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## Knowledge, Attitudes, and Barriers Toward Evidence-Based Practice Among Oral Health Professionals in Saudi Arabia

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**KNOWLEDGE, ATTITUDES, AND BARRIERS TOWARD  
EVIDENCE-BASED PRACTICE AMONG ORAL HEALTH  
PROFESSIONALS IN SAUDI ARABIA**

by

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Requirement for the Degree of

MASTER OF SCIENCE

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## **ABSTRACT**

### **KNOWLEDGE, ATTITUDES, AND BARRIERS TOWARD EVIDENCE-BASED PRACTICE AMONG ORAL HEALTH PROFESSIONALS IN SAUDI ARABIA**

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Evidence -based decision making enables oral health professionals to make clinical practice decisions by utilizing the best available and most current scientific evidence. In combination with patients' values and circumstances, oral health professionals' experience and judgment are equally considered with scientific evidence in evidence-based decision making. The purpose of this study was to explore the knowledge and attitudes of evidence-based practice (EBP) among oral health professionals in Saudi Arabia and to determine the obstacles and barriers to implementation. Using a descriptive survey design, classrooms and clinics of 258 oral healthcare professionals were randomly selected from King Saud University, College of Dentistry and King Saud University, College of Applied Medical Sciences. The questionnaires were distributed by hand to the female participants from one of the female co-investigators. For male schools, class leaders of each classroom handed out the questionnaires to their academicians and classmates. Data from the questionnaires was analyzed using the following: frequency, medians, percentile, Spearman Rank Order Correlations, and Mann-Whitney U test. More than 40% of the participants reported they had "no idea" what meta-analysis, p-value, relative risk, odds ratio, publication bias, and confidence interval meant when surveyed. Over 30% of the participants were able to identify "patients' preferences or values" as one of the three components included in the evidence-based decision making (EBDM) process. Similarly, participants selected "systematic review" as the type of scientific

literature providing the strongest evidence for EBDM. More than 70% of the participants reported interest towards integrating EBP in the curriculum of all dental and dental hygiene programs. Barriers to implementing EBP included very expensive academic journals, the lack of information exchange between practitioners and academics, and the lack of up-to-date evidence for many devices and products. The EBP concepts and approach were not fully understood by the majority of oral health professionals in Saudi Arabia; however, the oral health professionals and students surveyed demonstrated a welcoming attitude aimed at EBP. Emphasis on enhancing the awareness of EBP concepts and approach, its significance, and process among Saudi Arabian oral health professionals and students is needed to improve quality oral health care.

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## **CHAPTER I**

### **INTRODUCTION**

Evidence based medicine (EBM) is defined as “the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients” (Sackett, Richardson, Rosenberg, Gray, & Haynes, 1996). Several health care professions have refined this definition to make it specific to their discipline. Evidence-based dentistry (EBD) is an offspring of EBM. It includes the judicious use of scientific current evidence, in conjunction with the dentists’ clinical expertise and the patients’ treatment needs and preferences regarding patients’ dental health care (American Dental Association[ADA], 2013).

Evidence-based decision making (EBDM) is the formalized process of using the skills for identifying, searching for and interpreting the results of the current scientific evidence (Forrest & Miller, 2009a). EBDM evolved in response to the need to promote quality health care by minimizing the gap between current scientific evidence and clinical practice. To apply the EBDM process, oral health professionals should use or reject a procedure, process, or device based on the application of evidence-based practice(EBP). The integration of current scientific evidence (1), clinical experiences and judgment of providers (2), patients’ preferences or values (3), and clinical/patient circumstances (4) defines evidence-based practice (EBP) (Forrest & Miller, 2004).

Through the application of EBP, oral health professionals can improve clinical care by consistently using a valid and reliable process. EBP further seeks to reduce and close the gap between research and clinical practice (Forrest & Miller, 2009b). This study was planned to assess the parameters of EBP used by oral health professionals in Saudi

Arabia by evaluating their knowledge, attitudes, and barriers toward EBP concepts and approach.

### **Statement of the Problem**

Several studies have been conducted to assess the knowledge, attitude, and barriers toward EBP in both developed and developing countries. Specific studies on the perceptions, awareness, and barriers among Saudi Arabian oral health professionals in using EBP are rare and limited. Therefore, the purpose of this survey was to explore the knowledge and attitudes toward EBP among oral health professionals in Saudi Arabia and to determine the obstacles and barriers to implementation.

### **Significance of the Problem**

Traditional methods for making clinical decisions regarding patient care do not insure the best procedure, process, or device. Some of the traditional methods oral health professionals have used to acquire knowledge were obtained through textbooks, consulting other experts, trial and error, and personal experiences (Lai, 2009; Forrest & Miller, 2001c). These methods are prone to error because they are not based on EBP concepts and approach. Oral health professionals need a scientific approach to guide towards the best procedure, process, or device available. By applying EBP in clinical practice, oral health professionals provide the best care supported by current scientific research. EBP facilitates lifelong learning and enables health professionals to support their clinical experiences with current research outcomes. EBP provides the best available approach to solve for health care problems faced by oral health professionals and their patients such as quality health care (Forrest, 2006).

EBDM promotes quality health care by providing a standardized process for implementing EBP. This standardized process consistently incorporates current scientific evidence based research with individualized values of the patient, clinical experience and judgment of providers, and clinical/patient circumstances. To improve the provision of health care quality, providers need a demonstration of replicated research using the scientific approach with different environments, settings, subjects. According to Forest & Miller (2009), replication of at least three evidence based, rigorously conducted research studies is required to utilize the scientific evidence component of EBP if a meta-analysis or systematic review is not available (Figure 1).

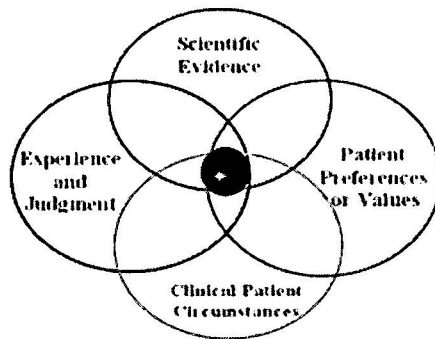


Figure 1. Components of Evidence-Based Practice (Forrest & Miller, 2004).

