



Grupo Ser Educacional  Gente criando o futuro

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SOLANGE ALVES JOB

**BARREIRAS ENVOLVIDAS NA UTILIZAÇÃO DAS EVIDÊNCIAS
DISPONÍVEIS POR DENTISTAS: UMA REVISÃO SISTEMÁTICA DE
ESTUDOS QUANTITATIVOS**

Guarulhos

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Guarulhos, 30 de abril de 2018.

DEDICATÓRIA

Dedico este trabalho aos meus amigos e família que por muitas vezes precisaram compreender a minha ausência. E que quando mais precisei estavam ao meu lado , de certa forma como anjos que iluminam, protegem e acalmam. À vocês um dos meus maiores sonhos.

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RESUMO

O objetivo desta revisão sistemática foi sintetizar os dados disponíveis sobre as barreiras relacionadas à aplicação da prática baseada em evidências por cirurgiões-dentistas. A presente revisão sistemática foi realizada e relatada de acordo com o instrumento PRISMA. Os detalhes do protocolo foram registrados no banco de dados do PROSPERO (CRD42017056298). A busca eletrônica foi realizada nas bases de dados Cochrane, Embase, PubMed, Scopus e Web of Knowledge. A última busca foi realizada em abril de 2017. Foram coletados os dados obtidos a partir de estudos observacionais (transversais ou longitudinais) e clínicos (randomizados ou não randomizados). Para os estudos observacionais longitudinais, apenas os dados iniciais foram incluídos. Para determinar o risco de viés dos artigos, foi utilizada a Ferramenta de Avaliação da Qualidade para Coortes Observacionais e Estudos Transversais. A partir das pesquisas realizadas nas bases de dados eletrônicas citadas e na literatura cinza, foram obtidos 9.437 registros. Após a exclusão de 3.796 artigos duplicados, 5.641 artigos foram avaliados. Na primeira etapa do processo de triagem, 5.536 artigos foram excluídos, por serem irrelevantes de acordo com os títulos e/ou resumos. Na segunda etapa do processo, 105 artigos foram lidos na íntegra. Após a aplicação dos critérios de inclusão e exclusão, 35 artigos foram selecionados, dos quais 18 não reportaram as barreiras relacionadas à evidências e 8 foram apenas qualitativos. Portanto, 9 estudos foram incluídos nesta revisão sistemática. Quatro tipos de barreiras foram evidenciadas: barreiras autorreferidas, barreiras relacionadas à evidência, barreiras contextuais e barreiras relacionadas ao paciente. Há várias barreiras que podem influenciar na prática do Dentista baseada na evidência. De acordo com essa revisão sistemática, a falta de habilidades e treinamento, evidências odontológicas indisponíveis ou inacessíveis, bem como questões práticas, tais como restrições financeiras e falta de tempo podem desempenhar papéis importantes na falha da prática do dentista baseada na evidência.

Palavras-chave: Comunicação de Barreiras; Prática Baseada em Evidências; Revisão; Dentistas; Comportamento; Conhecimento.

ABSTRACT

The aim of this systematic review was to synthesize the available data on the barriers related to apply Evidence-Based Practice (EBP) by dental surgeons. The present systematic review was performed and reported according to the PRISMA instrument. The protocol details were recorded in the PROSPERO database (CRD42017056298). The electronic search was performed in the Cochrane, Embase, PubMed, Scopus and Web of Knowledge databases. The last search was made in April 2017. The data were collected from observational (cross-sectional or longitudinal) and clinical (randomized or non-randomized) studies. For longitudinal observational studies, only baseline data were included. To determine the risk of bias in the articles, the Quality Assessment Tool for Observational Cohorts and Cross-Sectional Studies was used. From the searches performed in the cited electronic databases and in the gray literature, 9,437 records were obtained. After the 3,796 duplicate articles excluded, 5,641 articles were evaluated. In the first phase of the screening process, 5,536 articles were excluded, because they were irrelevant according to the titles and/or abstracts. In the second phase of the process, 105 full-text articles were read. After applying the inclusion and exclusion criteria, 35 articles were selected, of which 18 did not report the evidence-related barriers and 8 were qualitative only. Therefore, 9 studies were included in this systematic review. Four barriers types were identified: self-reported barriers, evidence-related barriers, contextual barriers, and patient-related barriers. There are several barriers that may influence the EBP of dentists. According to this systematic review, lack of skills and training, dental evidence unavailability or inaccessibility, as well as practical issues such as financial constraints and lack of time might significant roles on dentists' failure of practicing evidence-based Dentistry.

Keywords: Barriers Communication, Evidence-Based Practice, Review, Dentists, Behavior, knowledge.

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1. INTRODUÇÃO

A prática da odontologia pode ser historicamente caracterizada pela ênfase no treinamento e na experiência (NIEDERMAN & BADOVINAC, 1999). Neste contexto, clínicos tendem a tomar decisões intuitivamente e, muitas vezes, suportadas pela experiência adquirida entre seus próprios pacientes (REDFORD & GIFT, 1997).

No entanto, um novo paradigma vem ganhando cada vez mais espaço em debates e pesquisas. Trata-se da prática baseada em evidências (PBE). A PBE foi concebida como um método prático de se utilizar a evidência científica para resolver problemas clínicos (GUYATT, 1991). Tal filosofia é tradicionalmente definida como a utilização criteriosa, explícita e conscienciosa da melhor evidência disponível, para viabilizar tomadas de decisões sobre o atendimento clínico de cada paciente, individualmente (SACKETT et al., 1996). Compõem os passos da PBE, a definição de uma dúvida clínica específica, a busca na literatura por evidências que a contemplem, a avaliação da validade e relevância da literatura selecionada, a posterior aplicação da evidência na prática clínica e a avaliação do seu impacto (NEEDLEMAN, 2003; GILLETTE et al., 2009). Este movimento teve início na Medicina (NIEDERMAN & BADOVINAC, 1999), e foi difundindo para as outras áreas do cuidado à saúde, inclusive para a Odontologia, dando origem à Odontologia Baseada em Evidências (OBE) (IQBAL & GLENNY, 2016).

A literatura aponta potenciais benefícios com a adoção da OBE no ambiente clínico, tais como o aumento da capacidade de decisão, maior confiança no tratamento, aumento da possibilidade de se prover terapias mais eficazes e seguras, além de consequente aumento de satisfação do profissional e do paciente (GILLETTE et al., 2009). Os desafios iniciais relacionadas à adoção e prática da OBE são, no entanto, significativos (RICHARDS & LAWRENCE, 1995). Uma das principais barreiras envolvidas se referem à excessiva quantidade e à baixa qualidade da literatura, bem como àqueles obstáculos relacionadas aos tradicionais métodos de disseminação da evidência científica (RICHARDS & LAWRENCE, 1995).

Este complexo processo de se transferir o conhecimento para prática clínica é hoje contemplado por uma área de estudo, a “pesquisa translacional” (*translational research*). Esta área compreende, ao todo, quatro “fases”, ou sub-áreas distintas: a) transferência de achados provenientes de pesquisas básicas para estudos envolvendo seres humanos, b) facilitação da transferência de achados de pesquisas clínicas para guias de conduta, c) facilitação da transferência de diretrizes clínicas para a prática e d) avaliação do impacto da alteração de práticas clínicas sobre a população (MESLIN et al., 2013). Constituem os focos principais deste projeto as três últimas sub-áreas.

Originalmente, o conceito de Transferência de Conhecimento (TC) foi definido como um processo dinâmico e interativo que inclui a síntese, disseminação, troca e aplicação ética do conhecimento, com o intuito de melhorar a saúde ou prover serviços e produtos mais efetivos, além de fortalecer os sistemas de saúde (DAVIS et al., 2003; STRAUS et al., 2009). Há um considerável número de propostas e modelos teóricos desenvolvidos para orientar a prática de TC, derivados de diferentes pontos de vista disciplinares e contextuais (GROL & GRIMSHAW, 2003; GRAHAM et al., 2006; DORAN & SIDANI, 2007; SUDSAWAD, 2007; NILSEN, 2015). Estes modelos, em termos gerais, possuem três objetivos essenciais, quais sejam: descrever ou instruir para a transferência da pesquisa para a prática, entender ou explicar os fatores que influenciam a sua implementação e/ ou avaliar o impacto após a implementação; GRAHAM & LOGAN, 2004; RYCROFT-MALONE, 2004; NILSEN, 2015; CANADIAN INSTITUTES OF HEALTH RESEARCH, 2016).

