

Review Article



Comparison of the level of evidence of four chapters of the reference book on oral diseases in three different editions (2003-2021)

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Abstract

Background: Studies are assigned a level of evidence (LOE) based on the methodological quality of their design, validity, and applicability to patient care. Determining the LOE provides insights into evidence-based dentistry (EBD), and the LOE of dental education texts is important from an educational viewpoint. The present research aimed to analyze the LOE of references used in four clinical chapters in three editions of an oral medicine textbook.

Methods: The references of the chapters "Ulcerative and Vesiculobullous Diseases," "Oral Cancer," "Oro-Facial Pain," and "Cardiovascular Diseases" in the textbook *Burket's Oral Medicine* were evaluated in three of its editions (2003, 2008, and 2021). LOE was ranked according to study type and an Oxford scale from 1 to 5. The chi-square test was used to compare the LOE between chapters and editions.

Results: A total of 3136 references were assessed. The LOE had the same distribution in all three editions ($P=0.000$). The highest LOE in all editions was the "Cardiovascular Diseases" chapter. The LOE significantly increased over time between the editions for three chapters: "Oro-Facial Pain," "Cardiovascular Diseases" ($P<0.001$), and "Ulcerative and Vesiculobullous Diseases" ($P<0.05$).

Conclusion: The majority of these four clinical chapters were not written using the evidence-based approach, so they had low LOE. Researchers must be encouraged to conduct studies with high LOE, and the results of such research must also be applied in dental education textbooks.

Keywords: Evidence-based dentistry, Level of evidence, Oral medicine

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Introduction

Evidence-based dentistry (EBD) is "an approach to oral health care that requires systematic assessment and judgment about the validity of clinical scientific evidence and the integration of data related to this valid evidence." This data is related to patients' medical and oral history and should be coupled with the needs and priorities of patients, on the one hand, with the clinical experiences of the dentists on the other.^{1,2} Evidence-based clinical decision-making requires the achievement and use of large, high-quality studies. Meta-analyses, structured reviews, and randomized clinical trials have been evaluated as the highest-quality studies.³⁻⁵ Dental treatment planning should be based on the highest level of evidence (LOE), and the availability of quality clinical studies for clinical examination and decision-making related to evidence

is essential. LOE was defined as a benchmark and grading for various studies; the highest LOE belongs to randomized clinical trials (RCTs and systematic reviews), and the lowest is given to expert options and case series. Therefore, the higher the LOE of the studies, the more reliable the results of the studies for clinical questions raised in each field of specialization.¹⁻⁷ Reference books or texts are the main teaching sources and act as references for students and assistants in various fields of medical sciences, helping them find answers to clinical questions. The tradition of writing textbooks dates back to ancient Greece. In modern times, thanks to the printing industry, these books are usually revised and reprinted every 3 to 4 years by a group of selected writers in the relevant field. However, if articles with a higher LOE are used in writing the clinical chapters of medical science reference books,



the content of those chapters will be richer in terms of an evidence-based approach, making the students in that field specialized assistants and clinicians. The purpose of this study was to compare the LOE of the references used in four important clinical chapters of *Burket's Oral Medicine* in three editions (2003, 2008, 2021). This authoritative book is one of the main educational sources for dental students at both general and specialized levels, and its 13th edition was published in 2021. The evidence-based approach has necessitated the revision of reference books to cite articles with a high LOE.

The present research aimed to examine how much this necessity has been considered in the revisions of this reference book. No similar study has been published on oral disease reference books.

Methods

This cross-sectional study studied three editions of the reference book *Burket's Oral Medicine*. For this purpose, printed and electronic versions of the book's 10th, 11th, and 13th editions (2003, 2008, and 2021, respectively) were analyzed. Four chapters of this book (Oral Ulcers, Orofacial Pain, Oral Cancer, and Dental Considerations of Cardiovascular Diseases) were selected and analyzed. A checklist was prepared for the references of each chapter, and the study type of each of those references was entered into the checklist. In order to determine the type of each study, two pre-trained examiners specify the methodology of the studies examined. These two researchers evaluated the references separately and reached an agreement with the joint evaluation of 10 sample references. A joint final decision was made after completing a separate checklist of the disagreements. The LOE of the sources of each chapter of each book was checked. The first way to determine the type of study is by reading the references; for example:

Adour KK et al. Bell's palsy treatment with acyclovir and prednisone compared with prednisone alone: a double-masked, randomized, controlled trial. *Ann Otol Rhinol Laryngol* 1996;105:371-8.

The second method is to search for the study reference number and determine its methodology based on the abstract. The LOE was determined using the criteria of the Oxford Centre for Evidence-Based Medicine (National Health Service Research & Development).^{8,9} Thus, a 1 to 5 grade is assigned to express the LOE of different studies using Table 1.