This requirement ensures applied EBP prevents providers from changing their procedure, process, or device based solely on one study that may not be reproducible under different environments. Providers should only change their procedure, process, or device when they have a body of knowledge from the current scientific evidence. When the body of knowledge driven from multiple studies examining the same topic, the

sample size and power increase and precision in estimating the effect of treatment enhance (Forrest & Miller, 2009b; Forrest & Miller, 2004). Innovative databases allow access to current literature for not only oral health care professionals but this same information may also be available to patients.

Having access to online resources and availability of technology enables patients to look for information about oral health care procedures, processes, or advices.

However, the internet, mass media and mass consumerism allows patient exposure to either correct or incorrect information. Frequently, the information patients find through advertisements and the internet access influences their decisions (Forrest & Miller, 2001d). Oral health professionals need to comprehensively answer patient's questions and guide patients to make proper decisions about their own oral health using the components of EBP. EBP enhances credibility and builds trust and confidence between oral health professionals and patients because it reinforces the need of considering and integrating patient's preferences or values into the decision making process.

Numerous authors have inconsistently and incorrectly used terms such as EBM, EBD, EBDM and EBP. It is important to correctly reference and consistently use terms associated with EBP to properly implement the concepts and approach (Forrest & Miller, 2004). The EBP process is critical in the promotion of global oral health.

Because EBP is an emerging concept in Saudi Arabia, this study was important to those who practice dentistry and dental hygiene. This study evaluated oral health professionals' knowledge, attitudes, and barriers towards evidence-based practice (EBP) in King Saud University, College of Dentistry (School 1) and King Saud University, College of Applied Medical Sciences (School 2). By measuring oral health professionals'

understanding and opinions towards EBP, these schools will become aware of their faculty and students' status and enable modifications to their educational systems, modify faculty and student training, and encourage adoption of EBP in their curricula across health science disciplines.

### **Definition of Terms**

For the purpose of this study, the following key terms were defined:

1. Evidence-based: the information health care professionals use based on scientific research, not someone's opinion
2. Evidence-based medicine: the conscientious, explicit and judicious use of current best evidence in making decisions about the overall health care of individual patients (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996)
3. Evidence-based dentistry: an approach to oral health care that requires the judicious integration of systematic assessments of clinically relevant scientific evidence, relating to patients' oral and medical condition and history, with the dentists' clinical expertise and the patients' treatment needs and preferences (Forrest & Miller, 2009a)
4. Evidence-based decision making: the formalized process of using the skills for identifying, searching for and interpreting the results of the best scientific evidence (Forrest & Miller, 2009a)
5. Evidence-based practice: the integration of current scientific evidence, clinical experiences and judgment of oral health professionals, patients' preferences or values, and clinical or patients' circumstances (Forrest & Miller, 2009a)
6. Oral health professionals: dental and dental hygiene students, interns, instructors, dentists, dental hygienists, and dental assistants that work or study in King Saud

University, College of Dentistry (School 1) and King Saud University, College of Applied Medical Sciences (School 2)

7. Evidence-based practice knowledge: oral health professionals' understanding of technical terms related to EBP, measured by a questionnaire on technical terms/tools in the EBP process: using an ordinal scale *no idea what this technical term means, and not interested in knowing; no idea what this technical term means, but interested in knowing; have a vague idea what this technical term means, or have a good understanding of what this technical term means*; two multiple-choice questions also measured the oral health professionals' understanding: of the components of EBP and the types of studies that would provide the best evidence to support EBP

8. Evidence-based practice attitudes: oral health professionals' degree of agreement/disagreement toward six statements related to EBP in the questionnaire and measured by the Likert scale: *strongly agree, agree, don't know, disagree, and strongly disagree*

9. Evidence-based practice barriers: the challenges that either keep the oral health professionals away from implementing EBP or the challenges that they experienced when using EBP to support their clinical decision making, measured by the extent to which various factors are a problem, using a scale from 1 "no problem" to 5 "big problem"

### **Assumptions**

The following assumptions were made in accordance with this study:

1. The majority of oral health professionals in Saudi Arabia lack EBP knowledge.
2. Oral health professionals respond honestly when answering the questionnaire about their knowledge, attitudes, and barriers toward EBP.

3. The questionnaire is a valid and reliable instrument for gathering data and measuring the variables under study.
4. Participants understand the instructions provided for completing the questionnaire.

### **Limitations**

The following limitations were identified as possible threats to the internal and external validity and reliability of this investigation:

1. Measurement bias may occur because the questionnaire may not sample the domain of the area being measured. This was minimized by using valid and reliable measures from past studies and assessing the questionnaire by an expert panel of faculty of the Dental Hygiene Department at Old Dominion University to determine content validity.
2. The respondents may misinterpret the questions. This was minimized by piloting the questionnaire on a random sample of 5 oral health professionals to establish test- retest reliability.
3. The co-investigators may change their instructions for the participants to follow from time to time. This was controlled by having a narrative that illustrates the procedures, risks, and benefits of the study to the participants in each classroom. The co-investigators used this narrative consistently and obtain the exact same instructions for the participants to follow to assure the intrarater and inter-rater reliability.
4. A potential for a low response rate might exist. This was minimized by discussing the significance of the study with the nonresponders and encourage them to participate and increase the response rate.

5. Selection bias might occur because of the different characteristics of those who participated in the study and those who did not participate. An attempt was made to contact the nonresponders and encourage participation.

### **Research Questions**

This study will address the following research questions:

1. Do oral health professionals in Saudi Arabia have good understanding on the most common technical terms used in EBDM?
2. Are oral health professionals in Saudi Arabia aware of the components of EBP and the strongest evidence in the hierarchy of evidence?
3. What are Saudi Arabian oral health professionals' opinions toward:
  - a. Improving quality of healthcare by implementing EBP in practice.
  - b. Reducing healthcare cost by practicing EBP.
  - c. Supporting clinical experiences with evidence research.
  - d. Integrating patients' preferences and concerns into treatment plans.
  - e. Teaching EBP concept in dental schools.
4. What barriers prevent or limit oral health professionals in Saudi Arabia from implementing EBP in practice?



