



ORIGINAL ARTICLE

Integration of substance use disorders program in general medicine education program based on Kern model

دمج برنامه اضطرابات تعاطی المخدرات في برنامج تعليم الطب العام بناءً على نموذج كيرن

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Background: Substance Use Disorders (SUD) are one of the biggest public health problems nationally and globally. It is necessary to provide specific educating programs about SUDs. The purpose of this study was to integrate some trainings which are related to substance use disorders in general medicine education.

Methods: This study was a quasi-experimental and pre-test post-test intervention research. Participants were 114 students studying at different stages of medical education at Shahrekord University of Medical Sciences. The training program was designed based on the training model of David Kern. Training was integrated into pharmacology, psychology, poisoning and forensic medicine courses. The present researchers organized a life skill workshop for third-semester medical students. The students visited an addiction treatment exhibition during community medicine externship as well. Assessment tools included questionnaires to assess knowledge, attitude, and satisfaction. Data were analyzed by SPSS 18 software.

Result: In all interventions, the mean score of knowledge and knowledge self-assessment increased significantly after the intervention ($p < 0.001$). Students' attitudes about the curriculum were favorable. Satisfaction of the majority of students about the program was high. The highest level of satisfaction was related to the internship addiction emergency program.

Conclusion: The positive effect of all interventions on the perception, attitude, and satisfaction of medical students emphasized that modifying the medical educational curriculum through considering the pattern, content, and results of the interventions can be very effective in improving the performance of physicians in the field of addiction management.

Key words: Medical Education, Substance Use Disorder, Kern Model

الخلفية: اضطرابات استخدام المواد (SUD) هي واحدة من أكبر مشاكل الصحة العامة على الصعيدين الوطني والعالمي. من الضروري توفير برامج تعليمية محددة حول SUDs. كان الغرض من هذه الدراسة هو دمج بعض التدريبات المتعلقة باضطرابات تعاطي المخدرات في تعليم الطب العام.

الطرق: هذه الدراسة عبارة عن بحث تدخل شبه تجريبي واختبار ما قبل الاختبار. كان المشاركون 114 طالباً يدرسون في مراحل مختلفة من التعليم الطبي في جامعة شهركرد للعلوم الطبية. تم تصميم البرنامج التدريبي على أساس نموذج التدريب لديفيد كيرن. تم دمج التدريب في دورات علم الصيدلة وعلم النفس والتسمم والطب الشرعي. نظم الباحثون الحاليون ورشة عمل حول المهارات الحياتية لطلاب الطب في الفصل الثالث. كما قام الطلاب بزيارة معرض علاج الإدمان خلال فترة التدريب في طب المجتمع. تضمنت أدوات التقييم استبيانات لتقييم المعرفة والمواقف والرضا. تم تحليل البيانات بواسطة برنامج SPSS 18.

النتيجة: في جميع التدخلات، زاد متوسط درجة التقييم الذاتي للمعرفة والمعرفة بشكل ملحوظ بعد التدخل ($p < 0.001$). كانت مواقف الطلاب حول المناهج مواتية. كان رضا غالبية الطلاب عن البرنامج مرتفعاً. كان أعلى مستوى من الرضا مرتبطاً ببرامج الطوارئ الخاص بالإدمان الداخلي.

الخلاصة: إن التأثير الإيجابي لجميع التدخلات على تصور طلاب الطب وموقفهم ورضاهم أكد أن تعديل المناهج التعليمية الطبية من خلال النظر في فمط ومحتوى ونتائج التدخلات يمكن أن يكون فعالاً للغاية في تحسين أداء الأطباء في مجال إدارة الإدمان.

