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ORIGINAL RESEARCH ARTICLE

Development of an evidence-based dentistry course for dental students and its effect on their awareness, attitude and self-assessed knowledge

Khami MR[1], Mohtashamrad Z[2], Razeghi S[1], Jafari A[1], Yazdani R[1], Moscowchi A[3], Akhgari E[3], Elyasi M[4]

Abstract

Background and Aim: The aim of evidence-based dentistry (EBD) is to make best clinical decisions with the judicious and systematic uses of the best scientific evidences. The objective of the present study was to develop an EBD course for dental students, and to assess the effects of participation in this course on awareness, attitude and self-assessed knowledge of the students. The students' satisfaction with the course was also assessed.

Materials and Methods: In this controlled interventional study, 65 dental students in two main state Dental Schools in Tehran were selected and were divided into two groups: 43 students in the intervention group and 22 in control group. An EBD course was developed and presented for the intervention group. The scores of awareness, attitude and self-assessed knowledge were determined in both groups before and after participation in the course by means of a questionnaire. The post-test questionnaire in the intervention group had also some questions about course evaluation. Student's *t*-test and linear regression model served for statistical analysis. Statistical significance was set at 0.05.

Results: The students participating in the EBD course showed more improvements regarding total scores of awareness, attitude and self-assessed knowledge when compared to control individuals ($P < 0.0001$, $P < 0.005$ and $P < 0.0001$, respectively). Of different studied factors, only students' gender showed significant influence on the knowledge scores changes ($P = 0.042$).

Conclusions: The developed EBD course seemed to be effective to improve the participants' awareness, attitude and self-assessed knowledge regarding evidence-based concepts. The results call for more emphasis on EBD in dental curriculum through designing courses on the subject.

Keywords: evidence-based dentistry, dental students, curriculum

Introduction

Dental practice is becoming more complex and challenging as a result of changing socio-demographic patterns, knowledgeable healthcare consumers, rapid technical advances, the information explosion and increasing public expectation. Thus, clinical decision making posed several problems for the dental practitioner[1]. Moreover, nowadays more people retain all of their teeth due to increasing the lifetime, level of health and access to services[2]. Therefore, dentists should provide efficient treatments and apply the best possible care for patients. It is important for dentists to be up to date with developments in diagnosis, prevention and treatment of oral disease[3,4].

Evidence-based dentistry (EBD) links real-world dental practice to clinical research and enables dentists to use relevant research results[3]. "EBD is the integration and interpretation of the available current research evidence, combined with personal experience"[4]. The ultimate goal of EBD is to aid clinical judgment, to minimize errors in diagnosis and to ensure optimal decision making about therapies and treatments[5]. EBD approach comprises five main steps: defining the main question, searching for the information resources, interpreting the evidence, acting on the evidence, and following the results[4].

Increasing the application of evidence-based treatments and practices in dentistry is depending on teaching EBD to dental students[6]. With regard to the need of dental students

*Correspondence: Razeghi S (E-mail: s-razeghi@tums.ac.ir)
[1]Research Center for Caries Prevention, Dentistry Research Institute, Department of Community Oral Health, School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran.
[2]Prsosthodontist, Private Practice, Tehran, Iran.
[3]Dentist, Private Practice, Tehran, Iran.
[4]PhD Candidate, University of Alberta, Canada.

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to be competent in evidence-based practice (EBP) many dental schools have provided EBD education course for students[6–10]. No report, however, exists on providing EBD courses for dental students in Iran[11]. Previous studies in Iran have indicated that despite positive attitude toward learning EBD, the level of actual knowledge of dental students and dental faculties about basic principles of EBD was unfavorable[12–14].

The objective of the present study was to develop an EBD course for dental students in Tehran University of Medical Sciences, and to assess the effects of participation in this course on their awareness, attitude and self-assessed knowledge towards EBD. The students' satisfaction with the course was also assessed.

Methods

Study subjects

The study was approved by the Research Ethics Committee at Tehran University of Medical Sciences (TUMS). The study was a controlled trial study with 65 dental students from two main state dental schools in Tehran and Iran; 43 dental students from TUMS as intervention group, and 22 dental students from Shahid Beheshti University of Medical Sciences (SBUMS) as a control group. All the participants were in their fifth year of a sixth-year undergraduate curriculum at the time of study (Spring 2010).