## CHAPTER II

### REVIEW OF THE LITERATURE

#### History of Evidence-Based Practice

In the 10th century the need for validation of medical clinical judgment began (Nasser, &Tibi, 2006). As ways of clinical decision making were often non-scientific. Clinicians had confidence in using their clinical acumen to diagnose and provide the best treatment plan and care (Nasser, &Tibi, 2006). In the 20th century, an awareness of need for an effective approach for clinical decision making arose. In 1909, Archie Cochrane, whose experience as a physician for the prisoners of war in Greece and Germany during the Nazi occupation, led him to defend the idea of having an efficient approach of clinical decisions based on high levels of evidence such as randomized control trials (Lai, 2009). Alvin Feinstein also shaped the EBP concepts when he made epidemiology appropriate and applicable to the bedside care of the patients. He also introduced clinical epidemiology into clinical health care as another important dimension required of a holistic practitioner. In honor of Archie Cochrane for his aspiration, The Cochrane Collaboration was established in 1993. Collaborators from this organization worked together to produce the Cochrane Database of Systemic Reviews (CDSR) under the leadership of Sir Iain Chalmers (Lai, 2009). The CDSR has become the leading resource for systematic reviews of randomized controlled trials in health care. Through this biomedical database, the Cochrane Collaboration has becomes the main torch-bearer of evidence-based medicine (Lai, 2009).

In the late 1980s, investigators at McMaster University, Ontario, Canada, defined EBM as “a systematic approach to analyze published research as the basis of clinical

decision making.” (Claridge & Fabian, 2005). The term was defined by Sackett, Rosenberg , Gray, Haynes & Richardson in 1996 as “the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients.” (Claridge & Fabian, 2005). Since then, the evidence-based movement has become widely accepted among several health care professions and disciplines. Dentistry and dental hygiene are among the current disciplines accepting EBP standards. The American Dental Association (ADA) has refined the definition of EBM to make it more specific to dentistry. ADA defines EBD as “an approach to oral health care that requires the judicious integration of systematic assessments of clinically relevant scientific evidence, relating to patient’s oral and medical condition and history, with the dentists’ clinical expertise and the patients’ treatment needs and preferences” (American Dental Association[ADA], 2013). EBD has become an emerging subject and is supported within ADA accreditation standards for both dental and dental hygiene education. Specific to dental education standards, students must demonstrate competency of evidence based practice relating to patient care (American Dental Association Commission on Dental Accreditation [ADA], 2014 ). Relating to accreditation standards for dental hygiene education, the curriculum in dental hygiene schools must include “learning methods to promote critical appraisal of scientific evidence in combination with clinical application and patient factors” (American Dental Association Commission on Dental Accreditation [ADA], 2013).

Continued growth of the evidence-based movement to access current scientific knowledge was facilitated through the quick availability to online biomedical databases. For example, as of 2014 the MeSH (Medical Subject Headings) thesaurus of the U.S

National Library of Medicine has 27,149 descriptors and also over 218,000 entry terms that help to find the most appropriate MeSH Heading (U.S. National Library of Medicine [NLM], 2014). Another example of biomedical online database accessibility is the extensive number of trials listed in ClinicalTrials.gov which currently has 178,903 trials with locations in 50 states and 187 countries (ClinicalTrial.gov, 2014).

Today, oral health professionals and patients have the ability to access research studies, visit manufacture websites, and attempt to remain current in medical and dental knowledge. However, they must check the validity and reliability of resources before using or rejecting procedures, processes, and advices based on that knowledge. As a result of these advances, evidence-based practice requires oral health professionals to have an understanding of its four components; current scientific evidence, clinical experiences and judgment of oral health professionals, patients' preferences or values, and clinical or patients' circumstances, and develop skills to apply them in clinical practice.

### **Components of Evidence-Based Practice**

Applied to any discipline, EBDM is the comprehensive process of using the best current evidence in making decisions about individual patient care by having rigorous skills in identifying, searching for, and extracting the results of the scientific evidence (Forrest & Miller, 2009b). EBDM is a short way to make good judgment by implementing the current scientific evidence. This current scientific evidence is only one key component of the evidence-based practice. Traditionally, EBP has defined as three part approach; best research evidence, clinical expertise, and patient's values (Sackett, Straus, Richardson, Rosenberg, & Haynes, 2000). Best research evidence refers to

relevant current scientific evidence that focuses on patients' problems. Clinical expertise refers to the clinical experiences and judgment of medical and oral health professionals to determine the patients' diagnosis, treatment plan, risks and benefits of a particular procedure, process, or device. Patients' values refer to the preferences, concerns, and expectations that each patient want or look for in their health care delivery services. A researcher for the University of California, Dr. Jane L. Forrest, further clarified this definition by adding clinical or patient circumstances as a fourth component of EBP. Clinical or patient circumstances refer to uncontrollable conditions related to clinical or patient status such as unavailability of a particular procedure, process, or device in a clinic, patient age, and patient socioeconomic status (Forrest & Miller, 2009a).

EBP not only requires oral health care professionals to use current scientific evidence, it requires health care professionals to support their clinical experiences and consider patients' values with the use of current scientific evidence outcomes in the context of clinical/patient circumstances. By integrating the four components of EBP, oral health care professionals can enhance their decision making skills and maximize the opportunities for achieving successful patient care outcomes.

### **Process and Skills for Evidence-Based Decision Making**

EBDM is one component of the EBP concept and approach. Oral health professionals should have an understanding of the process and skills related to EBDM. To translate these skills into clinical practice, oral health professionals should chronologically follow five steps (See Table 1).

The first step of the oral health professionals is to convert information presented as a need or problem into the form of a clinical question. This question is often generated

by patients or it can also emerge from an observed problem or a topic of interest, or to identify new medication or procedure. The question should be structured to find a precise answer and phrased to ease the computerized search. The question should include four parts, (PICO): patients' problem (P) refers to identifying patients' complaints, concern, and patients' characteristics if these characteristics would affect the results of computerized search and expected findings. Intervention (I) may consist of a particular diagnostic test, drug, treatment, adjunctive therapy, medication, procedure, or any advice intended for the patient. Comparison (C) is optional. Oral health professionals may only want to know the effectiveness of the intervention and not compare the intervention with another alternative. Outcome (O) refers to the clinical results that oral health professionals desire for the client, e.g., to reduce specific symptoms, maintain particular effects, or improve certain functions (Forrest & Miller, 2001b).

Table 1.  
Steps to Use the EBDM Process (Forrest & Miller, 2009a).