الكلمات المفتاحية: التعليم الطبي، اضطراب استخدام المواد، نموذج كيرن

ادغام برنامه اختلالات مصرف مواد در برنامه آموزشی پزشکی عمومی بر اساس مدل كيرن

كيرن ماڈل کی بنیاد پر جنرل میڈیسن ایجوکیشن پروگرام میں مادہ کے استعمال کے امراض کے پروگرام کا انضمام

زمینه و هدف: اختلالات مصرف مواد از بزرگترین مشکلات سلامت عمومی در سطح ملی و جهانی می باشد. برگزاری برنامه های آموزشی در رابطه با اختلالات مصرف مواد ضروری می باشد. هدف این مطالعه ادغام برخی آموزش های مرتبط با اختلالات مصرف مواد در دوره آموزش پزشکی عمومی می باشد.

روش: این مطالعه از نوع نیمه تجربی و مداخله ای از نوع پیش آزمون- پس آزمون می باشد. شرکت کنندگان در مطالعه 114 نفر از دانشجویان مقاطع مختلف پزشکی دانشگاه علوم پزشکی شهركرد بودند. برنامه آموزشی بر اساس مدل آموزشی دیوید کرن طراحی شد. برنامه آموزشی در دروس فارماکولوژی، روان شناسی، مسمومیت و پزشکی قانونی ادغام شد. یک کارگاه مهارت های زندگی برای دانشجویان ترم سه پزشکی طراحی شد و دانشجویان در کارآموزی پزشکی اجتماعی از نمایشگاه ترک اعتیاد بازدید کردند. ابزار ارزیابی پرسشنامه های ارزیابی دانش، نگرش و رضایتمندی بود. اطلاعات بعد از جمع آوری با نرم افزار SPSS18 آنالیز شدند.

یافته ها: در تمامی مداخلات، میانگین نمره دانش و خودارزیابی دانش بعد از مداخله به طور معنی داری افزایش یافت ($p < 0.001$). نگرش دانشجویان در خصوص برنامه آموزشی مطلوب بود. رضایت اکثر دانشجویان در خصوص برنامه آموزشی بالا بود. بیشترین میزان رضایت مربوط به برنامه اورژانس های ترک اعتیاد در مقطع اینترنتی بود. **نتیجه گیری:** تأثیر مثبت تمامی مداخلات بر دانش، نگرش و رضایتمندی دانشجویان پزشکی بر این مسأله تأکید می کند که اصلاح کوریکولوم آموزشی پزشکی با در نظر گرفتن الگو، محتوا و نتایج مداخلات اجرا شده می تواند در بهبود عملکرد پزشکان در حیطه مدیریت اعتیاد بسیار مؤثر باشد.

واژه های کلیدی: آموزش پزشکی، اختلالات مصرف مواد، مدل كيرن

پس منظر: ماده کے استعمال کی خرابی (SUD) قومی اور عالمی سطح پر صحت عامہ کے سب سے بڑے مسائل میں سے ایک ہے۔ ایس یو ڈی کے بارے میں مخصوص تعلیمی پروگرام فراہم کرنا ضروری ہے۔ اس مطالعہ کا مقصد کچھ تربیتیوں کو ضم کرنا تھا جو عام دوائی کی تعلیم میں مادہ کے استعمال کے عوارض سے متعلق ہیں۔

طریقے: یہ مطالعہ ایک نیم تجربیاتی اور پری ٹیسٹ پوسٹ ٹیسٹ مداخلت کی تحقیق تھی۔ شرکاء میں شاہریکورد یونیورسٹی آف میڈیکل سائنسز میں میڈیکل کی تعلیم کے مختلف مراحل میں زیر تعلیم 114 طلباء تھے۔ تربیتی پروگرام ڈیوڈ کرن کے تربیتی ماڈل کی بنیاد پر ڈیزائن کیا گیا تھا۔ تربیت کو فارماکولوجی، سائیکالوجی، پوائزننگ اور فرانزک میڈیسن کورسز میں ضم کیا گیا تھا۔ موجودہ محققین نے تیسرے سمسٹر کے میڈیکل طلباء کے لیے لائف اسکل ورکشاپ کا اہتمام کیا۔ طلباء نے کمیونٹی میڈیسن کی ایکسٹرن شپ کے دوران نشے کے علاج کی نمائش کا بھی دورہ کیا۔ تشخیصی ٹولز میں علم، رویہ، اور اطمینان کا اندازہ لگانے کے لیے سوالنامے شامل تھے۔ ڈیٹا کا تجزیہ SPSS 18 سافٹ ویئر کے ذریعے کیا گیا۔