Data collection instrument

An anonymous questionnaire served as data collection instrument. Based on previous studies[3,6], the questionnaire was developed to determine awareness, attitude and self-assessed knowledge regarding EBD. Two experts in community oral health and one oral epidemiologist assessed the validity of the questionnaire. Reliability of questionnaire was evaluated and approved by performing a test–retest procedure on 15 students with 2 weeks interval. Kappa coefficient calculated to be from 75% to 95% in different questions.

In addition to age and gender as demographic background, the questionnaire had three main parts as follow:

- Awareness of EBD concepts comprised 10 questions asking the familiarity of students with the main concepts of EBD. The students reacted to the questions in a five-point Likert scale from "none or very little" to "very well." The responses were scored from 1 to 5. Then, the scores were summed up to calculate the final knowledge score with possible range from 10 to 50.
- Attitudes towards EBD were assessed through 12 statements to be answered in a five-point Likert scale from "completely disagree" to "completely agree." The responses were scored from 1 to 5, and were summed up to calculate final attitude score with possible ranged from 12 to 60.
- Self-assessed knowledge of EBD concepts was assessed through presenting nine specific terms and concepts commonly used in EBD. The alternatives ranged from "no awareness of the concept" to "understand and ability to define the concept." The responses were scored from 1 to 5, and were summed up to calculate final awareness score with possible ranged from 9 to 45.
- Satisfaction with the course was assessed by asking the students to rate their own viewpoints (from a scale 0 to 10) regarding course duration, course content applicability, adaptation of content with course title, lecturer proficiency on topics and lecturers teaching method. These questions were included in post-test questionnaire of the students in the intervention group.

The questionnaire was administered to the participants before and after the course. The students were voluntarily asked to write a unique code at top of their both pre-test and post-test questionnaires. This code was used to assess individual changes throughout the study.

Intervention

A 4-day course on EBD for dental students was developed. The course comprised 6 hr theoretical and 10 hr teamwork by students. Topics of the theoretical part included the importance of EBD approach and its principles, developing a clear question, searching for evidence and critical appraisal of the literature. The students then formed small groups and each group selected a topic to work on. After that, the students searched for evidence under supervision of the tutors, and continued group work to extract the best evidence. In the last day, each group presented their work to others, and the quality of their work was discussed. The students were evaluated by tutors according to a checklist. The students also received some educational materials at the end of the first day.

Data collection

The pre-test questionnaire was distributed among intervention and control groups on the same day at the beginning of the course in their classroom settings. The questionnaires were collected immediately. Post-test questionnaire for intervention group was distributed in the last day of their course. The students in control group answered the post-test questionnaire on the same day as the intervention group did.

Statistical analysis

The data were entered to SPSS software. The change of the scores was statistically analyzed by *t*-test between the two groups while the effect of age, gender and grouping was analyzed by the linear regression model. Significance level was set at $P < 0.05$.

Results

In the intervention group, 35 out of 43 students (81.4%) were female, and the mean age of this group was 22.7 ± 1 .6, and in the control group 14 out of 22 students (63.6%) were female with mean age of this group was 23.8 ± 2.3.

Percentage of responses to questions about awareness regarding EBD among dental students in both intervention and control groups before and after the training course is demonstrated in Table 1. Before training in both groups, most respondents specified that their awareness of different databases using in EBD is very poor or poor. Additionally, before training in the intervention group majority of students stated that their competency in critical appraisal of a scientific article was very poor or poor. After EBD course, the most favorable change was seen in the level of awareness regarding EBD in the intervention group.

Table 2 shows percentages of answers to attitude questions before and after the training program in both groups. Before the training, in both control and intervention group, the majority of students indicated that using a book or a paper as a resource for a specific dental procedure should be first based on ensuring the quality of the source. After the training in control group, the most respondents selected the same item as pre-test; in the intervention group, most students indicated that to define a clear specific question in clinical practice, the problem, the particular intervention, the alternatives and the outcomes should be determined (Table 2). After course implementation, the highest favorable change was regarding students' viewpoint on level of evidence of systematic review.

Percentage of responses to questions on self-assessed knowledge regarding EBD among dental students in two groups before and after the training course is demonstrated in Table 3. Before training in both groups, most items with lack of knowledge were Cochrane collaboration. After training, the item with the most positive change was on students' knowledge regarding EBD.