1. Convert information need/problems into clinical PICO questions
2. Conduct computerized research for finding the best research evidence to answer the question.
3. Critically appraise the evidence for its validity and applicability.
4. Apply the outcomes of the appraisal, or evidence, in clinical practice.
5. Assess the entire process.

After formulating the PICO question, oral health professionals apply step 2 by conducting computerized research for finding the best research evidence from online databases to answer the question (Forrest & Miller, 2001a). With the advent of various online resources such as: Cochrane Database of Systematic Reviews (COCH), MEDLINE/PubMed, Database of Abstracts of Reviews of Effectiveness (DARE), and Agency for Health Care Research (AHRQ), oral health professionals can access literature conveniently and quickly. It is subjective important for oral health professionals to understand and apply the hierarchy of evidence which classifies research (Figure 2).



Figure 2. Hierarchy of Evidence (Forrest & Miller, 2001b).

The hierarchy of evidence represented in pyramid form is based on demonstrating the effects of treatments and the risk of bias (Forrest & Miller, 2009b). Progressing up of the pyramid the reliability on effects of interventions increases, the risk of bias decreases, and health care professionals can be more confident of the reported findings. Systematic

reviews and meta-analysis are considered the “gold standard” for bringing evidence to clinical practice. They collectively report on the findings of rigorous research and summarize results and findings on specific topics. Oral health professionals who have limited time to spend on literature searches, can find current scientific research evidence for clinical procedure, process, or device very quickly through systematic reviews and meta-analysis.

Oral health care professionals need to know the appropriate level of evidence for each type of PICO question before conducting the literature search because the highest level of evidence in each type of question is different. For example, the highest levels of evidence for a question related to therapy or prevention is the systematic review or meta-analysis of randomized clinical trial (RCT). In contrast, the highest level of evidence for a question related to prognosis is the systematic review of inception cohort studies. In therapy or prevention questions, oral health professionals should select best treatment by focusing on the effect of a therapy on experimental groups and compare with control groups; the systematic review or meta-analysis of randomized clinical trials (RCT) is the best type of the study to review. However, in prognosis questions, oral health professionals need to estimate progression of a disease over time and compare with a group without this disease; the systematic review of inception cohort studies will be the proper type of study to review (Forrest & Miller, 2001c). Sources of evidence related to oral health are also available in evidence-based journals such as: Evidence-Based Dentistry, Journal of Evidence-Based Dental Practice, Evidence-Based Medicine, Evidence-Based Nursing, and Evidence-Based Healthcare. Oral health professionals

should be familiar with the structure of an online database before searching the literature in order to get the relevant research efficiently (Forrest & Miller, 2001b, 2009a).

The third step of the EBDM process is to critically appraise the evidence for its validity and applicability. To judge if the literature is valid, the oral health professionals asks three questions: 1) Are the results of the study valid? 2) What are the results? 3) Will the results help in caring for my patient? (Forrest & Miller, 2002). To answer the first question, the oral health professionals focuses on the research methodologies and research design of the evidence. If the researchers conducted the study appropriately, selected the correct research design for answering the research question, and controlled the extraneous variables that threaten the internal and external validity of the research, the oral health professionals can be confident about the research results. Otherwise, the articles provide inadequate evidence to answer the PICO question and should be excluded from the search (Forrest & Miller, 2002). Many online resources such as the Center for Evidence-Based Medicine, University of Oxford, Clinical Appraisal Skills Programme (CASP) and Aggressive Research Intelligence Facility (ARIF), University of Birmingham have critical appraisal checklists available to oral health professionals. These agencies selected questions from *the Journal of the American Medical Association's* users' guides to the medical literature established by the Evidence-Based Medicine Working Group (Forrest & Miller, 2002). These checklists guide oral health professionals to critically appraise systematic reviews and randomized control trial studies (RCT) for validity and usefulness (Appendix A).

After oral health professionals find the evidence-based articles guided by the questions on the checklists, they identify whether the outcomes, risks, and benefits



presented in articles are significant to apply in clinical practices. The oral health professionals look for particular information of each type of study. For example, studies related to therapies should include the control event rate, the experimental event rate, and absolute and relative risk reduction in their results. In studies that interpret diagnostic methods or tests for a disease, the results should include the sensitivity, specificity, and likelihood ratio to compare a diagnostic test with “the gold standard” diagnostic test and determine the degree to which a test is reliable and useful (Forrest & Miller, 2002). The last step of the EBDM process is applying outcomes of the appraisal, or evidence, in clinical practice and evaluating the entire EBDM process.

### **Evidence-Based Practice in Dentistry**

EBP in dentistry is less developed than EBP in medicine, despite its growth. For example, The ADA integrates evidence-based practice into the private practice model in the US through its website available at: <http://ebd.ada.org>. Other examples of evidence-based practice in dental disciplines include the oral health database in the Cochrane Collaboration, *Evidence-Based Dentistry Journal*, *Journal of Evidence-Based dental practice*, *Journal of the American Dental Association*, and *Center for Evidence-Based Dentistry*. (Waytowich, 2009). In addition, the ADA Center for Evidence-Based Dentistry has over 2000 systematic reviews and is updated monthly. Topics related to dental hygiene have included cariology and caries management, periodontics, community oral health and health policy, anesthesia, oral sedation and pain control, and tobacco use and smoking cessation (ADA, 2012).

Bader and Ismail (2004) conducted a survey of systematic reviews in dentistry to determine quality and quantity of reviews related to dental practice. The researchers used

MEDLINE and the Cochrane databases to find systematic reviews and abstracts of literature reviews that met the following criteria: the systematic reviews included in this survey identified all relevant articles within predefined limits, defined exclusion and inclusion criteria, and studies' data. The results revealed 131 systematic reviews; 96 were directly relevant to clinical dentistry. The results of clinically relevant systematic reviews were different in their definitiveness; 17% of the studies were insufficient to answer the key PICO question. Fifty percent of the studies did not answer the key question. The researchers concluded the number of systematic reviews relevant to clinical dentistry was small and the quality of systematic reviews was not strong. The researchers stated as more systematic reviews are published, the evidence-based practice will improve (Bader, & Ismail, 2004).