As intervenções de TC têm o objetivo essencial de promover a utilização da melhor evidência disponível na prática clínica (STRAUS et al., 2013). Revisões da literatura dedicadas à avaliação da efetividade de intervenções de TC em áreas da saúde identificaram várias modalidades de estratégia (GRIMSHAW et al., 2012; BERO et al., 1998; BOAZ & FRASER., 2011. Além de materiais educativos (guias de prática clínica, materiais audiovisuais e publicações eletrônicas), ainda destacam-se outras estratégias, tais como encontros educacionais (conferências, palestras, *workshops* ou treinamentos), “auditoria e devolutiva” (*audit and feedback*) (GRIMSHAW et al., 2012;

IVERS et al., 2012) “visitas educacionais” (*educational outreach*) (O'BRIEN, 2007), atuação de líderes de opinião (FLODGREN et al., 2011; ABDULLAH et al., 2014; YOST et al., 2015) dentre outras. De um modo geral, os resultados decorrentes da implantação destes recursos como intervenção são variáveis (GRIMSHAW et al., 2012; IVERS et al., 2012; JAMTVEDT et al., 2006), mas especialmente significativos quando a aderência basal a práticas recomendadas é baixa (IVERS et al., 2012; JAMTVEDT et al., 2006).

Ao longo dos últimos anos, esta área de conhecimento tem se tornado o foco de interesse de grandes iniciativas organizacionais. O Grupo *EPOC (Effective Practice and Organisation of Care)* vem conduzindo, dentro do contexto da Colaboração Cochrane, estudos sobre os efeitos de intervenções de TC (FLODGREN et al., 2011; GRIMSHAW et al., 2006). Outra importante iniciativa na área da Odontologia, vem sendo desenvolvida na Escócia, e é denominada *TRiADS (Translation Research in a Dental Setting)*. Esta destina-se, dentre outros objetivos, a elaborar guias de conduta para o cuidado odontológico no país, através da aplicação de um modelo prático de TC, passível de individualização (ELOUAFKAOUI & CASSIE., 2013). Dentre outras grandes iniciativas, destaca-se ainda a utilização de grandes redes de relacionamento, exemplificadas na literatura com “*Dental Practice-based Research Network*”. Estas redes procuram se engajar ativamente na comunidade profissional com o objetivo de identificar tópicos de pesquisa de interesse particular ou que são desafios na prática dentária rotineira, bem como para prover direcionamentos acerca de como conduzir futuras pesquisas que contemplem estes tópicos de interesse (PIHLSTROM & TABAK., 2005; MAKHIJA et al., 2009; STOUT et al., 2014).

Lacunas de conhecimento e barreiras na prática da Odontologia Baseada em evidências

Em termos gerais, as chamadas lacunas de conhecimento (LCs) (*knowledge gaps*) estão presentes em todas as áreas da saúde, tanto em setores de cuidado primário quanto especializado, seja em países desenvolvidos ou em desenvolvimento (STRAUS

et al., 2009). Há pesquisas, inclusive na área odontológica que apontam para variáveis graus de discrepância entre o que se pratica e o que se publica (RILEY et al., 2010; RILEY et al., 2011; TELLEZ et al., 2011; SAYAGH et al., 2012; ANABTAWI et al., 2013; JUNTGEN et al., 2013; NORTON et al., 2014).

Especificamente na área ortodôntica, vários estudos têm sido publicados com o intuito de descrever procedimentos e práticas relatadas por clínicos durante sua vida profissional. Destacam-se dentre os temas mais estudados, protocolos de contenção (RENKEMA et al., 2009; VALIATHAN & HUGHES, 2010; PRATT et al., 2011; AB RAHMAN et al., 2016), condutas tomadas frente à reabsorção radicular induzida (LIM et al., 2012) ou, ainda mais frequentemente, a época ideal para tratamento de maloclusões (KING et al., 1999; KIYAK et al., 2004; PIETILÄ et al., 2008; MADHAVJI et al., 2011; AL-SHAYEA, 2014).

Muito embora a descrição do padrão de tomadas de decisões de ortodontistas tenha sido realizada, estes estudos (RENKEMA et al., 2009; VALIATHAN & HUGHES, 2010; PRATT et al., 2011; AB RAHMAN et al., 2016; LIM et al., 2012; KING et al., 1999; KIYAK et al., 2004; PIETILÄ et al., 2008; MADHAVJI et al., 2011; AL-SHAYEA, 2014) contemplam apenas um restrito espectro de assuntos. Além disso, estes não confrontaram, em medida suficiente, grande parte das condutas reportadas pelos clínicos em relação àquelas suportadas pela literatura. A ausência deste tipo de análise impede com que haja definição a respeito do nível em que condutas clínicas se pareiam às evidências disponíveis. Assim, faz-se necessária a investigação de outros importantes tópicos referentes à Ortodontia. Ainda, há que se promover uma análise dos fatores de contexto eventualmente correlacionados às tomadas de decisão, além de se realizar um confronto direto das escolhas relatadas pelos clínicos em relação à literatura disponível.

Acredita-se que o melhor entendimento das barreiras envolvidas amplie o espectro de profissionais atingidos pela OBE (GRIMSHAW et al., 2012; MCGLONE et al., 2001). Observa-se maior aplicação da PBE em medicina (SQUIRES et al., 2011) e em saúde

pública (HUMPHRIES et al., 2014; OLIVER et al., 2014). Há a necessidade de se ampliar na Odontologia este acesso. (GRIMSHAW et al., 2012; BERO et al., 1998; OXMAN et al., 1995; GRIMSHAW et al., 2001).

Ainda assim, é possível identificar uma quantidade substancial de estudos que se dedicam ao mesmo escopo em publicações da área odontológica (IQBAL & GLENNY., 2016; VAN DER SANDEN et al., 2003; RABE et al., 2007; HANNES et al., 2008; YUSOF et al., 2008; SPALLEK et al., 2010; HOPPER et al., 2011; HARON et al., 2012; SBARAINI et al., 2013; STRAUB-MORAREND et al., 2013; GUPTA et al., 2015; YAMALIK et al., 2015). Apesar de dentistas geralmente reconhecerem a sua importância e demonstrarem alto grau de receptividade (IQBAL & GLENNY., 2016; MADHAVJI et al., 2011; VAN DER SANDEN et al., 2003; RABE et al., 2007; SPALLEK et al., 2010; HOPPER et al., 2011; HARON et al., 2012; STRAUB-MORAREND et al., 2013; GUPTA et al., 2015; YAMALIK et al., 2015) estes detêm um limitado conhecimento e entendimento da matéria de PBE (IQBAL & GLENNY, 2016; MADHAVJI et al., 2011; YUSOF et al., 2008; HARON et al., 2012; GUPTA et al., 2015). As tomadas de decisão de clínicos parecem ainda estar essencialmente relacionadas à convicção dos próprios dentistas (HARON et al., 2012) que, em casos de dúvidas, recorrem principalmente a opiniões de colegas (IQBAL & GLENNY., 2016; YUSOF et al., 2008; HOPPER et al., 2011; ISHAM et al., 2016). As maiores e mais frequentes barreiras para a plena PBE por dentistas parecem ser a alta carga de trabalho e a falta de tempo (IQBAL & GLENNY, 2016; RABE et al., 2007; HANNES et al., 2008; YUSOF et al., 2008; HOPPER et al., 2011; STRAUB-MORAREND et al., 2013; YAMALIK et al., 2015; WARDH et al., 2009) além de restrições financeiras (IQBAL & GLENNY, 2016; YUSOF et al., 2008), falta de acesso às evidências (RABE et al., 2007; HARON et al., 2012; YAMALIK et al., 2015) e carência de treinamento específico (YUSOF et al., 2008; HARON et al., 2012; GUPTA et al., 2015; YAMALIK et al., 2015).