نتیجہ: تمام مداخلتوں میں، مداخلت کے بعد علم اور علم کی خود تشخیص کے اوسط اسکور میں نمایاں اضافہ ہوا ($p < 0.001$)۔ نصاب کے بارے میں طلباء کا رویہ سازگار تھا۔ پروگرام کے بارے میں طلباء کی اکثریت کا اطمینان بہت زیادہ تھا۔ اطمینان کی اعلیٰ سطح کا تعلق انٹرنشپ ایڈکشن ایمرجنسی پروگرام سے تھا۔

نتیجہ: میڈیکل طلباء کے تاثرات، رویہ اور اطمینان پر تمام مداخلتوں کے مثبت اثرات نے اس بات پر زور دیا کہ مداخلتوں کے نمونے، مواد اور نتائج کو مدنظر رکھتے ہوئے طبی تعلیمی نصاب میں ترمیم کرنا ڈاکٹروں کی کارکردگی کو بہتر بنانے میں بہت مؤثر ثابت ہو سکتا ہے۔ نشے کے انتظام کا میدان۔

کلیدی الفاظ: طبی تعلیم، مادہ کے استعمال کی خرابی، کیرن ماڈل

INTRODUCTION

Substance use disorders (SUD) are major public health problems both nationally and globally. According to United Nations Office on Drugs and Crimes, illegal substance use is on the rise. 5.6% of individuals aged 15 to 65 had used drugs at least once in 2016 worldwide. Globally, deaths related to drug use, primarily opioids, increased by 60% from 2000 to 2015 (1). In Iran, over 2.5 million people suffer from SUDs (2).

Physicians within all branches of medicine are very likely come into contact with SUDs patients. Medical doctors have a key role in promoting not only their patients' health but also the nation's public health. SUDs are often accompany other comorbidities, including physical problems and psychiatric disorders (3, 4). Because of broad range of medical conditions and comorbidities that often complicated SUDs, all physicians need some basic skills in the management of SUDs patients. (5, 6) However, physicians often have not adequate knowledge and competence required for the evaluation and treatment of SUDs patients (7, 8). Lack of enough curriculum and exposure to end-stage addiction may lead to negative attitudes of medical doctors toward these patients (9). Improving the medical education curriculum with practical and interactive training methods is essential to increase SUDs patient's access to treatment. Sufficient learning about the bio-psycho-social factors in ethology of SUDs would be helpful to change negative attitude toward working with drug abusers (6).

Firstly, in the early 80s researchers mainly in English speaking countries noticed the gap in training medical students in SUD treatment. They suggested that it is necessary to educate primary care physicians in order to be able to provide better services to SUDs patients. They also reviewed reports on training programs for general practitioners. The studies deduced that specific courses need to be designed to change the competency and attitude of health care professional (10- 12). Shortly afterward, Johns Hopkins University School of Medicine designed a curriculum on substance use that focused on acquiring significant changes on medical students' belief and knowledge in relation to the responsibilities (13). 10 years later, research in Britain showed that SUDs were generally very poorly represented in the undergraduate medical curricula. (14) World Health Organization and United Nations recommend to all governments that substance misuse should be included in the medical curriculum (15).

Over the past twenty years, the importance of addiction medicine training has been recognized internationally. There has been a gradual increase in the published papers on the development of medical education curriculum considering SUDs (16). Several studies have revealed that even short courses could improve attitude and knowledge on SUDs (17-20).