A similar survey of the Cochrane databases of systematic reviews in different dental specialties was conducted by Faggion (2011). Only the systematic reviews of randomized controlled trials (RCTs) or controlled trials were included. The researcher divided the dental specialties accordingly: cariology and restorative dentistry, endodontics, dental implantology, oral and maxillofacial surgery, orthodontics, periodontics, prosthetic dentistry, and others. The researcher evaluated the outcomes of the reviews according to the quality of the evidence supporting a particular clinical treatment in dentistry. The researchers considered the quality of evidence as *adequate* when the authors showed their confidence in this quality, reporting words such as sound, high, or good quality of evidence. Moreover, when the authors failed to clearly reveal the evidence was *not strong*, but supported the effectiveness of the proposed therapy, the researchers also considered the evidence as *adequate*. The evidence was considered

*inadequate* when authors described weak or insufficient evidence. The researcher found 120 systematic reviews on 20 dental specialties. Only 26 of reviews were reported *adequate* (22.0% of the reviews). The researcher found several methodological limitations in these full-text reviews such as the authors did not mention the risk of bias among the selected primary studies, Methodological issues such as allocation concealment and blinding were not used in the entire primary studies sample. The highest percentage of adequate reviews (31%) was for the cardiology/restorative dentistry group. Endodontics and prosthetic dentistry had no adequate evidence available to make clinical decisions. The researcher found a lack of adequate evidence reviews for most dental procedures. They advised practitioners, educators and researchers to combine effort to improve evidence-based decision making and enhance the quality of evidence by conducting research in dental specialties where no evidence is available (Faggion, 2012).

EBD is growing among practitioners globally. For example, a series of articles have been published on the attitudes, awareness and perceptions about evidence-based dentistry among dental professionals and dental clinicians in some developed countries. (Iqbal& Glenny, 2002; Allison, & Bedos, 2003; Rabe, Holmen, & Sjögren, 2007; Madhavji, Araujo, Kim, & Buschang, 2011). Iqbal and Glenny (2002) published a study assessing 204 general dental practitioners (GDPs) in the North West region of United Kingdom (UK). The GDPs were randomly selected from National Health Service, private practice, and dental schools after researchers piloted the questionnaire on eight staff from the University of Manchester Dental Hospital. The questionnaire included closed questions to measure general dental practitioners' knowledge and opinion on EBP. A five point ordinal scale was used to assess opinions on the importance of EBP: one was

identified as *very important* and five was identified as *not important*. In addition, a free text section solicited the GDP's comments about the barriers to EBP. The results showed most of the GDPs had some knowledge of technical terms related to EBP; 165 of practitioners (81%) were interested in more information on EBP. Only one individual thought that EBP was not important. The most commonly perceived barriers toward EBP were "a lack of available time" and "financial constraints". The researchers concluded training, accessing and interpreting evidence, and enhancing the critical appraisal skills of practitioners are needed for future development of EBP in UK. The researchers controlled all possible subject relevant variables by randomly selecting the participants. They also ensured the validity and reliability of the questionnaire by piloting the questionnaire to before the questionnaires were sent out (Iqbal& Glenny, 2002).

In 2003, Allison and Bedos investigated Canadian dentists' views of the utility and accessibility of dental research findings. The questionnaire developed in both English and French languages, included four sections of closed ended questions: sociodemographic variables, research utility, research accessibility, and dental research priorities. The questionnaires were mailed to all Canadian dentists registered as members of *the Canadian Dental Association* (CDA). Two thousand-seven hundred ninety- seven out of 17,648 questionnaires were returned for a 15.8% response rate. Approximately 64% of the respondents believed results of dental research are easily available; nearly 89% of the respondents thought results of dental research are useful and 95,8% had already applied the research findings in their clinical practices. The Canadian dentists who responded were aware and had positive views of results of dental research and

changed their clinical practice according to these findings. Those who did not respond may not represent the same views as the respondents (Allison, & Bedos, 2003).

Rabe, Holmen, and Sjögren (2007) published a study to identify dental professionals' attitudes, awareness, and perceptions in the country of Halland, Sweden. Addresses were obtained from local branch organizations, the regional center of specialized dentistry and the Halmstad County Hospital (Halmstad, Sweden). The questionnaire was sent to 290 dental professionals including 91 dental hygienists, 182 general dentists, and 17 specialist dentists. Two hundred and twenty participants responded (67 dental hygienists, 137 general dentists, and 16 specialist dentists). The questionnaire consisted of closed questions to measure dental professionals' attitudes, awareness and skills on databases, technical terms related to EBD, and barriers to apply EBD in dental practice. Free text sections identified which scientific journals the respondents usually read. The researchers concluded the majority of participants had positive attitudes toward EBD. All participants found EBD useful in daily clinical practice. Most participants found EBD would improve the quality of their patient care, except the general dentists in private practice. A majority of the participants had a *good* level of knowledge toward the common terms related to EBD. In general, the dental professionals in Halland, Sweden had positive attitudes toward EBD and welcomed learning more about this emerging concept to analyze clinical situations correctly. The main identified barriers toward EBD were "lack of time" and "poor availability of evidence". The researcher controlled all possible extraneous variables by randomly selecting the dental professionals. They also used a previous survey among medical

general practitioners in the UK from 1997 that was already tested and its validity and reliability established (Rabe, Holmen, & Sjögren, 2007).

*American Journal of Orthodontics and Dentofacial Orthopedics* (2011) published a survey that evaluated the attitude, awareness, and barriers toward EBP among orthodontists in the United States. The questionnaire included 35 questions (6 relating to attitudes, awareness, and current practices, 10 relating to barriers, 10 relating to the understanding of terms; 7 statements on orthodontic issues, and 2 questions on solving clinical problems). The questionnaire was sent to 8455 members of the American Association of Orthodontists in the United States. One thousand five hundred seventeen orthodontists responded for a response rate of 32%. Most of the orthodontists had positive attitudes toward EBP; 80% found research influenced their daily work, 75% were interest in more clinical guidelines. The orthodontists' level of knowledge was *poor* on common terms related to EBDM. Less than one third of the orthodontists understood the meaning of meta-analysis, odds ratio, sample power, confidence interval, and specificity. Only 6% of the orthodontists knew the meaning of PICO. Mainly they reported barriers included conflicting and ambiguous literature, lack of clinical guidelines, and practical demands of work. The researchers concluded educational programs were important to improve orthodontist's level of knowledge, understanding, and use of EBDM in clinical practices. (Madhavji, Araujo, Kim, & Buschangd, 2011).