A compreensão do comportamento de busca de informação exercido por dentistas é igualmente essencial, porque tal entendimento pode também indicar maneiras de se aumentar o acesso e a utilização de pesquisas que viabilizem a tomada de decisão

clínica e conseqüente adoção da PBE pelos profissionais (ISHAM et al., 2016). Tradicionalmente, a preferência de profissionais é por modalidades de educação continuada via interpessoal, seja mediante cursos, conferências ou, principalmente, aconselhamento com colegas (YUSOF et al., 2008; ISHAM et al., 2016; WARDH et al., 2009; STRAUB-MORAREND et al., 2013; Allison & Bedos., 2003; Funkhouser et al., 2014).

2. PROPOSIÇÃO

Por meio desta revisão sistemática sintetizar as evidências disponíveis relacionadas às barreiras envolvidas na utilização de evidências odontológicas na prática clínica diária.

3. ARTIGO CIENTÍFICO

A ser submetido na revista *Journal of Evidence-based Dental Practice*.

BARRIERS INVOLVED IN DENTIST'S AVAILABLE EVIDENCE UTILIZATION: A SYSTEMATIC REVIEW OF QUANTITATIVE STUDIES

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ABSTRACT

Objective: The aim of this systematic review was to synthesize the available data on the barriers related to apply Evidence-Based Practice (EBP) by dental surgeons. **Method:** The present systematic review was performed and reported according to the PRISMA instrument. The protocol details were recorded in the PROSPERO database (CRD42017056298). The electronic search was performed in the Cochrane, Embase, PubMed, Scopus and Web of Knowledge databases. The last search was made in April 2017. The data were collected from observational (cross-sectional or longitudinal) and clinical (randomized or non-randomized) studies. For longitudinal observational studies, only baseline data were included. To determine the risk of bias in the articles, the Quality Assessment Tool for Observational Cohorts and Cross-Sectional Studies was used. **Results:** From the searches performed in the cited electronic databases and in the gray literature, 9,437 records were obtained. After the 3,796 duplicate articles excluded, 5,641 articles were evaluated. In the first phase of the screening process, 5,536 articles were excluded, because they were irrelevant according to the titles and abstracts. In the second phase of the process, 105 full-text articles were read. After applying the inclusion and exclusion criteria, 35 articles were selected, of which 18 did not report the evidence-related barriers and 8 were qualitative only. Therefore, 9 studies were included in this systematic review. Four barriers types were identified: self-reported barriers, evidence-related barriers, contextual barriers, and patient-related barriers. **Conclusion:** There are several barriers that may influence the EBP of dentists. According to this systematic review, lack of skills and training, dental evidence unavailability or inaccessibility, as well as practical issues such as financial constraints and lack of time might significant roles on dentists' failure of practicing evidence-based Dentistry.

Keywords: Barriers Communication, Evidence-Based Practice, Review, Dentists, Behavior, knowledge.

INTRODUCTION

The traditional dental practice has been historically characterized by the great emphasis placed on the professionals' training and experience.¹ In this sense, clinicians tend to intuitively make their decisions, based on comparisons established between their own previous cases.²

However, such traditional method of clinical dental practice has been increasingly shifting to a new paradigm, *i.e.*, the Evidence-based Practice (EBP). EBP has been regarded as a practical method of utilizing scientific evidence to elucidate clinical problems.³ Such philosophy is traditionally defined as the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients.⁴ This movement was originated in the medical field, but was posteriorly diffused to other health care areas, including Dentistry, originating the term Evidence-based Dentistry (EBD).⁵ The corresponding literature indicates potential benefits to be obtained with the adoption of EBD within clinical settings, such as the improvement of the clinician's decision-making ability, his confidence on the selected therapeutic approach, the increase in the possibility of providing safer and effective treatment modalities and, as a consequence, the growth of both professional's and patient's level of satisfaction.⁶

Nevertheless, the challenges involved in adopting and practicing EBD are still significant.⁷ Some of the main barriers are related to the excessive amount and overall low quality of the available evidence, as well as to those challenges generally related to the traditional and, most of the times, inaccessible means of scientific evidence dissemination.⁷

Discrepancies between available scientific evidence and clinical practice, also known as "knowledge gaps", are generally present in all health care fields, either on primary or

specialized care environments, both on developed and developing countries.⁸ There have been several studies indicating variable levels of discrepancy between what is published and practiced.⁹⁻¹² Without a better understanding of the related barriers to use available evidence and of the means by which practitioners may change their behavior, EBD has little to achieve.^{13,14} Unfortunately, investigations concerning the potential barriers and facilitators for the research uptake have been mostly conducted on medical.¹⁵ or public health fields.^{16,17} In these study areas, it has been clearly demonstrated that knowledge translation strategies, deliberately conceived and applied to overcome specific and pre-identified barriers tend to be more influential in the clinicians' behavior.^{18,13}

Interestingly, a substantial amount of studies addressing dentists' reported barriers for available evidence uptake has been published.¹⁹⁻²⁹ Nevertheless, methods, sample origin, and professional background profile of enrolled subjects appear to be extremely variable. Based on this, it could be argued that such a relevant topic might benefit from a more rigorous and systematic scientific synthesis to better understand, and apply if possible, what we know so far.

Therefore, the objective of this systematic review is to synthesize the available evidence related to the reported barriers involved in the dentists' evidence utilization in day-to-day clinical scenarios.

METHODS

- *Protocol and registration*

This systematic review was recorded at the database registry PROSPERO (identification number: CRD42017056298). The referred protocol was originally conceived with the purpose of collecting the available evidence regarding not only barriers, but also data concerning facilitators involved in evidence utilization by dentists; implementation behaviors; views, opinions, and perceptions; awareness and knowledge; as well as

willingness to adopt EBD practices. Therefore, this manuscript is a partial report of our findings. The Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) statement checklist.³⁰ was used for conducting and reporting this review.

- *Eligibility criteria*

Studies with the objective of providing answers for the following question: “What are the reported barriers involved in the utilization of available scientific evidence by dentists?” were searched. Information derived from the selected studies should have been collected through interviews, questionnaires, or conversation sessions including dentists. There was no restriction in relation to their professional accomplishments. Studies exclusively enrolling dentistry students, dental hygienists, or other health professionals were not considered in this systematic review. Studies that enrolled different sorts of health professionals – including dentists, but failed to independently report their results, were also excluded.

Primary studies, either observational (cross-sectional or longitudinal) or clinical trials (randomized or non-randomized) were accepted. In case of clinical trials or longitudinal observational studies, only baseline data were included. Qualitative studies, narrative or systematic reviews, meta-analyses, editorials, letters, as well as records presenting knowledge translation strategies/ initiatives (study protocols), examples of EBP approach to specific clinical questions (case scenarios), practical guidelines towards EBP implementation, study protocols, or duplicate results were excluded. There were no restrictions related to the year or language of publication.

- *Information sources, search strategy, and study selection*

A systematic search was performed up to April, 2017 covering the following electronic sources: Cochrane Database, Embase, PubMed, Scopus, and Web of Knowledge. Grey literature was partially covered by Google Scholar search, considering the first 100 hits. Reference lists of the pre-selected studies were also searched for relevant documents.

A search strategy was firstly designed for PubMed database (Appendix 1), and it was posteriorly adapted to the other information sources.

Eligibility of the articles was determined in two phases. In the first one, two authors (MFNF, MGR) searched electronic databases and pre-selected the studies that supposedly aimed at identifying the barriers involved in the utilization of available scientific evidence by dentists. If abstracts were unavailable or unclear, full texts were retrieved and reviewed before a definite decision was made. Once potentially eligible studies were selected, full documents were obtained for the second phase of the selection process. In this phase, the same reviewers independently evaluated the pre-selected studies. The ones that did not meet all eligibility criteria were excluded. Disagreements between both reviewers were discussed until consensus was reached.

- *Data items and collection*

Data collection was performed by two reviewers (MFNF, MGR), which used standardized tables to do so. Another author (CFM) reviewed the extracted information afterwards. Any inaccuracy or disagreement was resolved by re-examining the original document. The collected items are depicted at the Table 1. If necessary, the authors of the selected studies were contacted and inquired about missing, unclear, or incomplete data.

Information was collected in regard to the following items: site where study was carried out, sample characterization, and the assessment tool utilized for data collection. Reported barriers were extracted either as descriptive or inferential information.

