ORIGINAL ARTICLE

The effect of "evidence-based medicine" education on the knowledge and attitude of medical students

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Background: In recent years, in order to improve the quality of medical care, physicians have integrated their clinical expertise and best available research evidences to form evidence-based medicine. This study aims to assess the impact of training of evidence-based medicine on knowledge and attitude of medical students of Mashhad University of Medical Sciences.

Methods: This experimental study had a before-after design and did not use a control group and was carried out among 244 medical externs in a course of an educational year. During the one-month course of family medicine, a three-day workshop consisting of seven two-hour sessions were held by faculty staff of community medicine department about definition, components, and how to clinically use EBM in practice. SPSS version 16 was used for data analysis.

Results: The average attitude (total 5 points) improved from 2.2 before the workshop to 4.1, which was statistically significant ($P = 0.001$). The attitude regarding the positive effects of evidence-based medicine on patient outcome and its practicality and cost-effectiveness for the patient changed drastically. The knowledge of the participants regarding common concepts of EBM improved from 1.4 points to 2.4 points (total 3 points) after the workshop, which was statistically significant ($P = 0.001$).

Conclusions: Considering negative attitude and inadequate knowledge of students regarding evidence-based medicine, and favorable impact of the workshops on the knowledge and attitude of the students, even in the short-term, necessitates more extensive programs to be designed by the educational staff of the university.

Keywords: Medical student, Knowledge and attitude, Evidence-based medicine

تحقيق آثار تدريس الطب المبني على البراهين على معرفة وموقف طلاب الطب

الخلفية: في السنوات الأخيرة ، من أجل تحسين جودة الرعاية الطبية ، قام الأطباء بدمج خبراتهم السريرية وأفضل الأدلة البحثية المتاحة لتشكيل الطب القائم على الأدلة. تهدف هذه الدراسة إلى تقييم أثر تدريب الطب المسند بالأدلة على معرفة وسلوك طلاب الطب بجامعة مشهد للعلوم الطبية.

الطرق: كان لهذه الدراسة التجريبية تصميم قبل و بعد و لم تستخدم مجموعة ضابطة وتم إجراؤها على ٢۴۴ متدربا طبيا خلال عام واحد. تم عقد ورشة عمل لمدة ثلاثة أيام تتكون من سبع جلسات لمدة ساعتين من قبل أعضاء هيئة التدريس بقسم طب المجتمع خلال دورة طب الأسرة التي استمرت شهراً واحداً؛ حول التعريف و المكونات و استخدام التعاليم الطبية المسندة بالبينات في العيادة. تم استخدام الإصدار ١۶ من SPSS لتحليل البيانات.

النتائج: ارتفع متوسط درجة موقف المشاركين من مجموع درجات خمسة ، من ٢,٢ قبل ورشة العمل إلى ۴,١ (P= 0.001). تغير الموقف فيما يتعلق بالآثار الإيجابية للطب المسند بالأدلة على نتائج المريض وعمليته وفعاليته من حيث التكلفة بالنسبة للمريض بشكل جذري. تحسنت معرفة المشاركين فيما يتعلق بالمفاهيم المشتركة لـ EBM من ١,۴ نقطة إلى ٢,۴ نقطة (إجمالي ٣ نقاط) بعد ورشة العمل (P= 0.001).

الخلاصة: النظر في المواقف السلبية والمعرفة غير الكافية للطلاب فيما يتعلق بالطب القائم على الأدلة ، والتأثير الإيجابي لورش العمل على معرفة الطلاب وموقفهم ، حتى على المدى القصير ، يتطلب برامج أكثر شمولاً ليتم تصميمها من قبل مسئولي التعليم الجامعي. أظهرت هذه الدراسة أن معرفة الطلاب حول EBM غير متوفرة ، مما يستلزم تدريبهم على EBM. علاوة على ذلك، حتى ورش العمل قصيرة المدى يمكن أن يكون لها تأثيرات إيجابية كبيرة على معرفة وموقف الطلاب فيما يتعلق بـ EBM.