Rajabalipour et.al evaluated courses relating to substance abuse in medical curriculum in Iran. They found that there is not a general unit for substance abuse topics in most courses. They suggested to provide specific educating programs about SUDs (21). Academic curricula in medical schools in Iran do

not devote some designed specific modules on SUDs as well as the treatment options. There has been a few sessions considered to SUDs issues in the latest medical curriculum announced by Ministry of Health and Medical Education of Iran (22).

The present researchers could not find any published study about need assessment and integrating SUDs into medical curriculum. Considering all these, they designed a study to integrate some educations about SUDs into undergraduate medical training aimed to evaluate knowledge, attitude, and satisfaction of medical students.

METHODS

This quasi-experimental and interventional research of pretest-posttest type was done from May 2016 to December 2019. Participants included 114 students studying at different stages of general medicine at Shahrekord University of Medical Sciences. The samples were selected by the census method. The present researchers included all students of the related courses. Because there were just between 2 and 4 students in each course of poisoning and forensic medicine internship, they provided educations for three groups of trainees. Exclusion criteria were: reluctance to participate in the study and leaving the research before completing the training. The pieces of training were provided during the students' courses after coordination with the medical school Education Development Unit and the explanation of the goals and gaining informed consent.

This study was approved by the ethics committee of the Shahrekord University of Medical Science with a reference number of IR. SKUMS. REC. 1398.084. This study was conducted in the field of developing and reviewing educational programs based on the model of David Kern.

Development of a training program according to the model of David Kern:

A. Needs evaluation

This step included evaluating the latest outlines of the medical education curriculum. Besides, a verbal needs assessment was performed among lecturers, general practitioners, interns, and educational experts. Accordingly, it was determined that education on addiction is not sufficient.

B. Needs assessment

A needs assessment of 226 general practitioner and interns was performed using a researcher-made questionnaire (23).

C. Setting Goals

Educational goals were determined based on both the results of needs assessment and the medical education curriculum of other countries (15, 24, 25) (Table 1).

D. Educational strategies

The strategies were selected using panel of experts.

1. Organizing life skills workshops for third-semester medical students.
2. The inclusion of topics in the psychology course
3. The inclusion of topics in the pharmacology course.
4. Visiting the addiction exhibition and presenting pieces of training in the community medicine internship.
5. Providing training due to mentioned goals in the internship of the poisoning and forensic medicine course.

Table 1. Educational goals for medical student in different stages

Level	Educational goals
Basic Science	<ol style="list-style-type: none"> 1. Informing students about the ten life skills and their impact on addiction prevention. 2. Informing students about the causes, epidemiology, and prevention of addiction, types of substances, and their effects. 3. Informing students about protective and risk factors and co-occurrence of other diseases in addiction
Physiopathology	<ol style="list-style-type: none"> 1. Informing students about the types of substances being abused and their pharmacological properties. 2. Informing students about the types of drug dependence treatments.
Externship	Informing students about the types of substances being abused and their pharmacological properties, current therapies (pharmacologic or psychologic), drug dependence treatment centers, and how to refer patients to these centers
Internship	Empowering students in managing the aggression, agitation, and restlessness of patients who abuse methamphetamine, opioid, and alcohol overdose and their withdrawal syndrome

E. Performance and assessment

The pieces of training were provided in coordination with the Medical Education Development Office during the students' school hours. Two 2-hour sessions for 2nd-semester medical students were held during the psychology course. The mentioned sessions were conducted interactively through PowerPoint presentations, and at the end, an educational booklet was provided to the students for further study. A 6-hour workshop on life skills was held for third-semester medical students. Sixth-semester students received training during the pharmacology course, which included two 2-hour sessions. In the community medicine internship, a 4-hour program was planned, including visiting the addiction exhibition affiliated to Chaharmahal and Bakhtiari Province Anti-Narcotics Coordination Council, and provided related training. Finally, poisoning and forensic medicine internship students received practical training (Table 1).