### **Evidence-Based Practice in Developing Countries**

The EBD concept is relatively new in developing countries. It is not a concept well known to every oral health professional in all developing countries (Akadiri, & Adeyemo, 2010). EBD remains under-reported among several countries. Overall, few

researchers have studied the perceptions, knowledge, attitudes, and barriers of EBD among oral health professionals in developing countries (Fedorowicz, Almas, & Keenan, 2004; Yosof, Han, San, & Ramli, 2008; Haron, Sabti, & Omar, 2012; Nahid, Haifa Lubna, Sahr, & Ashraf, 2013).

Fedorowicz, Almas, and Keenan (2004) studied the perception and attitudes toward the use of EBD among final year dental students and interns at King Saud University in Riyadh, Saudi Arabia. This was the first study in Saudi Arabia that evaluated future Saudi dentists' awareness and attitudes of EBD. The 13-item questionnaire was given to 115 final year students and interns; 88 students responded (68 were final year students and 20 were interns). Only 9% of the participants had attended EBD workshops and 30% of the total number of participants used EBD in their clinical practices. Respondents' level of knowledge of final year students and interns was *poor*. A multiple choice question was asked about the two other components of EBD in addition to clinical expertise; 15% answered "patients' choice" and 11% selected "evidence-based resource". Less than 20% of the respondents selected the systematic review as "being capable of providing the strongest evidence for research"; 26% of the participants selected "no time" as a major barrier; 46.6% answered "no access to evidence based resources" and 20% found "EBD is difficult to understand". Most final year students were unsure about the EBD concept. The interns were more aware of the significance of EBD and willing to attend EBD workshops and courses. The majority of participants had a strong desire to learn more about EBD concept. Researchers concluded there is a limited awareness of EBD among participants but also a genuine desire to learn more about this emerging field. This study used an EBM questionnaire from a previous study

that assessed the views of primary health care physicians working in the ministry of health in Bahrain (Fedorowicz et al, 2004). The questionnaire was piloted to establish its validity and reliability and the researchers did not make any changes except substituting the term of EBM for EBD in all questions. The researchers distributed the questionnaire at a group meeting which may affect the representativeness of the sample. Using a convenient sample may also lead to investigators bias and limit generalizability of the findings. The participants may have shared their answers with each other and may have threatened the research findings and internal validity of the study (Fedorowicz, Almas, & Keenan, 2004).

Yosof, Han, San, and Ramli (2008) conducted a survey among 193 Malaysian dental practitioners to evaluate their attitudes and knowledge toward EBP, and barriers that limit its use. Many of the respondents had positive attitudes toward EBP; 97.8% of the respondents stated EBP improved their knowledge and skills and the treatment quality they provided. When the practitioners faced uncertainty in their clinical practice, 91.1% of them consulted friends and colleagues, 88.9% made referrals, 83.0% consulted textbooks. The major barriers reported as preventing the implementation of EBP were lack of time (64.4%), financial constraints (40%), and lack of knowledge (28.1%). Many of the participants desired further information about EBP. Researchers reported on the validity and reliability of the self-administered questionnaire by piloting the questionnaire on three practitioners and exclude them from the study to avoid pretest effect and pretest-x interaction to increase the internal validity (Yosof, Han, San, & Ramli, 2008).



Haron, Sabti, and Omar (2012) assessed the awareness, knowledge, and practice of EBD among 120 dentists from all five health districts in Kuwait. The 25-item questionnaire (8 questions on socio-demographic factors, eight pertaining to knowledge of EBD, 7 pertaining to attitudes towards and practice of EBD, and 2 pertaining to barriers in using EBD had categorical response options. Results revealed that participants' knowledge of EBD terms was poor. More than 70% stated that they had no idea of, and had no interest in knowing about the EBD terms. The majority of the participants were unaware of the hierarchy of the strength of evidence; 73.3% of the respondents made their clinical decisions based on their own judgment; 28.3% used *PubMed* as an evidence-based resource; and just 6.7% used Cochrane library to decide the best treatment for their patients. The researchers concluded training in EBD was necessary for improving participants' knowledge and suggested having access to evidence-based sources in dental centers to overcome some barriers in implementing EBD. Researchers controlled all extraneous variables by randomly selecting the participants. This study showed evidence of proper sample size representing the entire population of general dentists and specialists working in the ministry of health. The questionnaire was piloted to confirm its content validity and test-retest reliability (Haron, Sabti, & Omar, 2012).

Nahid Ashri A. et al, (2013) conducted a study to compare between dental and medical practitioners' awareness and attitude toward EBP in Riyadh, Saudi Arabia. Three hundred practitioners (150 dentists and 150 medical practitioners) working at eight different academic, governmental, and private sectors in Riyadh, Saudi Arabia participated in completing a self-administered questionnaire. The questionnaire was

adopted from a study conducted on medical practitioners in 1998. Minor modifications were made to meet the purpose of the study. The questionnaires were delivered by hand to the practitioners, including four parts; demographic data, attitude toward EBP in terms of application and usage, awareness and usage of various bibliographic database, and the barriers for the use of EBP. Approximately 70% of invited dental practitioners and medical practitioners completed the questionnaire. The results showed most participants had an overall positive attitude towards EBP in terms of application and usage; 85% of the participants reported interest in the current promotion of EBP; 97% believed EBP improves patient care and 96% represented usefulness of research in day-to-day practice. Significantly fewer dentists reported understanding of the technical the terms used in EBP. Less than half of participants obtained formal training in search strategies (43.8%), critical appraisal (34.4%) and other EBP skills (40.6%). Approximately 45% of dentists and physicians actually used methods to transition from opinion-based practice to EBP. The investigators concluded dentists and physicians had a favorable attitude toward EBP. More attempts should be made to strength the skills and use of EBP among all medical and dental practitioners working in Saudi Arabia (Nahid, Haifa, Lubna, Sahr, & Ashraf, 2013).

EBP is an effective approach for clinical decision making because it integrates current scientific evidence with clinical experiences and judgment of oral health professionals, patients' preferences or values, and clinical or patient circumstances. Oral health professionals must not only use their clinical experiences to treat patients, but use current scientific evidence, respect patients' preferences or values, and consider clinical or patient circumstances with their clinical experiences. EBP reduces the gap between

oral health professionals' experiences and research knowledge by requiring the dental professional to maintain up-to-date knowledge related to the latest clinical research evidence. It improves the overall quality of health care by reducing variability in practice and implementing scientific evidence for practice.