الكلمات المفتاحية: طالب الطب ، المعرفة والموقف ، الطب المسند

میڈیکل کے طلباء کے علم اور رویے پر "ثبوت پر مبنی ادویات" کی تعلیم کا اثر

بیک گراونڈ : حالیہ برسوں میں ، طبی دیکھ بھال کے معیار کو بہتر بنانے کے لیے ، معالجین نے اپنی طبی مہارت اور بہترین دستیاب تحقیقی شواہد کو شواہد پر مبنی دوا بنانے کے لیے مربوط کیا ہے۔ اس مطالعے کا مقصد مشہد یونیورسٹی آف میڈیکل سائنسز کے میڈیکل طلباء کے علم اور رویے پر شواہد پر مبنی ادویات کی تربیت کے اثرات کا جائزہ لینا ہے۔

طریقے: اس تجرباتی مطالعے میں پہلے سے بعد کا ڈیزائن تھا اور اس میں کوئی کنٹرول گروپ استعمال نہیں کیا گیا تھا اور اسے تعلیمی سال کے دوران ٢٣٣ میڈیکل ایکسٹرنز میں کیا گیا تھا۔ فیملی میڈیسن کے ایک ماہ کے کورس کے دوران ، تین روزہ ورکشاپ جس میں سات دو گھنٹے کے سیشن شامل تھے ، کمیونٹی میڈیسن کے فیکلٹی سٹاف کی طرف سے تعریف ، اجزاء ، اور عملی طور پر ای بی ایم کو طبی طور پر کیسے استعمال کیا جائے۔ ڈیٹا تجزیہ کے لیے ایس پی ایس ایس ورژن ١۶ استعمال کیا گیا۔

نتیجے: اوسط رویہ (کل ۵ پوائنٹس) ورکشاپ سے پہلے ٢,٢ سے ٣,١ تک بہتر ہوا ، جو اعدادوشمار کے لحاظ سے اہم تھا (P = 0.001)۔ مریض کے نتائج پر ثبوت پر مبنی ادویات کے مثبت اثرات اور مریض کے لیے اس کی عملیت اور لاگت کی تاثیر کے حوالے سے رویہ یکسر تبدیل ہو گیا۔ ای بی ایم کے عام تصورات کے بارے میں شرکاء کا علم ورکشاپ کے بعد ١,٣ پوائنٹس سے ٢,٣ پوائنٹس (کل ٣ پوائنٹس) تک بہتر ہوا ، جو کہ اعدادوشمار کے لحاظ سے اہم تھا (P = 0.001)۔

سفارش: شواہد پر مبنی ادویات کے بارے میں طلباء کے منفی رویے اور ناکافی علم پر غور کرنا ، اور طالب علموں کے علم اور رویہ پر ورکشاپس کے سازگار اثرات ، یہاں تک کہ قلیل مدتی میں ، مزید وسیع پروگراموں کی ضرورت ہوتی ہے جو تعلیمی عملے کے ڈیزائن کیے جائیں۔ یونیورسٹی

کلیدی الفاظ: میڈیکل کا طالب علم ، علم اور رویہ ، ثبوت پر مبنی دوا

بررسی تأثیر آموزش پزشکی مبتنی بر شواهد بر سطح آگاهی و نگرش دانشجویان پزشکی

زمینه و هدف: در سال های اخیر، به منظور ارتقاء کیفیت خدمات پزشکی پزشکان اقدام به تلفیق تجارب بالینی خود با بهترین مقالات و شواهد موجود در قالب پزشکی مبتنی بر شواهد نموده اند. هدف این مطالعه بررسی تأثیر آموزش پزشکی مبتنی بر شواهد بر آگاهی و نگرش دانشجویان پزشکی مشهد به این مقوله بود.