- *Risk of bias in individual studies*

Two reviewers (SAJ, JBM) appraised the selected studies according to NIH Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (National

Institutes of Health) (Table 2), since all of the included studies in this systematic review were observational. A third reviewer (MGR) was requested only in case of disagreement between the two reviewers.

- *Summary measures*

Primary outcome was reported barriers involved in the utilization of available scientific evidence by dentists. Descriptive data (percentage of occurrence) was collected.

- *Synthesis of results*

Results were synthesized descriptively, since it was not considered adequate to perform meta-analyses, due to large heterogeneity regarding sample characteristics, assessment tool utilized, or method of collecting and analyzing data.

RESULTS

- *Study selection*

Searches performed on the above-mentioned sources yielded 2,645 (Pubmed), 1,944 (Web of Knowledge), 1,735 (Scopus), 284 (Cochrane), 100 (Google Scholar), and 2,729 (Embase) studies, totalizing 9,437 records from the databases search. Using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram³⁰ an overview of the article selection process is illustrated (Figure 1). After exclusion of 3,796 duplicate articles, 5,641 articles remained. In the first step of the screening process, further 5,536 articles were excluded, since they were irrelevant from the titles and abstracts. In the second step of the screening process, the remaining 105 full-text articles were evaluated and 70 were excluded after application of the inclusion and exclusion criteria. Specific reasons for their exclusion are depicted in Figure 1 and Appendix 2.

Therefore, the selection process resulted in 35 full-text articles^{5,6,31-38,19-23, 25-29,39-53}, out of which 9^{22,23,25,27-29,42,53} were specifically reported in this first study, that included

quantitative information on barriers of evidence utilization only.

- *Study characteristics*

Studies covered a period of publication ranging from 2008²² to 2015.^{28,29} The included studies were conducted in a large amount of locations, such as Saudi Arabia²³, India²⁸, Kuwait²⁵, Malaysia²², European countries²⁹ and in the US.^{23,27,42,53} A large variability was also observed for sample sizes, which ranged from 43²³ to 1517⁴²

In general, samples included mostly male dentists^{22,23,25,28,42,53}, with great variability concerning age and years of experience. Among the studies that presented information on respondents work field, most focused on interviewing general practitioners, with the exception of one study⁴², which collected data exclusively from orthodontists. As for work settings, there were interviewees working on government positions, academia, and private practices.

According to generalizability, the authors of this systematic review evaluated that, in five of the nine analyzed studies, samples could not be considered as representative, due to either small sample size⁵⁴ or convenience sample recruiting.^{23,25,28,29}

In order to collect data, all the studies used self-administered questionnaires, which were either administered online^{27,29,42,53,54} or personally.^{22,23,25,28} Questionnaires were generally developed on previous studies or based on researchers and/ or experts opinions, pilot-tested, and posteriorly modified on most of the studies.^{22,25,27,28,42,53,54}

- *Risk of bias within studies*

In this review, the NIH Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (National Institutes of Health) was used to appraise the risk of bias of the included studies (Table 2).

According to the quality assessment of the reported studies, all of them explicitly defined a research question (Item #1). Even though most of the studies properly defined the population from which the study participants were selected or recruited^{23,25,27,28,53} (Item #2), only three^{22,28,54} recruited more than 50% of the target population (Item #3).

All studies used previously determined eligibility criteria that were uniformly applied to all subjects during sample composition for being a cross-sectional study (Item #4), and only one²² presented sample size justification (Item #5).

None of the included studies could be assessed according to Items #6, #7, #8, #9, and #10, since all of them were cross-sectional, and there has never been any intention to investigate an exposure-outcome relationship (as in cohort or case-control study designs). Otherwise, they mainly focused on presenting descriptive data (on dentists' reported barriers), and no concern should have been actually dedicated to control exposure or to allow an appropriate timeframe for an outcome to occur.

As for the measurement of the variables indicating barriers (Item #11), only a couple of the studies^{23,29} failed to appropriately validate their questionnaires/ interviews, or was unclear about the validation process. The remaining items could not be evaluated, once descriptive cross-sectional studies, as the ones we included here, are not liable to be negatively influenced by the absence of assessors' blinding (Item #12), insufficient follow-up (Item #13), or uncontrolled confounding variables (Item #14).

- *Results of individual studies*

A summary of the main findings is depicted in Table 1. In order to organize the collected data, we have classified reported barriers – either selected or scored by respondents, in categories, i.e., self-, evidence-, and patient-related barriers, as well as the ones related

to the work context. Posteriorly, we have collected data on inferential statistics, covering variables significantly associated with the report of specific barriers.

- *Self-related barriers*

A relatively small part of the respondents selected or agreed with not having awareness of EBD concepts and basics^{22,29} or having issues with English language⁵⁴. Personal lack of interest²⁸, resistance to change⁵⁴, as well as high self-confidence with current knowledge/ practice/ skills^{22,23,42} have been occasionally recognized or selected as relevant barriers as well.

More frequently, a relevant amount of respondents across the studies^{22,23,25,27-29,54} selected or agreed that not having the proper skills or training might be considered as an important barrier against EBP implementation. Some studies detailed that those issues might be particularly related to difficulties on searching for relevant information²³ or appraising scientific documents.^{22,25,28,29}

- *Evidence-related barriers*

Dentistry, as a knowledge field, was reported to be complex and constantly subjected to changes²³ which, according to some interviewees might make it difficult for the evidence to keep pace with dental area advances and complexity.

Literature was also regarded as conflicting, ambiguous^{23,42} unclear, and somehow, outdated²³. As detailed by one of these studies, some might notice that not only might academic language, per se, be sometimes noticed as a barrier, but also a lack of information exchange between practitioners and academics²³. Sole reliance on peer advice for problems was actually cited as a barrier²³.

More than one half of the interviewed professionals from one of the included studies

declared to be uncertain of EBD practicality²⁸. A considerable portion of EBD non-users is reportedly to see restricted value on that topic, or none at all²⁷.

Unavailability⁵⁴, insufficiency, as well as inaccessibility^{25,29}, were also remembered as potential barriers by a varied number of respondents across these studies^{25,29,54}.

- *Contextual barriers*

In general, practical demands of work were noticed to play an important role against EBD implementation⁴². Particularly, most of the studies included in this systematic review^{22,23,25,27-29,53,54} detected lack of time as one of the most important barriers preventing EBD implementation; which could be further detailed as lack of time in practice schedule⁵³ or derived from the assumption that EBD is time-consuming²⁹.

In addition, work-derived barriers occasionally referred to financial constraints^{22,28,54}, which could be exemplified by the lack of reimbursement from eventual third-party payers⁵³ or shortage of monetary incentives²⁹.

Infra-structural barriers, such as not having access to Internet^{22,25,28,54}, scientific journals^{23,35,27} or computers^{22,25} were also reported as barriers, specially in one of these studies²⁵.

- *Patient-related barriers*

Concerning barriers related to patients, some dentists perceive that their satisfaction should be preferred over any other criterion to justify treatments²³, and that if patients were to be eventually charged additional fees, it might be a rather significant deterrent to EBD implementation⁵³.

- *Factors associated with report of barriers*

More intensely, female dentists seem to sense patients' preferences and objections against potential fees as potential barriers, as compared to males⁵³.

Professionals who recognize not being EBP adopters tend to perceive, more frequently, resistance to change, inadequate training on EBP skills, and lack of time as barriers against its implementation⁵⁴. Lack of time report was also associated with year of graduation²⁷, and age²⁹, in the sense that novices and younger professionals cite it more frequently than experienced ones. Younger professionals also seem to agree, more frequently, that practical demands of work are actual barriers for evidence use⁴². Public health service dentists also perceived lack of time as a barrier more frequently than those who mainly worked at private settings²⁹.

Both age and professional experience seemed to influence the level of perception of few others barriers. Beginners or younger professionals agreed, in a more frequent fashion, that conflicting and insufficient evidence are true barriers⁴². More intensely, younger dentists also seem to sense patients' preferences and objections against fees as potential barriers, as compared to older ones⁵³. Less experienced professionals also cited lack of financial incentives more frequently than more experienced ones²⁹.