Considering the need to implement EBP in clinical practice, many studies in different countries were conducted to assess oral healthcare professionals' attitudes, knowledge, barriers associated with EBP. The purpose of these studies was to encourage oral health professionals to use EBP in their practices, overcome the obstacles of implementing EBP, and improve the quality of oral health care among dental practice environments (Fedorowicz, Almas, & Keenan, 2004; Yosof, Han, San, & Ramli, 2008; Haron, Sabti, & Omar, 2012; Nahid, Haifa, Lubna, Sahr, & Ashraf, 2013).

## **CHAPTER III**

### **METHODS AND MATERIALS**

#### **Research Design**

A descriptive survey design was planned to randomly select classrooms and clinics of oral health professionals from six different organizations: Dammam Central Hospital, Qatif Central Hospital, University of Dammam, College of Dentistry, King Saud University, College of Dentistry, Riyadh Colleges of Dentistry and Pharmacy, and King Abdul-Aziz University, College of Dentistry. After consulting a statistician at Old Dominion University, Norfolk, Virginia regarding the necessary sample size and statistical power, classrooms and clinics of 258 oral health professionals were randomly selected from two schools; King Saud University, College of Dentistry (School 1) and King Saud University, College of Applied Medical Sciences (School 2). The dependent variables in this study were knowledge, attitudes, and barriers to evidence-based decision making. The independent variables in this study included: gender, age, professional title, and years of experience if applicable. The knowledge, attitudes, and barriers toward evidence-based decision making among oral health professionals questionnaire was used as the dependent variable measure. Participants responded to the questionnaire (Appendix C) and cover letter (Appendix D). The questionnaires were distributed by hand to the participants via either a female investigator who are a dental hygienist or male class leaders of the selected classes and clinics.

#### **Sample Description**

Participants in this study consisted of a cluster sample including 258 oral health professionals (students, interns and instructors studying or teaching in dental and dental

hygiene professions; dentists, dental hygienists and dental assistants employed in the clinics). Participating dental students were required to have completed three years of studies; participating dental hygiene students were required to have completed two years of studies; participating dental assistants were required to have graduated from their program. In the first three years of Saudi dental programs, dental students are enrolled in basic science courses but have not started practicing in dental clinics. Dental hygiene students start practicing in dental hygiene clinics after completion of two years of study. Dental assisting students graduate from school after two years of study in Saudi dental assisting programs. A random cluster sampling technique was used to select didactic classrooms and clinics in order to access oral health professionals. Only classrooms and clinics of students that meet the inclusion/exclusion criteria were included in the survey.

### **Methodology**

This study included 258 oral health professionals who met the inclusion criteria and agreed to participate. Data collection occurred at King Saud University, College of Dentistry (School 1) and King Saud University, College of Applied Medical Sciences (School 2). Institutional Review Board (IRB) approvals were obtained from Old Dominion University and from King Saud University, College of Dentistry (School 1) and King Saud University, College of Applied Medical Sciences (School 2). Appointments were scheduled with the deans of both schools to meet and discuss the purpose of the study, its procedures, and the importance of participation of oral health professionals that were also reflected in the cover letter to the potential participants. Emails were sent to deans of the two schools including an invitation letter to each potential instructor announcing the study and asking for their participation with specific

dates (Appendix G). Recruitment letters were posted in various locations of the schools to announce the study (Appendix E).

Female oral health professionals are separated from the male oral health professionals due to cultural and religious rules in Saudi Arabian schools. One of the female investigators was not allowed to enter the male schools to survey oral health professionals. Hence, a male instructor and three male class leaders of selected classrooms and clinics were designated as research assistants to distribute the questionnaires to the male participants. These research assistants were calibrated for purposes of internal validity. The female investigator in this study conducted the survey among female participants within female classrooms and clinics.

All oral health professionals who agreed to participate received and signed an informed consent packet demonstrating their approval to participate in the research investigation (Appendix B). The approximate time needed to answer the questionnaire was discussed with potential participants to enhance the response rate. The co-investigator and male research assistants handed out each questionnaire with an envelope to the participants. After the participants answered the questionnaires they were returned in sealed envelopes.

### **Protection of Human Subjects**

The design of each question presented on the survey questionnaire focused on preventing embarrassment or potential risk to participating subjects. All data collected from participants was treated with confidentiality; ensuring the absence of risk for subjects. Participants did not provide any information that would reveal subject identifiers when asked for information on the demographic portion of the questionnaire.

After participants completed the questionnaire, they returned it in a sealed envelope to maintain confidentiality; thus, preventing researchers from tracking individual questionnaires to any participants. Participants signed an Informed Consent Form, signifying they were aware of all information available about the study including any associated risks and benefits of the study to protect their rights and welfare. Data collected was used only for research purposes and was not shared with anyone outside of the research project team. All questionnaires were kept in a locked cabinet in the dental hygiene research center, Old Dominion University. There are no direct personal benefits for participants except personal satisfaction obtained from their participation in research and encouragement to promoting oral health professionals to use EBP. All questionnaires were destroyed by using a paper shredder and all electronically stored information will be erased after two years of the study's published date.

### **Data Collection**

To promote a high response rate, a self-distribution pattern was used to deliver and collect the data. The female investigator returned to Saudi Arabia and made direct contact with the deans of both schools. The data was not conducted by emails because not all Saudi oral health professionals, instructors, and students communicate through the email system. The educational system in Saudi Arabian universities and colleges is innovatively progressing, but there are some schools who do not participate in an email system of communication or other educational interfaces.

The female investigator called and scheduled appointments with the male research assistants to discuss the purpose of the study, procedures and the importance of participation by oral health professionals. Copies of the questionnaire and narrative

describing the procedures, risks, and benefits of the study were provided to each male research assistant (See Appendix F). The female investigator and male research assistants used this narrative consistently and provided the exact instructions for participants to follow, ensuring intrarater and inter-rater reliability.

The female investigator and male research assistants read the narrative in classrooms and clinics prior to directing participants to complete the questionnaires. The female investigator and male research assistants remained in the classrooms or clinics for 15 minutes to ensure completion of the survey. The female investigator and male research assistants encouraged participants to answer all questions without assistance from other participants. The questionnaires were further distributed to the instructors' offices and employing dentists, dental hygienists, and dental assistants' clinics. The questionnaires were collected after one week following the initial visit. The questionnaires were returned in sealed envelopes to maintain anonymity of the participants.