روش: این مطالعه تجربی با طراحی قبل و بعد و بدون گروه کنترل بر روی ۲۴۴ کارآموز پزشکی در طی یک سال انجام شد. در دوره یک ماهه کارآموزان در بخش پزشکی خانواده، یک کارگاه سه روزه متشکل از هفت جلسه دو ساعته توسط اعضای هیئت علمی گروه پزشکی اجتماعی دانشگاه علوم پزشکی مشهد با موضوعاتی درباره تعریف، اجزا و نحوه استفاده از آموزه های پزشکی مبتنی بر شواهد در بالین برگزار شد. آنالیز داده ها توسط نرم افزار SPSS ویرایش ۱۶ انجام گردید.

یافته ها: میانگین نمره نگرش شرکت کنندگان از نمره کل پنج، از ۲/۲ قبل از کارگاه به ۴/۱ افزایش یافت ($P = 0.001$). دیدگاه شرکت کنندگان در خصوص تاثیر مثبت پزشکی مبتنی بر شواهد بر پیامد بیمار و عملی و مقرون به صرفه بودن آن برای بیمار، به نحو قابل ملاحظه ای تغییر کرده بود. دانش شرکت کنندگان در خصوص آشنایی با اصطلاحات رایج در پزشکی مبتنی بر شواهد از میانگین نمره ۱/۴ قبل از برگزاری کارگاه از نمره کل (۳) به ۲/۴ بعد از کارگاه افزایش یافت ($P = 0.001$).

نتیجه گیری: با توجه به نگرش پایین و دانش کم دانشجویان نسبت به پزشکی مبتنی بر شواهد و تأثیر قابل قبول کارگاه های مرتبط حتی کوتاه مدت بر سطح دانش و نگرش ایشان، برنامه ریزی گسترده تر توسط مسئولین آموزشی دانشگاه در این خصوص ضروری به نظر می رسد.

واژه های کلیدی: دانشجوی پزشکی، دانش و نگرش، پزشکی مبتنی بر شواهد

INTRODUCTION

The development of novel information and research technologies has increased and facilitated having access to medical information resulting from scientific studies on the application of new diagnostic and therapeutic methods in recent decades (1). In order to help achieve the best possible patient outcome, evidence-based medicine (EBM) was developed by combining vast medical information, which is readily available to the medical staff today, physicians' clinical experience, and patients' preferences (1). The term "EBM" was first coined by a number of researchers at McMaster University of Canada (2).

Today, the development and influence of technology in medical information and the emergence of a plethora of information, acted as a favorable substrate for the application of EBM, a rational framework for decision-making in medicine (3). EBM is valuable in clinical decision making due to the fact that it combines clinical experience with the most authoritative research available (4), neither of which can lead to effective measures for the patient when used alone (3, 4). Also, referring to the most recent evidence on a regular basis can prevent the use of outdated therapeutic methods that provide no benefit for the patients or have the potential to harm them (3, 4). In order to achieve the goals of EBM, physicians perform the following steps: 1) turn the required information into answerable questions, 2) follow the best available evidence to answer the proposed question with maximum applicability, 3) review the evidence found in terms of validity (how close is it to the reality) and applicability (how useful is it in the clinical settings), 4) combining the study with clinical experience and applying it, and 5) evaluate their performance in performing the aforementioned steps (4).

Different studies used various methods and at different levels for educating medical students in EBM. Most studies investigate case-based integrated long-term programs and short-term workshops. A study conducted in Saudi Arabia at 2004 found that only 40 percent of physicians had learned the basics of EBM (5). In a UK study, the primary reason physicians did not use EBM was lack of time (6). The results of other studies in other countries also indicated that physicians generally do not have a clear understanding of the applications of and terminology used in EBM. Studies conducted in Iran at Bushehr, Shahid Beheshti, and Shiraz University of Medical Sciences also showed similar results to studies in other countries (7-9).

Mohammad Reza Khami et al. reported that dental students had a low level of knowledge regarding EBM (10). In the study of Mohammad Sahib Al-Zamani et al., not a single physician could answer questions related to designing a clinical question based on the PICO model, none could understand statistical expressions, and none was familiar with common epidemiological terms such as relative risk, absolute risk, and odds ratio (11).