The evaluation tools included researcher-made questionnaires of knowledge, attitude and satisfaction assessment, for addiction pharmacology, psychology-integrated training, and substance abuse emergencies. Participants' knowledge was measured through four-choice questionnaires in which each question had a correct answer and a Likert self-assessment questionnaire (score one was given to "very poor" and score five was given to "very high"). In the Likert self-assessment questionnaire, scores from 1 to 5 were considered. For knowledge self-assessment, the researchers used 20 items questionnaire in psychology course (with minimum score of 5 and maximum score of 100), 8 items questionnaires in addiction pharmacology (with minimum score of 5 and maximum score of 40), and 5 items questionnaire in substance abuse emergencies with minimum score of 5 and maximum score of 25. The number of questions in the four-choice questionnaires in addiction pharmacology was 35, in the psychology-integrated training was 12 and in the substance abuse emergencies was 10. One point was considered for each question. The Knowledge questionnaires were

completed before and immediately after the training. At the end of each intervention, attitude were evaluated using a 20 items Likert questionnaire. A total score of more than 67 was considered a good attitude, the score of 34 to 67 as moderate, and the score of 20 to 34 was contemplated a poor attitude. The trainees' satisfaction was evaluated at the attitude questionnaire endpoint with a Likert question (score one was given to "very poor" and score five was given to "very high"). The present researchers only assessed attitude and satisfaction in visiting the addiction exhibition program and life skills workshop. The validity of the questionnaires was confirmed by a survey of 5 faculty members (psychiatrist, social medicine specialist, and medical education). Cronbach's alpha of internal reliability of Likert self-assessment questionnaires including addiction pharmacology, psychology-integrated training, substance abuse emergencies, and attitude questionnaire were 0.81, 0.78, 0.84, and 0.87 respectively. The attitude of trainees was evaluated in the life skill workshop using a 25 items Likert questionnaire with a satisfaction assessing question at the end of it. For this questionnaire, a score of more than 100 was considered a good attitude, the score of 99 to 70 as moderate, and the score of 26 to 69 was contemplated a poor attitude. Cronbach's alpha of internal reliability of this questionnaire was 0.85. At the end of this tools, satisfaction was evaluated via a Likert question (score one was given to "very poor" and score five was given to "very high").

Statistical analysis:

After some trainings, the data were collected and analyzed using SPSS 18 software at a significance level of $P < 0.05$. Data were analyzed by descriptive statistical methods including number, percentage, mean and standard deviation, and inferential method including paired t-test.

RESULTS

A total of 114 students participated in the intervention sections of this study. The demographic characteristics

of the study participants are shown in Table 2.

Finding of the psychology course program

33 second-semester medical students 15 (45.5%) boys and 18 (54.5%) girls) were evaluated. Paired t-test showed that the difference between the mean total score of self-assessment before and after the intervention was significant (p <0.001) (Table 2). In Four-Choice test, the mean score before the intervention was 3.48 ± 1.5 and after the intervention was 7.84 ± 2.06. This difference was statistically significant. (p <0.001) (Table 3). The mean attitude score was 76.69 ± 8.41. Twenty two (66.66%) students reported high satisfaction and 11(33.33%) moderate satisfaction, which indicated the students' good attitude toward the desired educational program.

Findings of attitude and satisfaction assessment of the life skills workshop program

The life skills workshop was attended by 16 third-semester medical students. The mean total score of attitude was 111.68 ± 6.64, which indicated the students' good attitude toward the educational program. Results showed 14(87.5%) students had little or no knowledge about the topics presented in the workshop (types of life skills) and all of the participants stated that their knowledge increased after the workshop. 12(75%) learners believed educations about life skills is necessary for all students. 81.3% of trainees declared that all students should pass life skills workshops.