The mean of the awareness, attitude and self-assessed knowledge scores did not differ significantly from pre-test to post-test in the control group. In the intervention group, however, the means of awareness, attitude and self-assessed knowledge scores in the post-test were significantly higher than those in the pre-test ($P = 0.001$ and $P = 0.009$, respectively) (Table 4). According to Table 4, the students participated in the EBD course showed more improvements regarding total scores of awareness, attitude and self-assessed knowledge when compared to control group ($P < 0.0001$, $P < 0.005$ and $P < 0.0001$, respectively).

Of different demographic variables, students' gender only showed significant impact on the knowledge scores changes ($P = 0.042$) according to linear regression model.

Regarding satisfaction on participants in interventional course on EBD, except for course duration and one lecturer teaching method (satisfaction rate = 6.5), the other items were rated as satisfying by the students (satisfaction rate over 7.5).

Discussion

The present study investigated effectiveness of a course on EBD on awareness, attitude and self-assessed knowledge of dental students towards EBD. The results in short-term evaluation showed that the course was successful.

The interventional and controlled design of the study, interactive format of the designed course, and high participation rate can be considered as the strengths of the study. The students of control group were selected from a similar dental school to the intervention group in terms of recruitment criteria and educational atmosphere[15]. On the other hand, course assessment in a short-term follow-up and based on a self-report questionnaire may affect the results.

Previous studies have shown that EBD courses can improve critical appraisal expertise. Levin et al. (2008) emphasized the benefits of an interdisciplinary course that was implemented to teach first-year dental students at the University of Texas Health Science Center at Houston Dental Branch about EBD, search strategies, critical appraisal of the literature and dental informatics[16]. Thomas et al. (2009) also implemented a similar course in the University of Kentucky and reported that the course was successful[17]. Azarpazhooh et al. (2008) developed an evidence-based module for second-year dental students at the University of Toronto, Faculty of Dentistry to have students develop and apply skills in EBP. They reported high level of satisfaction in dental students regarding the evidence-based module as an enjoyable way of learning and also effectiveness of module in rising students' awareness of the importance of EBP[6]. Hinton et al. (2015) reported successfulness of a comprehensive 4-year curriculum in EBD that had been launched in 2008 in Texas A&M University Baylor College of Dentistry[18]. Furthermore, many dental schools have integrated EBD content into dental curriculum[19–23] and have emphasized on EBD skills in new generation of dental students as a paramount importance for the future of dentistry.

In the present study, in the intervention group after the course 65.2% of subjects believed that they achieved lots of information towards EBD, and more than 90% of participants said that they do not rely on their knowledge about treatment planning anymore and they felt that dentists should have life-long learning expertise and should keep up to date. These findings show that the course could form new ideas in students' minds about efficiency of their scientific knowledge. Life-long learning has been defined as one of the main competencies for a dentist in Europe[24] and Canada[25]. This is specifically important for countries with health systems in transition[26].

After the course, more than 90% of students attending the course believe that systematic reviews are the most reliable studies, and 88.4% of participants reported that they could define systematic reviews. Systematic reviews are considered as a basic tool of EBD since they are reviews of the resources by using a scientific and explicit methodology to reduce

Table 1 Responses to questions about awareness regarding EBD among dental students of Shahid Beheshti ($n = 22$) and Tehran ($n = 43$) universities, by percentage of respondents