Despite the addition of EBM education in the curriculum of some medical universities in the country, there are limited studies that examine the effects of this education on students' knowledge and attitudes. This study aims to investigate the effects of EBM on the knowledge and attitude of medical students in Mashhad University of Medical Sciences.

METHODS

This experimental study had a before-after design and did not use a control group. 244 medical externs were enrolled in the study according to the calculated sample size. They were provided with training content in the form of a three-day workshop (Table 1). The overall goal was to increase and improve students' attitudes towards EBM. The training courses consisted of 7 sessions of 2 hours each were presented by the professors of the public health department during the one-month course of family medicine. The content of the training, which was held as a workshop, included the definition, history, necessity, steps of performing EBM, designing a clinically responsive question (PICO), familiarity with databases and searching for evidence, steps, methodology and evaluation. Articles were diagnostic, therapeutic, prognostic, and ultimately the principles of evidence.

Before the workshop, the knowledge and attitude of the trainees were assessed using a researcher-designed questionnaire. At the end of the training course, they were assessed again. The participants were enrolled until a sufficient sample size was obtained, which consisted of twelve courses of family medicine externs. The validity of the content of the questionnaire was confirmed by presenting it to three professors of public health department and two professors of medical education department and applying their opinions. Reliability was confirmed using Cronbach's alpha index of the first 20 questionnaires obtained from students in the amount of 0.82.

The questionnaire contained demographic information, six questions with 5-point Likert scale to measure attitude, and twelve questions of common terms in EBM with 3-point Likert scale, which were completed at the beginning and at the end of the workshops as well. Also, there were 8 multiple choice questions about the familiarity with databases, which were asked only at the beginning of the workshops. At the beginning of the course, all participants were asked whether they have previously participated in a similar workshop.

For data analysis, after entering the data in SPSS software version 16, charts and central and dispersion indices including mean and standard deviation were used to describe the data. Paired t-tests or their equivalent non-parametric tests were used to compare quantitative data. To compare qualitative data, Chi-square and McNemar tests were used.

RESULTS

The study was performed on 244 medical interns. Forty-one percent (100 people) were male. The mean age was 24.33 ± 0.99 with a minimum of 23 and a maximum of 31 years. Seven participants (2.9%) had previously participated in the same workshop.

Participants' overall knowledge (very high and relatively high) about EBM increased from 6.1% before the workshop to 87% afterwards (P-value = 0.001). This general knowledge is related to the first two questions of table 1, which includes the participants' understanding of EBM and the steps towards its execution (table 1).

Table 1. Comparison of participants' views on EBM before and after the workshop

P-value Test Statistics*	z	very little	little	Relatively low	Relatively high	Very high		questions about participants' attitude on EBM
		Number	Number	Number	Number	Number		
0/000	-13.265	137	63	28	14	2	before	I know what EBM is
		0	4	13	101	126	after	
0/000	-13.089	143	58	29	9	5	before	I can explain the steps of applying EBM to others
		2	15	30	95	102	after	
0/000	-13.035	49	86	107	1	1	Before	Applying EBM will have a better outcome for the patient.
		0	18	9	198	19	after	
0/000	-11.028	16	16	24	67	121	before	applying EBM will not actually work for all patients because sometimes it is not cost effective
		74	41	15	110	4	after	
0/000	-10.794	36	40	47	49	72	before	Applying EBM will not actually work for all patients because it is sometimes unreliable.
		108	99	15	20	2	after	
0/000	-6.788	64	74	43	24	39	before	EBM has conflicts with physician independence in clinical decision making
		81	127	8	19	9	after	

*Wilcoxon Signed Ranks Test

General attitude of the participants about EBM before and after the workshop shows a significant difference (P-value = 0.001) (Table 1). The general attitude is related to questions three to six in table 2. According to our results, participants' views on the positive impact of EBM on patient outcomes, and its practicality and cost-effectiveness for the patient changed significantly. Students' views on the impact of EBM on improving patient outcomes increased from 8.9% before the workshop to 8.9% thereafter. Prior to the workshop, 77% of students believed that performing EBM was not cost-effective for patients. This figure has decreased to 46% after the workshop. On the other hand, before the workshop, 25% of students believed that EBM contradicts the doctors' decision-making independence, which has been reduced to 18% after the workshop.