Professional work field or type of practice also seemed to play a significant role in the perception of few barriers as well. General dental practitioners tend to perceive, more frequently, inadequate training on EBP skills as barriers against EBP implementation²⁷. Those who are not involved in teaching tended to see ambiguous literature and practical demands of work as potential barriers more frequently than the ones involved in teaching practices⁴². Solo private practitioners perceived patients' objections against fees more intensely, while public health practitioners perceived lack of patient acceptance less intensely, when compared⁴².

DISCUSSION

- *Summary of evidence*

According to this systematic review, which focused on the barriers research against utilization reported by dentists, we could observe some frequently cited barriers across studies.

It seems that dentists acknowledge, in a relatively more frequent fashion, the fact that they might not have been adequately trained on EBP subject. Unfortunately there has been little high-quality evidence supporting EBD workshops as effective approaches on changing behavior of dental practitioners. A randomized trial enrolling general dental practitioners was conducted in Scotland with the objective of evaluating the effectiveness of strategies on disseminating third molars extraction guidelines⁵⁵. These were given to one of the study groups to which an educational program was also offered, whilst to the remaining groups audit and feedback, as well as computer-supported learning were also proposed. None of the groups had guidelines adherence rates increased⁵⁵. In another study⁵⁶, it was demonstrated that EBP educational strategies were effective only if associated with financial incentives.

It has been otherwise advocated that educational strategies should preferably comprise undergraduate curricula of dental schools⁵⁷. Teaching evidence-based dentistry to dental students has been assumed to be the key to increasing the uptake of evidence-based treatments and practices in Dentistry⁵⁸. Unfortunately, a significant variability in the scope and depth of EBD education has been identified among dental schools⁵⁹⁻⁶². Still, it has been claimed that trained clinical educators would be potentially able to demonstrate the application of EBD in patient care, helping to ensure students (future practitioners) to value, learn, and apply its concepts⁶³. Therefore, in order for EBD to be successfully incorporated into curricula, faculty members should, at first, embrace it⁶³.

In the other hand, dentists' participation on science clubs might be rather considered as

a potentially effective method, as far as implementation of novel treatment recommendations is concerned⁶⁴. In this sense, a series of studies, within the health care field, has demonstrated that interactive meetings are generally attractive⁶⁵ and tends to stimulate good habits, such as the increase in the search for peer-reviewed periodicals³⁷. Knowledge translation strategies using technological tools, such as Internet, social media has been attracting attention, as well as demonstrating high potential of interactivity.⁶⁶⁻⁷⁶

Another commonly alleged reason for insufficient adherence to dental evidence refers to its reportedly unavailability or inaccessibility. Even though several authors have endorsed the increasing of research accessibility to manuscripts, *via* format simplification^{64,77-81}, there is still serious debate on the free dissemination of science, such as in the case of open-access journals, particularly when “predatory” practices are associated. Predatory open access refers to those journals that betray the genuine open access model by charging the authors publication fees without peer-review services and transparent editorial procedures⁸²⁻⁸⁴. It is the researchers’ responsibility to make sure their methods of achieving open-access meet the requirements of funders and institutions and do not infringe the rights of publishers⁸⁵.

It seems to be clear that practical issues such as financial constraints and lack of time might play one of the most important roles on dentists’ failure of practicing EBD. In this sense, it is highly advisable that efforts should be engaged to create and implement initiatives to turn traditional formats (roughly, primary study manuscripts) into more straightforward presentations. Amongst available knowledge translation strategies, systematic reviews, still present significant disadvantages related to its conventional format, unfamiliarity, inaccessibility, occasional irrelevance of research questions, and non-useful or non-contextualized presentation or their results.⁸⁶⁻⁸⁹ Therefore, researchers propose systematic reviews to be more broadly accessible⁸⁰ and recommend their authors to produce summarized versions^{77,81} critical summaries or guidelines associated to them.^{64,78,79}

- *Limitations*

Even though this study have collected important data on barriers against research utilization by dentists, these results must be cautiously considered, since most of the selected studies present limitations concerning reduced sample representation; therefore, lacking generalizability. This disadvantage was due to reduced samples or absence of sample size justification, small response rates, and/ or convenience sampling.

No meta-analysis could be performed, since data showed large variability. In addition, only quantitative data was collected; therefore, qualitative data analysis is still necessary, so this topic could be deeply understood. And, finally, questionnaire studies might be inherently biased, since interviewees tend to provide socially acceptable answers. Therefore, actual barriers might have been underreported

CONCLUSION

There are several barriers that may influence the evidence-based practice of dentists. According to this systematic review, lack of skills and training, dental evidence unavailability or inaccessibility, as well as practical issues such as financial constraints and lack of time might significant roles on dentists' failure of practicing evidence-based Dentistry.

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Figure 1: Flowchart of the study selection process.

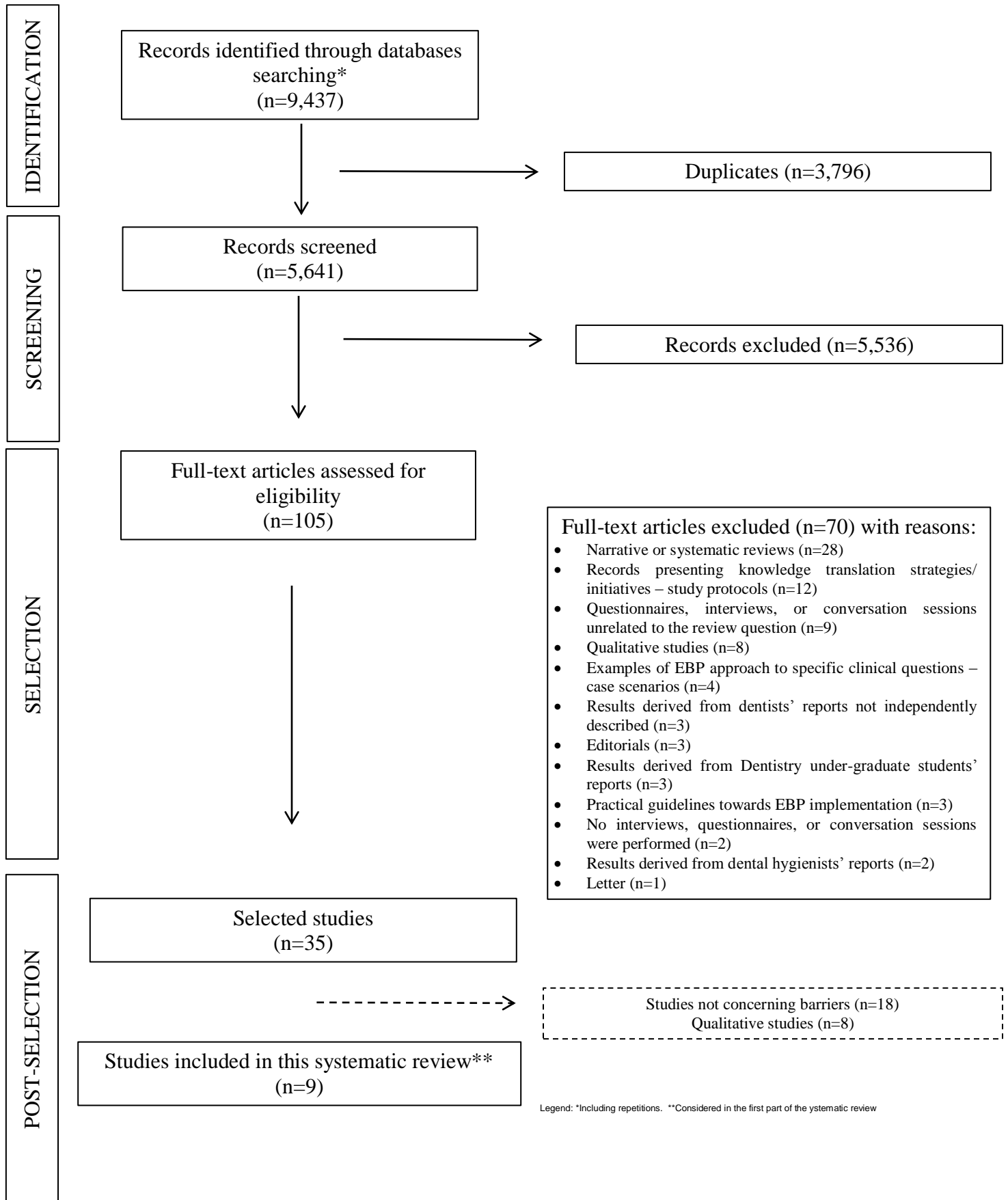


Table 1: Summary of characteristics and quantitative results of the included studies.