	Control group						Intervention group					
	Pre-test ($n = 22$)			Post-test ($n = 22$[‡])			Pre-test ($n = 43$)			Post-test ($n = 43$)		
	Poor* (%)	Moderate (%)	Well† (%)	Poor (%)	Moderate (%)	Well (%)	Poor (%)	Moderate (%)	Well (%)	Poor (%)	Moderate (%)	Well (%)
How much do you rely on your own scientific base to provide a proper and favorable dental treatment?	4.5	50.0	45.5	0.0	20.0	80.0	4.7	58.1	37.2	27.9	69.8	2.3
How much do you think your own scientific base is useful and efficient for an effective treatment plan?	13.6	59.1	27.3	30.0	40.0	30.0	18.6	60.5	20.9	27.9	65.1	7.0
How much do you know EBD?	72.7	13.6	13.6	40.0	40.0	20.0	83.7	14.0	2.3	4.7	30.2	65.1
How much do you know various resources to gain last scientific dental information?	45.5	45.5	9.0	40.0	40.0	20.0	51.2	39.5	9.3	4.7	46.5	48.8
How much do you know various databases used in EBD?	77.3	22.7	0.0	70.0	30.0	0.0	90.7	7.0	2.3	7.0	44.2	48.8
How much do you expect to find your answers to your questi ons through searching in scientific articles?	22.7	31.8	45.5	20.0	20.0	60.0	34.9	41.9	23.2	9.3	37.2	53.5
How is the quality of articles or matters that you find in your search?	13.6	50.0	36.4	20.0	50.0	30.0	18.6	55.8	25.6	13.9	51.2	34.9
How much do you know main criteria in critical appraisal of a scientific article?	54.5	36.4	9.1	40.0	40.0	20.0	86.0	11.6	2.3	4.7	51.2	44.1
How much is your competency in critical appraisal of a scientific article?	68.2	22.7	9.1	50.0	40.0	10.0	90.7	7/0	2.3	18.6	51.2	30.2
How much do you know evidence hierarchy?	63.6	27.3	9.0	60.0	30.0	10.0	83.7	14.0	2.3	20.9	32.6	46.5

*A combination of "None or very little" and "A little" responses
†A combination of "Well" and "Very well" responses
‡12 students answered all questions

Table 2 Responses to questions about attitude regarding EBD among dental students of Shahid Beheshti ($n = 22$) and Tehran ($n = 43$) universities, by percentage of respondents

	Control group						Intervention group ($n = 43$)					
	Pre-test ($n = 22$)			Post-test ($n = 22$‡)			Pre-test ($n = 43$)			Post-test (n=43)		
	Disagree* (%)	No opinion (%)	Agree† (%)	Disagree (%)	No opinion (%)	Agree (%)	Disagree (%)	No opinion (%)	Agree (%)	Disagree (%)	No opinion (%)	Agree (%)
Experts' opinions, which are expressed based on work experiences could not necessarily be the basis for diagnosis and treatment.	36.4	9.1	54.5	30.0	10.0	60.0	27.9	7.0	65.1	18.6	2.3	79.1
To do a high quality dental treatment, we can trust to findings of latest researches.	54.5	18.2	27.3	60.0	10.0	30.0	62.8	20.9	16.3	27.9	16.3	55.8
To use a resource (book or paper) for a specific dental procedure, we should first ensure the quality of the source.	0.0	0.0	100.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0	2.3	97.7
A criterion to asses a paper quality is its study type.	9.1	36.4	54.5	10.0	30.0	60.0	0.0	34.9	65.1	0.0	7.0	93.0
Findings of cohort studies are more valid than findings of case-control studies.	22.7	40.9	36.4	50.0	30.0	20.0	18.6	30.2	51.2	7.0	2.3	90.7
The highest level of evidences are derived from systematic reviews.	0.0	50.0	50.0	0.0	50.0	50.0	0.0	72.1	27.9	4.7	4.7	90.7
The most important criterion to assess a clinical trial study is randomization.	9.1	50.0	40.9	0.0	70.0	30.0	9.3	20.9	69.8	2.3	2.3	95.3
In case of no blinding in a clinical trial study, the study would be invalid to be cited.	9.1	27.3	63.6	20.0	20.0	60.0	18.6	20.9	60.5	83.7	7.0	9.3
To define a specific clear question in clinical practice, the problem, the particular intervention, the alternatives, and the outcomes should be determined.	0.0	18.2	81.8	0.0	10.0	90.0	0.0	7.0	93.0	0.0	0.0	100.0
Contents of scientific websites are valid for citation since they are new.	36.4	27.3	36.4	40.0	40.0	20.0	39.5	27.9	32.6	32.5	23.3	44.2
After graduation dentists should search for the latest information and evidence related to their practice.	0.0	4.5	95.5	0.0	0.0	100.0	0.0	0.0	100.0	2.3	0.0	97.7
Dentists should have the competency of life-long learning.	0.0	4.5	95.5	0.0	10.0	90.0	0.0	2.3	97.7	0.0	2.3	97.7

*A combination of "completely disagree" and "disagree" responses
†A combination of "completely Agree" and "agree" responses
‡12 students answered all questions