The total attitude scores ranged from a minimum of one to a maximum of five points of the Likert scale. Since the questions had different score scales, the scores were first matched and then the paired t-test was used to compare the average score obtained before and after the workshop, due to the normal data distribution (Table 2). This number increased from the average of 2.2 before the workshop to 4.1 afterwards, which denotes significance (p-value = 0.001). This shows that holding the workshop has significantly improved students' attitudes towards EBM.

The present researchers examined the level of students' familiarity with EBM databases at the beginning of the workshop (Figure 1). The only reference all students have known was UpToDate. The most common resource used by students in the clinic was UpToDate (68%). The usage of other resources ranged from 0.8% to a maximum of 6.1% in the clinic.

Measuring the level of familiarity of students with various terms used in EBM was an indicator of their general familiarity with EBM. The researchers of this study asked twelve common terms before and after the workshop. The knowledge of participants differed significantly regarding all the terms before and after the workshop (Table 3).

DISCUSSION

In the present study, the general knowledge of people based on EBM increased from about 6% before the workshop to about 86% thereafter. Students' attitudes were significantly different before and after the workshop. Participants' familiarity with common terms in EBM after the workshop was significantly higher than before. At the beginning of the study, participants were most familiar with the UpToDate database and did not know much about other resources.

Numerous studies have been conducted in the country and abroad on the level of knowledge and attitudes of students

Table 2. Compares the results of participants' attitudes about EBM before and after the workshop

Test Statistics* p-value	Dispute	Mean and standard deviation		Variable
		Post-test	Pre-test	Participants' attitudes
0.001*	-1.890710	4.161885 ± 0.36	2.2712 ±	

*Paired Samples Statistics

Table 3. Comparison of participants' familiarity with some statistics used in EBM before and after the workshop

Test Statistics*		I do not understand but I want to learn number	I understand to some extent number	I understand and can explain to others number	Z	Asymp. Sig. (2-tailed)
Relative risk	before	80	152	12	-12.578	.000
	After	5	54	185		
Absolute risk	before	123	114	7	-10.538	.000
	after	0	170	74		
Systematic review	before	147	77	20	-12.784	.000
	after	0	54	190		
Odds ratio	before	80	150	14	-11.049	.000
	after	0	120	124		
Meta Analysis	before	114	118	12	-13.158	.000
	after	3	13	228		
Number needed to treat	before	232	10	2	-12.493	.000
	after	40	90	114		
Confidence interval	before	61	148	35	-10.546	.000
	after	0	108	136		
Absolute risk reduction	before	232	8	4	-10.504	.000
	after	96	84	64		
Heterogeneity	before	231	12	1	-13.112	.000
	after	33	55	156		
Likelihood ratio	before	210	31	3	-13.084	.000
	after	24	199	21		
P value	before	151	34	59	-11.387	.000
	after	12	45	187		
BIAS	before	167	17	60	-10.730	.000
	after	20	59	165		