Data on records were collected in the form of SPSS version 26 (chapter name, number of renditions per chapter, number of reprints and chapter number, year of print, type of study, and LOE). Pearson's chi-square test was used to compare the LOE distribution for each chapter of the different book editions and to compare the LOE of the chapters of each edition. *P*-values less than 0.05 was considered to be significant.

Results

This study reviewed 3136 references from the textbook of oral medicine (*Burket's Oral Medicine*) for four chapters in three editions. Table 2 shows the number of references for each chapter separately. LOE was determined for 100% of the studied parameters. The number of references in the reviewed chapters was in the range of 170–416, with an average of 261 references for each chapter. For almost all chapters, the number of references for that chapter increased with each revision. The only exception was the number of references for the “Oral Cancer” chapter, which decreased by more than 50% from 2008 to 2021.

In Table 3, the percentage distribution of the references of these four chapters in the three editions is shown by type of study, and as observed, 13 types are specified. For example, The highest share of RCT citations was related to the “Cardiovascular Diseases” chapter of the 2021 edition (33.7%). The highest citation rate to structured reviews was also related to the same chapter of the same edition (10.3%).

In contrast, for the “Orofacial Pain” chapter of the 2003 edition, the share of RCT citations was only 6.1% (the lowest rate of RCTs among all chapters). There were no citations to structured reviews in the two chapters “Oral Ulcers” and “Oral Cancer” from the 2003 edition. The distribution of the LOE between chapters showed a significant statistical difference ($P=0.000$) (asymptotic significance; 2-sided). As for all three edits, the highest LOE belonged to the “cardiovascular disease” chapter, and the lowest LOE for all three editions belonged to “Ulcerative and Vesiculobullous diseases” ($P<0.001$).

Table 4 shows the LOE distribution for all chapters and all edits. The highest LOE in all three edits was related to the “Cardiovascular Disease” chapter, and the lowest LOE for all three edits belonged to the “Ulcerative and Vesiculobullous Diseases” chapter. Diagrams 1 to 4 show LOE distribution separately for the four chapters of the three editions separated by color. For example, 46.7% of the “Cardiovascular Disease” chapter resources from the 2021 edition had LOE 1, while 64.5% of the chapter's “Ulcerative and Vesiculobullous Diseases” resources had LOE 5 in the 2003 edition. The analysis of LOE variations was significant for three chapters (from 2003 to 2021): the chapters “Orofacial Pain” ($P<0.001$), “Cardiovascular Diseases” ($P<0.001$), and “Oral Ulcers” ($P<0.05$), the LOE improved significantly in every revision, but LOE did not significantly improve for the “Oral Cancer” chapter ($P=0.312$).

Discussion

The present study was conducted to compare the LOE in the four chapters in three editions of a reference book for oral diseases. The results showed that the highest LOE in all editions belonged to the chapter “Cardiovascular Diseases.” Furthermore, the most significant improvement

Table 1. Guide to determining the level of evidence of studies

Level of evidence (LOE)	Type of study
1	Randomized clinical trials and structured reviews
2	Interventional and cohort studies
3	Case-control and retrospective studies
4	Case series and cross-sectional studies
5	Case reports and expert opinions

occurred over time and with revision in this chapter's evidence level. The LOE for the two chapters "Oral Ulcers" and "Orofacial Pain" was low in the 2003 and 2008 editions, but in the 2021 edition, the LOE for these two chapters improved. However, the low LOE level of the "Oral Cancer" chapter did not improve significantly in the 2021 edition. In Hatami and colleagues' study, the number of references with the lowest LOE for most editions of the "Retreatment" chapter was above 80%, and similar to the present study, the change in LOE with re-editing was reported for the "Retreatment" and "Surgery" chapters.⁹ It seems that one of the factors influencing the LOE of resources used for writing reference works is the authors chosen to revise the texts, and their reliance on high-quality research will be reflected in the LOE of the sources of that chapter. In other words, it is possible that the authors of chapters with low-LOE sources are well-known experts who prefer to base the content of those chapters on their own or their colleagues' clinical experiences. They do not see the need to search for clinical trials or recent structured reviews and use their own opinions to write the chapters. Another factor is possibly that in some fields, there are fewer studies with high levels of evidence, or if done, their results are less frequently published due to reasons such as positive results bias.

