., 7: article 7.
52. Kreitzer, MJ., Mitten, D., Harris, I., Shandeling, J. (2002). Attitudes toward CAM among medical, nursing, and pharmacy faculty and students: a comparative analysis. Altern. Ther. Health Med., 8(6): 44-47, 50-53.
53. LaCille, RA., Kuvaas, NJ. (2011). Coping styles and self-regulation predict complementary and alternative medicine and herbal supplement use among college students. Psychology, Health Medicine,; 16: 323-332.
54. Lee, A., Shan, S. (2006). Acupuncture and anaesthesia. Best Practice & Research Clinical Anaesthesiology, 20:303–314.
55. Leea, J-W., Leea, WB., Kima, W., Mina, B-II, Leec, HS., Chod, S-H. (2015). Traditional herbal medicine for cancer pain: A systematic review and meta-analysis. Complementary Therapies in Medicine, 23: 265–274.
56. Lee, MY., Benn, R., Wimsatt, L., Cornman, J., Hedgecock, J., Gerik, S., Zeller, J., Kreitzer, MJ., Allweiss, P., Finklestein, C., Haramati, A. (2007). Integrating complementary and alternative medicine instruction into health professions education: organizational and instructional strategies. Acad. Med., 82(10): 939–945.
57. Levine, SM., Weber-Levine, ML., Mayberry, RM. (2003). Complementary and alternative medical practices: training, experience, and attitudes of a primary care medical school faculty. J. Am. Board Fam. Pract.,16(4): 318-326.
58. Li, X-M. (2009). Complementary and alternative medicine in pediatric allergic disorders. Current opinion in allergy and clinical immunology., 9(2): 161-167.

59. Lie, DA., Boker, J. (2006). Comparative survey of Complementary and Alternative Medicine (CAM) attitudes, use, and information-seeking behavior among medical students, residents & faculty. BMC Med. Educ., 6 (article 58).
60. Liu, J., Pei, M., Zheng, C. et al. (2013). A Systems-Pharmacology Analysis of Herbal Medicines Used in Health Improvement Treatment: Predicting Potential New Drugs and Targets. Evidence-Based Compl. Altern. Med., Article ID 938764, 17 pages. http://dx.doi.org/10.1155/2013/938764.
61. Majmaah University, Saudi Arabia. Available at: http://mu.edu.sa/en/about/ history (accessed on December 15, 2014).
62. Mansoor, KM., Al-Bedah, AM., Rukban, M., (2015). Medical students' knowledge, attitude and practice of Complementary and Alternative Medicine Therapies: a pre- and post-exposure survey in Majmaah University, Saudi Arabia. Advances Med. Educ. Pract., 2015; 6: 407-420.
63. Nahin, RL., Barnes, PM., Stussman, BJ., Bloom, B. (2009). Costs of complementary and alternative medicine (CAM) and frequency of visits to CAM practitioners: United States, 2007. Natl. Health Stat Report, 18: 1-14.
64. Nicolao, M., Tauber, MG., Heusser, P. (2010). How should complementary and alternative medicine be taught to medical students in Switzerland? A survey of medical experts and students. Medical Teacher, 32: 50-55
65. No authors listed. (2004). New alternative medicine guide launched amidst increasing reports of adverse reactions. Bull. World Health Org., 82(8): 635-636.
66. No authors listed. (2005). Education and training of health care practitioners. The White House Commission on Complementary and Alternative Medicine Policy. Available at: http://www.whccamp.hhs.gov/fr4.html. Accessed January 2, 2015.
67. Pearson, NJ, Chesney, MA. (2007). The CAM education program of the national center for complementary and alternative medicine: an overview. Acad. Med., 82(10): 921–926.
68. Perkin, MR., Pearcy, RM., Fraser, JS. (1994). A comparison of the attitudes shown by general practitioners, hospital doctors and medical students towards alternative medicine. J R Soc Med., 87(9):523-525.
69. Quartey, NK., Ma, PHX., Chung, VCH., Griffiths, SM. (2012).Complementary and alternative medicine education for medical profession: systematic review. Evidence- Based Complementary and Alternative Medicine, ID 656812, 13 pages.
70. Qureshi, NA., Al-Bedah, AM. (2013). Mood disorders and Complementary and alternative therapies. Neuropsychiatric Diseases and Treatment, 9: 639-658.