*Wilcoxon Signed Ranks Test

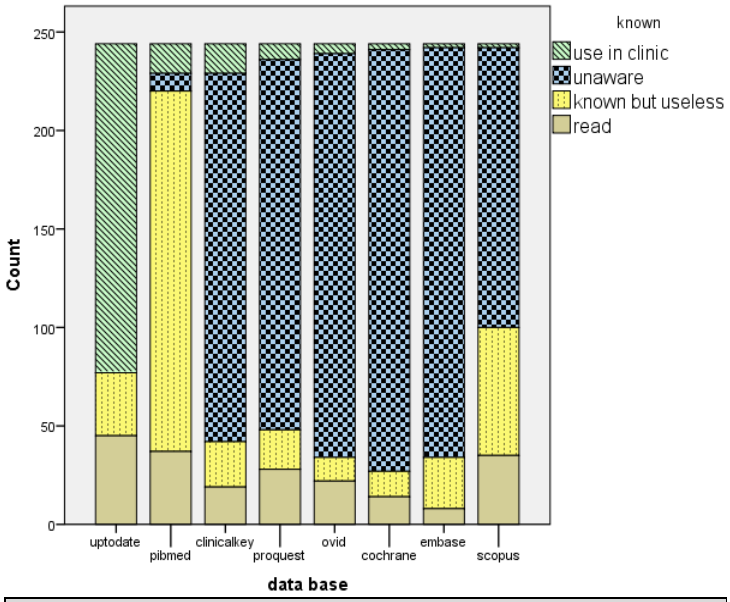

Figure 1. Status of participants' familiarity with evidence-based medicine databases

of systematic review (12). Malaysian physicians, on the other hand, reported better results, with 80% knowing the concept of EBM and 71.1% the concept of systematic review (13). In the study of Mohammad Sahib Al-Zamani et al. The results of the present study are consistent, but slightly different (11).

In the attitude section, the results of the study of Mohammad Sahib Al-Zamani et al. indicated a negative attitude of physicians towards EBM, which is due to lack of knowledge and awareness of EBM (11). In this regard, the results of a study conducted in Bushehr showed that the implementation of educational programs can have a positive effect on the knowledge and attitudes about the need for EBM, which was consistent with the results of this study conveying that the workshop was effective in both increasing knowledge and improving students' attitudes (9).

Implementation of similar interventions performed in other countries has shown similar results (14, 15).

In the present study, students were very unfamiliar with information resources at the beginning of the workshop. In a way that they were either unaware of most of them or did not use any. UpToDate was the only resource used by the of systematic review (12). Malaysian physicians, on the other hand, reported better results, with 80% knowing the concept of EBM and 71.1% the concept of systematic review (13). In the study of Mohammad Sahib Al-Zamani et al. The results of the present study are consistent, but slightly different (11).

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Implementation of similar interventions performed in other countries has shown similar results (14, 15).

In the present study, students were very unfamiliar with information resources at the beginning of the workshop. In a way that they were either unaware of most of them or did not use any. UpToDate was the only resource used by the students. Students used other resources very rarely. These results were consistent with the findings of the N M Lai's study on interns in Malaysia and the David A Feldstein's study on medical assistants in the United States (13, 16).

Yahya Safari *et al.* investigated the attitude of professors towards the concept of EBM, suggested that the behavior of professors regarding the use of EBM in clinical education and treatment should be changed (17). The present study found that education can make an acceptable change in students' attitudes about EBM. The results of this study regarding students' knowledge and attitudes are in line with the study of Ghahremanfard et al. (18).

Various studies have shown the effect of education on students' perspectives, which is consistent with the present study. For example, the study of Ehsan Nezakati aimed at the effect of EBM training on the presentation and quality of morning reports from the perspective of medical students, which improved active participation of students in group discussions and medical care (19).

The results of the study of Najafi *et al.* on evaluating the knowledge, attitude, and skill of medical interns using logbook and Alavi-Moghadam et al. which compared evidence-based journal club with its conventional implementation also indicated similar results to the present study in regards of students' knowledge and attitude towards concepts of evidence-based medicine (20, 21).

In general, the importance of applying EBM principles in clinical education in Iran has been noted in recent years. The effect of EBM workshops on improving the quality of morning reports, journal clubs, and students' clinical skills in using up-to-date resources and improving their knowledge and attitude towards EBM were illustrated in most of the relevant studies.

Conducting the workshop only for externs, short training period, and not following the effects of the workshops on students for a longer period of time, were among the limitations of this study.

Due to the low attitude and lack of knowledge of students towards EBM and the acceptable impacts of relatable workshops on their level of knowledge and attitude, even in short-term, more extensive planning by university education officials seems necessary in this regard.

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 Mashhad University of Medical Sciences approved this research, IR.MUMS.MEDICAL.REC.1398.061.

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