Up to this point, LOE studies for dental resources have focused on assessing published articles in specialized journals. The present study and the work of Hatami et al have been the only studies conducted on a reference book.⁹ However, today, evidence-based medical education necessitates that the training of students and faculty members should be based on resources with the highest LOE. Up to the present, most LOE assessments has been carried out in fields of endodontics and oral and maxillofacial surgery. In endodontics, most studies have shown that LOE is low in the major journals of this field.¹⁰⁻¹⁴ In this study, it was found that there were no structured reviews in the resources of the "Oral Cancer" and "Ulcerative and Vesiculobullous Diseases" chapters in 2003. Structured reviews are the main criteria for judging the existing clinical evidence. However, conducting structured reviews after 2000 has gradually become more common, and more attention has been paid to it. In the 2021 edition of this book for the two chapters above, the share of structured reviews increased to 4.5% and 2.6%,

Table 2. The number of references of each chapter in different editions and their total

Edition	2003	2008	2021	Total in each chapter
Disease of the Cardiovascular System	170	184	291	645
Ulcerative and Vesiculobullous Lesions	220	254	270	744
Oral Cancer	261	416	155	832
Orofacial Pain	261	299	355	915
Total in each edition	912	1153	1071	3136

respectively. Three studies in this field have achieved similar results in the specialized oral and maxillofacial surgery journals. As shown in the articles published in endodontics journals, there is a significant shortage of clinically structured workshops and review publications. In exchange, the share of case reports, patient series, laboratory studies, animal studies, and simple reviews has been significant.¹⁵⁻¹⁷ It seems that this is an issue that the editorial board of dental journals should seriously put on their consideration. A suitable solution is that they must allocate a certain share of the articles in each issue of their journal to articles with high LOEs and the associated reviewers should be more flexible about accepting clinical trial articles and structured reviews. Of course, this does not mean they should ignore the possible faults of these types of articles. A review of articles on our LOE in dental journals shows that similar to the rest of the specialized fields (including endodontics and oral and maxillofacial surgery), researchers in the field of restorative dentistry and prosthetics have shown little interest in LOE measurement, which is why there is no data available on the subject in the literature.¹⁸⁻²⁰ Meng and colleagues' study on the LOE of articles published in periodontology journals is the only one that reported a "relatively high" LOE level for the reviewed articles²¹, indicating that more RCT articles have been conducted and published in this specialized field.

This study showed that with the exception of "Oral Cancer," the LOE of the resources for the chapters improved in later revisions, with the most prominent improvement reported for "Cardiovascular Disease." In a similar study by Hatami et al, the percentage of sources with the lowest LOE in the "Surgery" chapter from the 1998 edition of the reviewed reference book in the field of endodontics was reduced to from 89% to 67% in the 2016 edition of this book.⁹ Adopting an evidence-based approach is becoming increasingly important as the results of four new studies have indicated that the publication of articles with high LOE has increased significantly in the studied journals in the past decade. Now, the journal policies have been promoted to consider the LOE of the articles. Notably, all four studies have been done in specialized journals of oral and maxillofacial surgery and oral implantology.²²⁻²⁵ One of the goals of the specialized journals is to promote the journal's impact

Table 3. Frequency percentage of all types of references for each chapter in different editions

		RCT	Review	Book	Outcomestudy	Metaanalysis	SR	Cohort	Case-control	Case series	Case report	Cross-sectional	Animal	In vitro
Orofacial Pain	2003	6.1	25.3	6.5	4.6	0.4	0.4	4.6	14.6	0.0	8.4	26.8	0.0	0.8
	2008	12.7	27.4	11.0	8.0	1.7	1.0	2.0	8.4	0.0	10.4	11.0	2.3	1.3
	2021	14.1	30.4	2.3	7.9	0.6	6.8	3.4	9.9	2.0	5.6	12.1	2.8	0.6
Disease of the Cardiovascular System	2003	18.2	28.8	1.8	3.5	0.6	0.6	21.8	6.5	0.0	1.2	5.9	0.0	0.0
	2008	19.6	28.3	12.5	4.3	3.3	0.5	17.4	4.9	0.0	1.6	4.3	0.0	0.0
	2021	33.7	23.7	0.7	9.6	2.7	10.3	7.2	2.4	0.3	1.7	6.2	0.0	0.0
Ulcerative and Vesiculobullous Lesions	2003	10.5	36.4	1.4	4.1	0.0	0.0	2.3	8.2	1.8	19.5	8.6	1.4	3.2
	2008	14.2	24.8	3.5	3.5	0.0	0.4	1.6	4.7	7.9	18.9	14.6	0.0	3.5
	2021	10.4	31.1	2.2	1.5	2.6	2.6	2.6	5.9	5.6	14.1	15.2	0.4	2.6
Oral Cancer	2003	17.6	28.4	2.3	8.0	0.4	0.0	6.9	10.3	1.5	2.3	11.9	5.0	3.4
	2008	15.6	28.1	1.4	7.0	1.0	1.2	4.6	12.3	1.4	2.9	15.1	3.1	5.3
	2021	10.3	38.1	1.9	0.0	5.2	4.5	8.4	7.1	3.9	1.3	15.5	0.0	1.9

Note: Data are expressed as percent.