71. Resnick, ES., Brett, PB., Bielory, L. (2008). Complementary therapy in allergic rhinitis. Current Allergy and Asthma Reports, 8.2: 118-125.
72. Reston, J. (1971). Now, about my operation in Peking. Now, let me tell you about my appendectomy in Peking. In The New York Times. New York. : 2.
73. Schneider, CD., Meek, PM., Bell, IR. (2003). Development and validation of IMAQ: Integrative Medicine Attitude Questionnaire. BMC Med. Education, 3: 5.
74. Sierpina, VS., Schneeweiss, R., Frenkel, MA., Bulik, R., Maypole, J. (2007). Barriers, strategies, and lessons learned from complementary and alternative medicine curricular initiatives. Acad. Med., 82(10): 946-950.
75. Subhose, V., Srinivas, P., Narayana, A. (2005). Basic principles of pharmaceutical science in Ayurveda. Bull. Indian Inst. Hist. Med. Hyderabad, 35: 83-92.
76. Sun, YZ., Song, J. (2015). Clinical trials for treatment of primary hyperlipidemia by using acupuncture in combination with Lipitor. Zhen Ci Yan Jiu., 40(1):61-64.
77. Tabish, SA. (2008). Complementary and Alternative Healthcare: Is it Evidence-based? Int J Health Sci (Qassim)., 2(1): V–IX.
78. The White House Commission on CAM. (2010). Ten principles: understanding and improving health. Healthy People. (http://www.healthypeople.gov/). (Accessed on April 20, 2015).
79. Taylor, N., Blackwell, A. (2010). Complementary and alternative medicine familiarization: what is happening in medical schools in Wales? eCAM, 7: 265-269.
80. Tilburt, JC., Kaptchuk, TJ. (2008). Herbal medicine research and global health: an ethical analysis. Bulletin WHO. Available at: http://www.who.int/bulletin/ volumes/86/8/07-042820/en/ (Accessed on January 6 2015).
81. Trompetter, I., Lebert, J., Weiß, G. (2015). Homeopathic complex remedy in the treatment of allergic rhinitis: results of a prospective, multi-center, observational study. Forsch Komplementmed 22: 18-23.(DOI:10.1159/000375244.
82. Ujala, V., Rashmi, S., Pankaj, G. Samta, G., Bhuvneshvar, K (2007). Allopathic vs. ayurveda practices in tertiary care institutes of urban North India. Ind. J. Pharmacol., 39: 52-54.
83. Wahner-Roedler, DL., Vincent, A., Elkin, PL., Loehrer, LL., Cha, SS., Bauer, BA. (2006). Physicians' Attitudes toward Complementary and Alternative Medicine and Their Knowledge of Specific Therapies: A Survey at an Academic Medical Center. eCAM, 3(4)495–501. doi:10.1093/ecam/nel036.
84. Wang, SM., Harris, RE., Lin, YC., Gan, TJ. (2013). Acupuncture in 21st Century Anesthesia: Is There a Needle in the Haystack? Pain Medicine, 116 (6): 1356- 1359.
85. Wiese, M. (2010). Understanding the emerging relationship between complementary medicine and mainstream healthcare: a review of the literature. Health (London), 14: 326-342.
86. Wolsako, P., Ware, L., Kutner, J., Lin, CT., Albertson, G., Cyran, L., Schilling, L. (2000). Alternative/complementary medicine: wider usage than generally appreciated. J. Altern. Complement. Med., 6: 321-326.
87. Wong, TW., Fung, KP. (1991). Acupuncture: from needle to laser. Family Practice, 8(2):168-170.
88. Yeo, AS., Yeo, JS., Yeo, C Lee, CH., Lim, LF., Lee, TL (2005). Perceptions of complementary and alternative medicine amongst medical students in Singapore – a survey. Acupuncture Med 2005; 23(1): 19-26.
89. Yıldırım, Y., Parlar, S., Eyigör, S., Sertöz, O., Eyigör, C., Fadıloğlu, Ç., Uyar, M. (2010). An analysis of nursing and medical students' attitudes towards and knowledge of complementary and alternative medicine (CAM). JCN, 19:1157–1166.
90. Yim, VW., Ng, AK., Tsang, HW., Leung, AY. (2009). A review on the effects of aromatherapy for patients with depressive symptoms. J Altern Complement Med. 15(2):187-95.