Reference	Site	Sample		Assessment tool			Outcome		Inferential analyses		
		n	Characteristics	Representativity	Characteristics	Validation/ Pilot-test	Category	Characteristics	Results	Statistically significant association/ correlation with...	
				Yes: Y; no: N; questionable: Q		Yes: Y; no: N; questionable: Q				Variable	How
Yusof et al. (2008)	Malaysia	193	Dentists	Y	Self-administered questionnaire	Y	Barriers	Closed-ended question			
	State of Selangor		<i>Gender</i> Male: (52.3%)		Collected at a local conference or sent by post.	Developed by dental public health academicians and literature		Multiple-choice			
			<i>Age</i> Not reported		<i>Response rate</i> 50.3%	Pilot-tested practitioners		More than one answer allowed			
			<i>Experience</i> 5-9 years (18.1%) 10-14 years (24.4%) 15-19 years (15.0%) ≥20 years (36.8%)			Modifications performed accordingly		Percentage out of the ones who reported to have heard about EBP (n=135)	Lack of time: 64.4%	-	-
			<i>Specialty</i> Not reported						Financial constraints: 40.0%	-	-
			<i>Work setting</i> Not reported						Very little knowledge of the concept of EBP: 28.1%	-	-
			<i>Others</i> Chinese (53.9%) Indians (22.8%) Malays (18.7%) Other ethnic						Being satisfied with current knowledge and practice: 23.7%	-	-

			groups (4.1%).									
										Lacking the necessary skills to appraise scientific papers: 22.2%	-	-
										Having limited access to computers and the Internet: 17.0%	-	-
Reference	Site	Sample		Assessment tool			Outcome		Inferential analyses			
		n	Characteristics	Representativity Yes: Y; no: N; questionable: Q	Characteristics	Validation/ Pilot-test Yes: Y; no: N; questionable: Q	Category	Characteristics	Results	Statistically significant association/ correlation with...		
											Variable	How
Spallek et al (2010)	US	43	Dentists	N	Self- administere d on-line questionnair e	N	Barrier s	Closed-ended questions				
			Gender Male (85.2%)	Data collected from dentists previously attending an Evidence- based Dentistry Conference 7 months before	Sent by e- mail	Developed based on previous studies and the expertise of the research team		Median of a 5- point scale (No problem (1) – big problem (5))	Lack of up-to-date evidence for many devices and products: 5.0	-	-	
			Age Range (25- 65 years or more) Most: ≥45 years		Response rate 34.0%				Contradictory information in scientific literature: 4.0	-	-	
			Experience Years of graduation: 7 – 46						Lack of clear answers to clinical questions: 4.0	-	-	
			Specialty General dentists (75%)						Continuing dental education courses not up-to-date with respect to evidence: 4.0	-	-	
			Work setting						Lack of information	-	-	

			Private practice (61.0%) Academia (25.0%)						exchange between practitioners and academics: 3.5		
									Complexity of the dental field regarding treatment choices: 3.0	-	-
									Difficulties in interpreting research results due to academic language: 3.0	-	-
									Difficulties in keeping up-to-date due to fast changing insights in the field of Dentistry: 3.0	-	-
									Lack of familiarity with searching for relevant information: 3.0	-	-
									Very expensive academic journals: 3.0	-	-
									No time to implement new evidence-based approaches: 3.0	-	-
									Patient satisfaction used as main criterion to justify treatments: 3.0	-	-
									Skills, not evidence, strongly influence outcomes with patients: 3.0	-	-
									Sole reliance on peer advice for problems: 3.0	-	-

Reference	Site	Sample		Assessment tool			Outcome		Inferential analyses		
		n	Characteristics	Representativity	Characteristics	Validation/ Pilot-test	Category	Characteristics	Results	Statistically significant association/ correlation with...	
				Yes: Y; no: N; questionable: Q		Yes: Y; no: N; questionable: Q				Variable	How
Madhavji et al. (2011)	US	1517	Dentists	Y	Self-administered on-line questionnaire	Y	Barriers	Closed-ended questions	Literature is ambiguous/conflicting Strongly agree/agree: 59.0% Neutral: 26.0% Strongly disagree/disagree: 15.0%	Age group	Less than and 40 years > 41 to 60 years
			<i>Gender</i> Male (79.0%)		Sent by e-mail	Pilot-tested on 7 teaching staff members and 20 orthodontic residents		3-point scale (Strongly disagree/ disagree - strongly agree/ agree)		Involvement in teaching	No < yes
			<i>Age</i> Modal age group: 41-60 years		<i>Response rate</i> 32.0%	Modifications performed accordingly			Practical demands of work Strongly agree/agree: 46.0% Neutral: 20.0% Strongly disagree/disagree: 34.0%	Age group	Less than and 40 years > 41 to 60 years > 61 years or more
			<i>Experience</i> Modal number of years in practice: 16-20 years							Involvement in teaching	No > Yes
			<i>Specialty</i> Orthodontists (100.0%)						Insufficient clinical guidelines Strongly agree/agree: 44.0% Neutral: 35.0% Strongly disagree/disagree: 21.0%	Age group	Less than and 40 years > 41 to 60 years
			<i>Work setting</i> Teaching (28.0%)						Satisfied with current knowledge Strongly	Involvement in teaching	No > yes

										agree/agree: 30.0% Neutral: 25.0% Strongly disagree/disagree: 45.0%		
			Others Master's degrees (59.0%)								Having a master's degree	No<yes
Reference	Site	Sample		Assessment tool			Outcome		Inferential analyses			
		n	Characteristics	Representativity Yes: Y; no: N; questionable: Q	Characteristics	Validation/ Pilot-test Yes: Y; no: N; questionable: Q	Category	Characteristics	Results	Statistically significant association/ correlation with...		
										Variable	How	
Haron et al. (2012)	Kuwait	120	Dentists	N	Self-administered questionnaire	Y	Barriers	Closed-ended questions	No access to internet connection: 94.2%	-	-	
	Kwait City: 31.7%		Gender Male (63.3%)	Data collected only from dentists who worked in the public health service	Distributed and collected personally	Developed based on some questions from previously tested questionnaires		Multiple-choice	No access to international journals: 91.7%	-	-	
	Hawalli: 16.7%		Age ≤40 years (82.5%)		Response rate 80.0%	Pilot-tested on 7 teaching staff members		More than one answer allowed	No personal computer in workplace: 88.3%	-	-	
	Farwaniya: 23.3%		Experience >10 years (32.5%)			Modifications performed accordingly			Lack of training in critical appraisal: 85.0%	-	-	
	Ahmadi: 12.5%		Specialty General dentists (55.8%)						Lack of access to evidence: 67.5%	-	-	
	Jahra: 15.8%		Work setting Ministry of Health (100.0%)						Lack of training: 66.7%	-	-	
									Lack of time: 56.7%	-	-	

Reference	Site	Sample		Assessment tool			Outcome			Inferential analyses	
		n	Characteristics	Representativity	Characteristics	Validation/ Pilot-test	Category	Characteristics	Results	Statistically significant association/ correlation with...	
				Yes: Y; no: N; questionable: Q		Yes: Y; no: N; questionable: Q				Variable	How
Straub-Morarend et al (2013)	US	518	Dentists	Y	Self-administered on-line questionnaire	Y	Barriers	Closed-ended questions			
	Iowa		<i>Gender</i> Not reported		Sent by e-mail	Pilot tested with 48 faculty members		Multiple-choice			
			<i>Age</i> Not reported		<i>Response rate</i> 38.4%	Modifications performed accordingly		More than one answer allowed	Inadequate training or knowledge: 50.5% of 9.4% (the ones that reported not using EBD approach in daily practice) of 80.8% (the ones that reported understanding the meaning of EBD)	-	-
			<i>Experience</i> Years of graduation: 4 – 68						Insufficient time: 33.7% of 9.4% (the ones that reported not using EBD approach in daily practice) of 80.8% (the ones that reported understanding the meaning of EBD)	-	-
			<i>Specialty</i> General dentists (84.7%)						Limited or no perceived value: 32.7% of 9.4% (the ones that reported not using EBD approach in daily practice) of 80.8% (the ones that reported understanding the meaning of EBD)	-	-
			<i>Work setting</i>						Lack of access to	-	-