Table 4. Frequency level of evidence (LOE) for each chapter in different editions

				LOE				
				1	2	3	4	5
Chapter	Orofacial Pain	Year	2003	6.9%	9.2%	14.6%	26.8%	42.5%
			2008	15.4%	10.0%	8.4%	11.0%	55.2%
			2021	21.4%	11.3%	9.9%	14.1%	43.4%
	Disease of the Cardiovascular System	Year	2003	19.4%	25.3%	6.5%	5.9%	42.9%
			2008	23.4%	21.7%	4.9%	4.3%	45.7%
			2021	46.7%	16.8%	2.4%	6.5%	27.5%
	Ulcerative and Vesiculobullous Lesions	Year	2003	10.5%	6.4%	8.2%	10.5%	64.5%
			2008	14.6%	5.1%	4.7%	22.4%	53.1%
			2021	15.6%	4.1%	5.9%	20.7%	53.7%
	Oral Cancer	Year	2003	18.0%	14.9%	10.3%	13.4%	43.3%
			2008	17.8%	11.5%	12.3%	16.6%	41.8%
			2021	20.0%	8.4%	7.1%	19.4%	45.2%

Numbers 1 to 5 (refer to Tables 1–3).

1: Highest LOE.

5: Lowest LOE.

factor (IF), which should increase the number of citations to the journal’s articles.

One of the goals of specialized journals is to improve their IF. For this purpose, the number of citations to the articles of that journal should be increased, and recent studies have shown that an increase in the number of researchers citing studies with the highest LOE, ultimately increases the IF of journals that publish more articles with higher LOE.¹⁵ The results of studies by Wu et al, Meng et al, and Nabil & Samman on articles published in implantology, periodontology, and oral and maxillofacial surgery have revealed a significant relationship between LOE and improvement of IF in Time Journals.^{21,22,24} Patini et al noted that publishing articles in children’s dentistry journals has a negative effect on IF.²⁶ In the current study, the “Cardiovascular Diseases” chapter had references with higher LOE compared to the other three chapters.

The high prevalence of cardiovascular diseases among the population is one of the leading causes of death. Therefore, more clinical trials have naturally been conducted to find effective treatments and new drugs compared to oral ulcers. Additionally, in areas such as oral cancer, clinical trials are more limited for ethical reasons, and in the discussion of oral ulcers, self-improvement of a variety of mucosal mouth sores makes it challenging to interpret relevant clinical trials. In the field of orofacial pain, it is difficult to mediate the involvement of mental states, and the multidimensional factors affecting pain perception make it challenging to evaluate the outcome of medical interventions. In the field of oral cancer, orofacial pain, and oral ulcers, researchers have conducted laboratory and animal studies to solve the potential problems mentioned. The authors of reference books refer to the existing texts and use the results of these studies. These

studies have the weakest level of LOE. Therefore, it seems that the difficult methodology of RCT is the main LOE-related challenge for the existing literature. In addition to the mentioned reasons, sample loss is high during RCTs, and a high budget is required to conduct RCTs. It should also be noted that the criteria for evaluating the researchers' performance in academic centers are often based on the number of published articles, and evaluators will consider the methodology of the articles. Therefore, when the researcher sees no advantage in conducting an RCT, they will be more inclined to conduct laboratory or animal research. The methodological challenges of RCTs also lead to weak RCT resources encountering additional objections.²⁷ The low LOE in the sources reviewed in this research shows that there is a significant gap between the clinical questions and their answers in this reference book, and this gap is especially evident in the "oral cancer" chapter. Hatami et al mentioned similar gaps in the reference book they examined in the field of endodontics.⁹ Even though LOE is a key element of the evidence-based approach,²⁸ it should be noted that a number of factors influence the LOE of research, for example, Jazayeri et al, by examining the conflicts of interest expressed by the authors of articles in the field of oral and maxillofacial surgery, stated that the amounts paid to researchers by factories have a significant relationship with the LOE of the relevant research, and this relationship is significant about cohort studies.²⁹

Conclusion

The present research indicated that even though the evidence-based approach is necessary for writing medical reference books, the LOE of the references of some chapters, such as "Oral Cancer," is not acceptable in the most recent edition of the reference book reviewed. This issue needs to be addressed by the authors. Moreover, other strategies, such as more financial support for researchers conducting studies with high-level evidence and developing standard guidelines for writing medical reference books according to the evidence-based approach, seem useful.

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Authors' Contribution

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Formal analysis: Nader Navabi.

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Competing Interests

The authors report no conflicts of interest.

Ethical Approval

The ethics committee of Kerman University of Medical Sciences approved the protocol of this study (Code: IR.KMU.REC.1400.234).

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