Findings of the pharmacology of substance dependency program

46 sixth-semester medical students participated in this course (26 (56.4%) female and 20 (43.5%) male). Paired t-test showed that the difference between the mean total score of self-assessment before and after the intervention was significant (p <0.001) (Table 2). Also, in four-Choice test, difference was statistically significant. (p <0.001) (Table 3). 40 (88%) students had well, and 6 (11%) had a moderate attitude toward the educated program. The mean total score of attitude in this study was 76.4 ± 8.71 indicating the students' desirable attitude. 88% of trainees showed

high and very high satisfaction.

Findings of attitude and satisfaction of visiting the addiction exhibition:

Eleven community medicine trainees attended the program. 8(72%) participants stated that their knowledge about the taught topics enhanced high or very high. The mean score of attitude was 75 ± 6.7 which indicates the good attitude of the participants. 9(81.8%) students were highly satisfied with this training program. Among participants 7(63.7%) learners believed that more time should be devoted to addiction training courses. 9(81.8%) participants also believed that training on substance use disorders could be helpful in their future work period.

Findings of the substance abuse emergencies training program

Eight interns participated in this part of the study (5 (62.5%) female and 3 (37.5%) male). Paired t-test showed that the difference between the mean total score of self-assessment of knowledge of addiction emergencies before and after the intervention was significant (p <0.001) (Table 2). Also, in four-Choice test, the difference was statistically significant (p <0.001) (Table 3). All participants were highly satisfied with this training program. The mean score of attitude in this study was 78.75 ± 6.56 indicating the good attitude of learners toward this education program.

General practitioners have a valuable role in the health service system and can be considered as an important reference in the management and treatment of patients with substance use disorders. However, their performance in the field of addiction is not very good.

In the present study, according to the necessities considered in medical education curricula for addiction in other countries, trainings in basic sciences, physiopathology, externship and internship in general medicine were integrated. In all interventions, the mean score of knowledge and self-assessment score of students' knowledge increased significantly after the intervention.

Table 2. Demographic characteristics of study participants				
Degree in General Medicine	number	age	Sex: n (%)	
			female	male
Basic sciences (Psychology course program)	33	19.3 ± 1.31	18 (54.5%)	15 (45.5%)
Basic sciences (life skill workshop)	16	20.1 ± 1.79	9 (56.2%)	7 (43.8%)
Physiopathology (pharmacology)	46	21.7 ± 1.53	26 (56.4%)	20 (43.5%)
Externship	11	23.5 ± 2.06	10 (90.1%)	1 (0.09%)
Internship (substance abuse emergencies)	8	24.6 ± 2.51	5 (62.5%)	3 (37.5%)

Table3. Comparison of total self-assessment score of knowledge before and after the intervention through paired t-test

Degree in General Medicine	Total Consciousness Score	Number of participants	Mean ± Sd	Mean difference	t	P value
Basic sciences (Psychology course program)	Before intervention	33	46.69±10.2	-30.48	-13.6	<0.001
	After intervention	33	77.18±5.24			
Physiopathology (pharmacology)	Before intervention	46	0.6±0.58	-4.98	-20/74	<0.001
	After intervention	46	5.59±1.63			
Internship (substance abuse emergencies)	Before intervention	8	13.12±1.30	-12.37	-11.58	<0.001
	After intervention	8	25.50±1.28			

Table 4. Comparison of four-choice knowledge assessment questionnaire before and after the intervention through paired t-test

Degree in General Medicine	Total Consciousness Score	Number of participants	Mean ± Sd	Mean difference	t	P value
Basic sciences (Psychology course program)	Before intervention	33	3.48±1.50	-4.36	-10.08	<0.001
	After intervention	33	7.84±2.06			
Physiopathology (pharmacology)	Before intervention	46	21.06±4.42	-9.79	-12.35	<0.001
	After intervention	46	30.86±2.99			
Internship (substance abuse emergencies)	Before intervention	8	4±1.30	-4.25	-11.61	<0.001
	After intervention	8	8.25±1.28			

DISCUSSION

In basic sciences, the intervention of psychology course led to an increase in the overall score of knowledge and self-assessment of knowledge by 4.36 and 30.48 points, respectively. In physiopathology, pharmacology intervention increased the overall score of knowledge and self-assessment of knowledge by 4.36 and 30.48 points, respectively.