			Private practicing (97.8%)						resources: 21.8% of 9.4% (the ones that reported not using EBD approach in daily practice) of 80.8% (the ones that reported understanding the meaning of EBD)		
			Others Not faculty members						Other: 12.9% of 9.4% (the ones that reported not using EBD approach in daily practice) of 80.8% (the ones that reported understanding the meaning of EBD)	-	-
								Closed-ended questions	Insufficient time: 36.0%	Year of dental school graduation	Recent years > remote years
								Multiple-choice	Inadequate training or knowledge: 25.6%	Specialty scope of practice	No > yes
								One answer allowed	Lack of access to resources: 16.9%	-	-
									Limited or no perceived value: 12.9%	-	-
									Other: 8.7%	-	-
Site	Sample	Assessment tool	Outcome	Inferential analyses							

Reference	n	Characteristics	Representativity	Characteristics	Validation/ Pilot-test	Category	Characteristics	Results	Statistically significant association/ correlation with...	
			Yes: Y; no: N; questionable: Q		Yes: Y; no: N; questionable: Q				Variable	How
Al-Ansari et al. (2014)	201	Dentists	N	Self-administered on-line questionnaire	Y	Barriers	Closed-ended questions	Lack of EBP skills: 69.2%	Implementing EBP	No>yes
		<i>Gender</i> Male (61.7%)	Saudi Dental Society stands at 3000 dentists	Posted on websites and networking sites	Developed based on previous studies		Multiple-choice	Unavailability of evidence: 60.3%	-	-
		<i>Age</i> 24-35 (52.0%)		<i>Response rate</i> Not reported	Pilot tested on 9 teaching staff members		More than one answer allowed	Lack of time: 59.6%	Implementing EBP	No>yes
		<i>Experience</i> Graduation in the previous 10 years (48.7%)			Modifications performed accordingly			Resistance to change: 50.0%	Implementing EBP	No>yes
		<i>Specialty</i> General dentists (58.5%)						Financial constraints: 45.5%	-	-
		<i>Work setting</i> Governmental positions (72.7%)						Not having access to Internet: 33.5%	-	-
		<i>Others</i> Saudi (54.5%) and expatriates						Poor understanding of English: 28.2%	-	-

Reference	Site	Sample			Assessment tool			Outcome		Inferential analyses	
		n	Characteristics	Representativity	Characteristics	Validation/ Pilot-test	Category	Characteristics	Results	Statistically significant association/ correlation with...	
				Yes: Y; no: N; questionable: Q		Yes: Y; no: N; questionable: Q				Variable	How
Wilder et al. (2014)	US	667	Dentists	Y	Self-administered on-line questionnaire	Y	Barriers	Closed-ended questions			
	North Carolina		Gender Male (77.0%)		Sent by e-mail	Developed based on the expertise of the research team		3-point scale (Significant barrier – Not a barrier)	Providers' perceptions that patients would object to additional fees for services Significant barrier: 59.5% Somewhat a barrier: 30.8% Not a barrier: 9.7%	Age	Younger dentists perceived this barrier more frequently Not specified between which age groups difference was significant
			Age ≥40 years (27.0%); 41-50 years (24.0%); 51-59 years (29.0%); ≥60 years (20.0%)		Response rate 49.0%	Pilot tested with dentists				Type of practice	Solo private practitioners perceived this barrier more frequently than group practitioners; and these perceived this barrier more frequently than public health practitioners Not specified between which groups difference was significant
			Experience Not reported			Modifications performed accordingly				Sex	Females>males
			Specialty Not reported						Lack of reimbursement from third-party payers Significant barrier: 49.3% Somewhat a barrier:	-	-

									35.6% Not a barrier: 15.1%		
			<i>Work setting</i> Private practicing (59.4%)						Lack of time in practice schedule Significant barrier: 29.9% Somewhat a barrier: 47.2% Not a barrier: 22.9%	-	-
			<i>Others</i> Practicing 31-40 hours/week (71.0%)						Lack of patient acceptance Significant barrier: 28.7% Somewhat a barrier: 57.4% Not a barrier: 13.8%	Age	Younger dentists perceived this barrier more frequently Not specified between which age groups difference was significant
										Sex	Female>male
										Type of practice	Solo private practitioners=group practitioners>public health practitioners

Reference	Site	Sample		Assessment tool			Outcome		Inferential analyses		
		n	Characteristics	Representativity	Characteristics	Validation/ Pilot-test	Category	Characteristics	Results	Statistically significant association/ correlation with...	
				Yes: Y; no: N; questionable: Q		Yes: Y; no: N; questionable: Q				Variable	How
Gupta et al. (2015)	India	200	Dentists	N	Self-administered questionnaire	Y	Barriers	Closed-ended questions	Lack of time Strongly agree: 28.40% Agree: 51.10% Uncertain: 14.20% Disagree: 4.30% Strongly disagree: 2.10%	-	-
	Bhopal City		Gender Male (62.5%)	Data collected only from dentists who reported to be familiar with EBP	Distributed and collected personally	Developed based on previous studies		5-point scale (Strongly agree - strongly disagree)	Lack of skill to appraise scientific journals Strongly agree: 22.70% Agree: 50.40% Uncertain: 16.30% Disagree: 10.60% Strongly disagree: 0.00%	-	-
			Age ≥ 40 years (6.0%)	Not included dentists practicing in a government setting or only involved in academic field	Response rate 80.0%	Pilot-tested on 10 % of sample size			Lack of interest Strongly agree: 14.20% Agree: 19.10% Uncertain: 53.90% Disagree: 12.10% Strongly disagree: 0.70%	-	-
			Experience $\geq 1-5$ years (69.0%)	Convenience sampling		Modifications performed accordingly			Financial constraints Strongly agree: 12.80% Agree: 19.10% Uncertain: 29.80% Disagree: 36.90% Strongly disagree: 1.40%	-	-
			Specialty General dentists (58.5%)						Lack of internet sources Strongly agree: 6.40% Agree: 22.00% Uncertain: 40.40% Disagree: 29.10%	-	-

										Strongly disagree: 2.10%		
			Work setting Private practice (100.0%)							EBDP is impractical Strongly agree: 0.00% Agree: 5.70% Uncertain: 56.70% Disagree: 27.00% Strongly disagree: 10.60%	-	-
Reference	Site	Sample		Assessment tool			Outcome		Inferential analyses			
		n	Characteristics	Representativity Yes: Y; no: N; questionable: Q	Characteristics	Validation/ Pilot-test Yes: Y; no: N; questionable: Q	Category	Characteristics	Results	Statistically significant association/ correlation with...		
Yamalik et al. (2015)	France, Georgia, Portugal, Slovakia, Turkey, and Poland	850	Dentists	N	Self- administere d on-line questionnai re	Q	Barrier s	Closed-ended question				
			Gender Male: (47.1%)	Uneven distribution among countries	Posted on websites or sent by e- mail to the member dentists by the relevant National Dental Association s	Developed by experts (FDI-ERO) working Group		Multiple- choice				
			Age 20-30 years (22.2%) 31-40 years (28.1%) 41-50 years (26.5%) ≥51 years (21.2%)		Response rate Not reported	No pilot-tests were mentioned		More than one answer allowed		Lack of necessary education on evidence-based dentistry: 14.9%	-	-
			Experience 0-10 years (39.3%) 11-20 years (28.7%)							Lack of time: 10.6%	Country	Slovakia>France = Georgia= Turkey= Poland >Portugal

			21-30 years (22.3%) ≥30 years (10.5%)								
			<i>Specialty</i> General practitioners (81.6%)							Work setting	Public>private
			<i>Work setting</i> Private practicing (77.5%) Public practicing (4.7%) Private and public practicing (17.8%)							Age	Younger dentists reported these barrier more frequently than old ones Not specified between which groups difference was significant
			<i>Others</i>						Lack of evidence- based clinical guidelines for dental care: 9.8%	-	-
									Lack of awareness on evidence-based dentistry: 8.5%	-	-
									Lack of necessary publications on evidence-based dentistry: 8.4%	-	-
									Lack of financial incentives: 7.7%	Experience	Dentists with less years in practice reported this barrier more frequently than the ones with more experience Not specified between which groups difference was significant
									Lack of continuing education courses on evidence based dentistry: 6.5%	-	-
									Limited evidence	-	-

									available in the dental field: 6.2%		
									Lack of evidence-based clinical decision support systems: 5.6%	-	-
									Lack of necessary web sites on evidence-based dentistry: 5.5%	-	-
									Lack of practical ways to reach to best evidence: 5.4%	-	-
									Limited knowledge regarding the quality of evidence (approval of evidence): 5.3%	-	-
									Evidence-based dentistry being perceived as time consuming: 5.0%	-	-
									Others: 0.3%	-	-

Table 2: Quality assessment of the included studies according to NIH Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies.