Table 3 Responses to questions about self-assessed knowledge regarding EBD among dental students of Shahid Beheshti ($n = 22$) and Tehran ($n = 43$) universities, by percentage of respondents

	Control group						Intervention group ($n = 43$)					
	Pre-test ($n = 22$)			Post-test ($n = 22$[‡])			Pre-test ($n = 43$)			Post-test ($n = 43$)		
	Low*	Moderate	High[†]	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
Evidence-based practice	45.5	22.7	31.8	30.0	30.0	40.0	72.1	18.6	9.3	0.0	7.0	93.0
Clinical effectiveness	22.7	31.8	45.5	10.0	40.0	50.0	41.9	25.6	32.5	7.0	16.3	76.7
Systematic review	18.2	22.7	59.1	0.0	50.0	50.0	55.8	16.3	27.9	2.3	2.3	95.3
Cochrane collaboration	68.2	9.1	22.7	50.0	30.0	20.0	88.4	7.0	4.6	58.1	9.3	32.6
Bias	36.4	13.6	50.0	0.0	40.0	60.0	20.9	14.0	65.1	7.0	14.0	79.0
Odds ratio	54.5	18.2	27.3	10.0	40.0	50.0	60.5	11.6	27.9	27.9	16.3	55.8
P-value	27.3	27.3	45.5	10.0	20.0	70.0	86.0	2.3	11.6	51.2	7.0	41.9
PubMed	22.7	9.1	68.2	10.0	0.0	90.0	9.3	11.6	79.1	0.0	2.3	97.7
Medical subject headings (MeSH)	54.5	18.2	27.3	70.0	20.0	10.0	67.4	11.6	20.9	11.6	4.7	83.7

*A combination of "no awareness" and "little awareness" responses
†A combination of "understand and use" and "understand and ability to define" responses
‡12 students answered all questions

Table 4 Mean score of awareness, attitude and self-assessed knowledge towards EBD among intervention (*n* = 43) and control (*n* = 22) dental students before and after conducting a course on EBD for intervention group

	Awareness		Attitude		Self-assessed knowledge	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Intervention	22.28 ± 4.22	33.77 ± 4.49	43.42 ± 2.64	49.17 ± 4.68	24.74 ± 7.05	38.76 ± 6.04
Control	24.73 ± 5.37	29.2 ± 6.02	42.55 ± 2.58	42.5 ± 3.87	28.8 ± 9.69	34.5 ± 4.81

possible errors and subjective viewpoints on literature[27]. However, this kind of reviews is limited in dentistry and dentists should assess validity and relevance of the findings obtained from different studies and finally, apply them in their daily treatments[28].

In post-test evaluation of intervention group, 93% of the students reported that they could define the EBP term. According to the study of Iqbal and Gleny (2002), evaluated awareness and attitude of British GDPs, 29% of participants could define this term and 18% of them could define the systematic reviews[3].

In the intervention group, 81% of students before and 44.2% of students after course attendance could not understand the meaning of Cochrane Collaboration. Also, in the study of Iqbal and Glenny, 72% of GDPs did not have concept about this term[3]. Cochrane Collaboration is an independent international organization that was established in 1992. This organization aims to help researchers, clinicians or patients, in preparation, planning and achieving systematic reviews, and try to evaluate the effects of interventions on health. The main product of the Cochrane Collaboration is Cochrane Library as an electronic resource including clinical trials and systematic reviews databases[29].

Dental students' positive attitude towards the issue of EBD should be viewed as an opportunity for dental curriculum designers. Meanwhile, establishing EBD courses in dental schools and holding seminars in this field is also important. It should be noted that EBD should be integrated into the whole educational curriculum and not just limited to teaching the concepts.

Some limitations, such as lack of time and financial resources that limit the implementation of evidence-based educational methods have been reported in several studies[3,30]. Anyway, applying EBD methods in educational curriculum has been emphasized in researchers assessing education and experience of EBD and its effects on improving the quality of treatments[31].

Conclusion

The results suggested that the educational objectives of the designed EBD course were met and the course seemed to be effective in improving the participants' self-reported knowledge and attitude regarding EBD concepts. Therefore, similar courses can be designed for the students, and adaptation of the curriculum to allow more emphasis on the topic could be considered.

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