In the poisoning internship, the intervention led to an increase in the overall score of consciousness and self-assessment of consciousness by 4.25 and 12.38 points, respectively. All the participant showed high and very high satisfaction and also good attitude toward educating programs entirely.

Renner considered the three main elements in the success of addiction management and treatment to be sufficient basic knowledge, a positive attitude towards the patient and the benefits of treatment, and a sense of responsibility for clinical problems (24). Of course, it is important to mention that changing the attitude and clinical practice of learners in the field of addiction is also very important, but change in these two areas requires the continuation of educational programs and the existence of educational facilities, including training centers for addiction treatment. Due to the absence of this topic in the educational curriculum for continuous training, changing in these two areas was not possible in the present intervention. Of course, it is important to mention that the shortcomings in the

educational curriculum are not limited to Iran, and this shortcoming is evident in studies in other countries (26, 16). A prospective cohort study in New Zealand that examined the impact of a medical education program on students' knowledge, attitudes, and skills relating to addiction found that students' knowledge and skills relating to addiction increased with the number of years of study (27). In the study of Brown et al., Who performed a 4-week and structured intervention on the issue of addiction for internal assistants, the results showed a significant increase in learners' knowledge after the intervention (28). Olford in 2003-2005 assessed the impact of a six-month addiction intervention program on general practitioners' knowledge and attitudes. After the intervention, the knowledge, attitude and self-confidence of the physicians participating in the intervention in dealing with substance use disorders had increased (18). In the study, Srivastava et al. examined the effect of implementing an educational program on improving the performance and skills of general practitioners in relation to opioids. This one-year training program was held in the form of lectures, discussions, video conferences and clinical support. After the intervention, during the follow-up courses, physicians' confidence and knowledge about opioids increased in comparison to the pretest using a self-assessment questionnaire (29). All studies that were conducted in order to improve the knowledge, attitude and practice of physicians in relation to substance and alcohol use

disorders and were performed in different scientific levels (general medical students, paramedics and general paramedics) were in line with the results of the present study in terms of increasing knowledge and attitude. Due to the positive effect of all interventions related to addiction and due to the high prevalence of diseases related to substance use disorders and the high burden of referrals, especially the first level of service delivery, physicians need to have basic information on substance use disorders and its management. This issue reveals the necessity of continuous implementation of educational programs in all stages of the medical course. This will be possible by entering the basic and main topics of addiction to the educational curriculum of general medicine course.

The interventions performed in the present study had some limitations, including that in these interventions only students' knowledge was measured using a self-assessment and four-choice test. Due to the fact that knowledge assessment was assessed only once after the intervention, it was not possible to assess the continuity of learners' knowledge and its impact on learners' future job activities. In addition, the effect of interventions on students' performance was not measured. Of course, it is important to note that the performance of learners can be evaluated in addiction treatment centers or after the end of general medicine and at the time of providing health services. However, the intervention was implemented for medical students and there were not addiction treatment centers, therefore it was not possible to measure students' performance. In order to improving the educational

curriculum, it is necessary to set up educational centers for addiction treatment in universities in order to teach the concepts in a practical way.

The positive effect of all present interventions on knowledge, attitude, and satisfaction of the medical student emphasizes modifying the medical education curriculum considering the pattern, content, and results of the implemented interventions can be very effective in improving the physicians' performance in the field of addiction management.

Ethical considerations

Ethical issues including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc. have been completely observed by the authors. The ethics committee of Shahrekord University of Medical Sciences approved this research, ethics code IR.SKUMS.REC.1398.084.

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