Question	Study reference								
	Yusof et al. (2008)	Spallek et al. (2010)	Madhavji et al. (2011)	Haron et al. (2012)	Straub-Morarend et al. (2013)	Al-Asnari et al. (2014)	Wilder et al. (2014)	Gupta et al. (2015)	Yamalik et al. (2015)
1. Research question	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Study population	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3. Participant rate of eligible persons	Yes	No	No	No	No	Yes	No	Yes	No
4. Eligibility criteria	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. Sample size	Yes	NR	NR	CD	NR	No	NR	NR	NR
6. Exposure assessment	NA	NA	NA	NA	NA	NA	NA	NA	NA
7. Timeframe	No	No	No	No	No	No	No	No	No
8. Exposure levels	NA	NA	NA	NA	NA	NA	NA	NA	NA
9. Exposure measures	NA	NA	NA	NA	NA	NA	NA	NA	NA
10. Repeated exposure assessment	NA	NA	NA	NA	NA	NA	NA	NA	NA
11. Outcomes measures	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No
12. Assessors blinding	NA	NA	NA	NA	NA	NA	NA	NA	NA
13. Follow-up rate	NA	NA	NA	NA	NA	NA	NA	NA	NA
14. Relationship between exposure and the outcome	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total (out of 7)	6	3	4	4	4	4	4	5	3

Appendix

Appendix 1: Description of the search strategy

Search groups	(1)	AND	(2)	AND	(3)	AND	(4)
Key-words	dentist OR dental practitioner OR dental professional	AND	science OR knowledge OR research OR evidence	AND	incorporat* OR implement* OR application OR apply OR applies OR utilization OR utilize* OR uptake* OR disseminat* OR diffuse* OR adopt* OR transfer* OR translat* OR use*	AND	attitude* OR awareness OR perception* OR perceive* OR view* OR opinion* OR understanding OR behavior* OR behaviour* OR habit* OR facilitat* OR barrier* OR obstacle* OR challeng*
URL of PubMed search strategy:	<p>https://www.ncbi.nlm.nih.gov/pubmed?term=(((((facilitat*%20OR%20barrier*%20OR%20obstacle*%20OR%20challeng*)))%20AND%20((((((evidence%20AND%20(implementation%20OR%20utilization%20OR%20uptake%20OR%20use%20OR%20adopt*%20OR%20transfer*%20OR%20translation))))%20OR%20((research%20AND%20(implementation%20OR%20utilization%20OR%20uptake%20OR%20use%20OR%20adopt*%20OR%20transfer*%20OR%20translation))))%20OR%20((knowledge%20AND%20(implementation%20OR%20utilization%20OR%20uptake%20OR%20use%20OR%20adopt*%20OR%20transfer*%20OR%20translation))))%20OR%20((science%20AND%20(implementation%20OR%20utilization%20OR%20uptake%20OR%20use%20OR%20adopt*%20OR%20transfer*%20OR%20translation))))))%20AND%20((dentist*%20OR%20(dental%20AND%20(practitioner*%20OR%20professional*))))</p>						

Appendix 2: Articles excluded after full-text evaluation and reasons for exclusion.

	Reference	Reason for exclusion
1995	Levine RA, Shanaman RH. Translating clinical outcomes to patient value: an evidence-based treatment approach. <i>Int J Periodontics Restorative Dent.</i> 1995;15(2):186-200.	Record presenting knowledge translation strategy/ initiative – study protocol
1999	Benn, D. K., Clark, T. D., Dankel, D. D. 2nd, & Kostewicz, S. H. (1999). Practical approach to evidence-based management of caries. <i>The Journal of the American College of Dentists</i> , 66(1), 27–35.	Record presenting knowledge translation strategy/ initiative – study protocol
1999	Deahl ST 2 nd . Conditions and tools for evidence-based dental practice. <i>J Am Coll Dent.</i> 1999;66(1):13-6.	Narrative or systematic review
1999	Monaghan N. Human nature and clinical freedom, barriers to evidence-based practice? <i>Br Dent J.</i> 1999 13;186(5):208-9	Editorial
2000	Manski RJ. Translating clinical practice into evidence-based research through the use of technology. <i>J Am Coll Dent.</i> 2000;67(2):30-2.	Narrative or systematic review
2000	Sutherland SE. The building blocks of evidence-based dentistry. <i>J Can Dent Assoc.</i> 2000;66(5):241-4.	Narrative or systematic review
2001	McGlone P, Watt R, Sheiham A. Evidence-based dentistry: an overview of the challenges in changing professional practice. <i>Br Dent J.</i> 2001 23;190(12):636-9.	Narrative or systematic review
2001	White BA, Maupomé G. Clinical decision-making for dental caries management. <i>J Dent Educ.</i> 2001;65(10):1121-5.	Record presenting knowledge translation strategy/ initiative – study protocol
2002	Benn DK. Applying evidence-based dentistry to caries management in dental practice: a computerized approach. <i>J Am Dent Assoc.</i> 2002;133(11):1543-8.	Record presenting knowledge translation strategy/ initiative – study protocol
2002	Forrest JL, Miller SA. Evidence-based decision making in action: Part 1- Finding the best clinical evidence. <i>J Contemp Dent Pract.</i> 2002 15;3(3):10-26.	Example of EBP approach to specific clinical questions – case scenario
2003	Bonetti D, Johnston M, Pitts NB, Deery C, Ricketts I, Bahrami M, Ramsay C, Johnston J. Can psychological models bridge the gap between clinical guidelines and clinicians' behaviour? A randomised controlled trial of an intervention to influence dentists' intention to implement evidence-based practice. <i>Br Dent J.</i> 2003 11;195(7):403-7.	Questionnaire, interview, or conversation sessions unrelated to the review question
2003	Walker AE, Grimshaw J, Johnston M, Pitts N, Steen N, Eccles M. PRIME--PRocess modelling in ImpleMEntation research: selecting a theoretical basis for interventions to change clinical practice. <i>BMC Health Serv Res.</i> 2003 19;3(1):22	Record presenting knowledge translation strategy/ initiative – study protocol
2003	White BA. On translating new biologic-based interventions into dental practice. <i>J Am Coll Dent.</i> 2003;70(4):30-4.	Narrative or systematic review
2004	Bahrami M, Deery C, Clarkson JE, Pitts NB, Johnston M, Ricketts I, MacLennan G, Nugent ZJ, Tilley C, Bonetti D, Ramsay C. Effectiveness of strategies to	Results derived from dentists' reports not independently described

	disseminate and implement clinical guidelines for the management of impacted and unerupted third molars in primary dental care, a cluster randomised controlled trial. <i>Br Dent J.</i> 2004 11;197(11):691-6.	
2004	Clarkson JE. Getting research into clinical practice - barriers and solutions. <i>Caries Res.</i> 2004;38(3):321-4.	Narrative or systematic review
2004	Cobban SJ. Evidence-based practice and the professionalization of dental hygiene. <i>Int J Dent Hyg.</i> 2004;2(4):152-60.	Narrative or systematic review
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4. CONCLUSÃO

Há várias barreiras que podem influenciar na prática do Dentista baseada na evidência. De acordo com essa revisão sistemática, a falta de habilidades e treinamento, evidências odontológicas indisponíveis ou inacessíveis, bem como questões práticas, tais como restrições financeiras e falta de tempo podem desempenhar papéis importantes na falha da prática do dentista baseada na evidência.

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