### **Instrumentation**

The cover letter explained the purpose of the study and its procedures, the importance of oral health professionals' participation, and the approximate time needed to complete the questionnaires. The questionnaire consists of two primary sections. The first section gathered demographic characteristics of the respondents: gender, age, professional title, and years of experience if applicable. The second section surveyed oral health professionals' knowledge, attitudes, and barriers toward evidence-based practice.

The female investigator designed section one of the questionnaire; demographic characteristics of oral health professionals. For the second section of the questionnaire, the female investigator combined existing, separate, valid, and reliable measures (in the



form of questions) of knowledge (Fedorowicz, Almas, & Keenan, 2004; Haron, Sabti, & Omar, 2012), attitudes (Wahabi, Alzeidan, Fayed, Esmail, & Al Aseri, 2011), and barriers (Spallek, Song, Polk, Bekhuis, Frantsve-Hawley, & Aravamudhan, 2008). Each instrument was modified to meet the applied demands of this aggregate investigation. The questionnaire was designed to be completed in approximately 5 minutes.

The second section was divided into three sub-sections. EBP *knowledge* sub-section measured technical terms used in EBDM, and two multiple-choice questions were provided to investigate knowledge about the components of EBP and the types of studies that would provide the best evidence to support EBP. The EBP *attitudes* sub-section measures the oral health professionals' degree of agreement/disagreement toward six statements related to EBP using a Likert scale: *strongly agree, agree, don't know, disagree, and strongly disagree*. The EBP *barriers* sub-section focused on the challenges that prevent oral health professionals from implementing EBP, measured by the extent to which various factors are a problem, using an ordinal scale from 1 "*no problem*" to 5 "*big problem*".

Before conducting the survey, questionnaire was evaluated by an expert panel of health science faculty of the dental hygiene department at Old Dominion University to determine content validity. Modifications to the questionnaire were made based on the panel's review. The survey was pilot tested for test-retest reliability and clarity of the questionnaire by randomly selecting five oral health professionals from the target oral health professionals. The questionnaire was provided twice to the same five participants over two weeks. In both tests, the five participants were asked to answer the questionnaire independently. The correlation coefficient between the two outcomes of

responses was used as a quantitative measure of the test-retest reliability. The values of correlation were stable and considered satisfactory. The questionnaire survey was conducted and the five participants were excluded from the study to prevent pretest effects, pretest-x interaction and selection- treatment interaction. After collection concluded the data of all questionnaires was statistically analyzed by a statistician provided by Old Dominion University.

### **Statistical Analysis**

Data from questionnaires was processed using Statistical Package for the Social Science. Descriptive statistics was used to describe and summarize data collected numerically. Because the data are nominal and ordinal in nature, frequency, medians, percentile, Spearman Rank Order Correlations, and Mann-Whitney U test were used for data analysis. Statistical analysis support was provided by a doctoral student in the department of mathematics and statistics, Old Dominion University.

Spearman Rank Order Correlations was used to measure the relationship between rankings of the ordinal variables; knowledge and attitude toward EBDM. The Spearman Rank Order Correlations was obtained to examine the relationship between participants' years of experience, knowledge and attitude. The Spearman Rank Correlation Coefficient was also used to assess the level and significance of these measured relationships.

Mann-Whitney U test was used to examine the differences of the ordinal dependent variables based on the independent variables. Mann-Whitney U test was performed to assess the median difference between the knowledge and attitude score of the two schools. In each analysis, a p-value of .05 was used to determine level of significance.

To reflect the level of EBP knowledge and attitudes among participants, EBP knowledge and attitude scores were calculated by assigning a score of each knowledge and attitude item. For the knowledge score, all technical terms related to EBDM weighted according to the ranking within the ordinal scale. Thus, *no idea what this technical term means, and not interested in knowing* was assigned a score of 0, *no idea what this technical term means, but interested in knowing* was assigned a score of 1, *have a vague idea what this technical term means* was assigned a score of 2, and *have a good understanding of what this technical term means* was assigned a score of 3. The two multiple choice questions were answered true or false; each was assigned a score of 2 for a correct response and 0 for incorrect response. The total score of EBP knowledge could possibly range from 0 to 34.

For the attitude score, five statements related to EBP were weighted based on the degree of agreement/disagreement: *strongly agree* was given a score of 5, *agree* was given a score of 4, *don't know* was given a score of 3, *disagree* was given a score of 2, and *strongly disagree* was given a score of 1. Only one statement “practicing EBDM replaces clinical experience” was assigned scores differently: *strongly agree* was given a score of 1, *agree* was given a score of 2, *don't know* was given a score of 3, *disagree* was given a score of 4, and *strongly disagree* was given a score of 5. The total score of EBP attitude could possibly range from 0 to 30.

## **CHAPTER IV**

### **RESULTS AND DISCUSSION**

This descriptive survey study was conducted to explore the knowledge, attitudes, and perceived barriers towards EBP among 258 oral health professionals in two Saudi Arabian schools; King Saud University, College of Dentistry (School 1) and King Saud University, College of Applied Medical Sciences (School 2).

#### **Results**

Of the 450 questionnaires submitted, a total of 259 surveys were retained and 258 were analyzed; one questionnaire was excluded from the analysis because it was missing responses to all questions except demographic information questions. Of the total number of surveys distributed to the participants, the response rate was 57.33%.

#### **Demographic Characteristics**

Demographic data comprised 42.8% of male respondents and 56.2% of female respondents. Age varied considerably, with the majority (74.4%) being 20-30 years of age; only two participants (1%) were 51 years of age or older. The professional title data revealed 153 participants were students, 23 were dentists, 25 were dental assistants, 17 were dental hygienists, and 40 were instructors. Only 32 (30.5%) had more than 10 years of clinical experience with the remaining respondents having 10 years or less of clinical experience. The demographic information of the sample study is shown in (Table 2).

Table 2.  
Demographic Characteristics of the Sample Study (n=258).

Characteristics	Study Sample	
	Frequency	Percentage
<u>Gender</u>		
Male	113	43.80%
Female	145	56.20%
<u>Age</u>		
20-30	192	74.42%
31-40	44	17.05%
41-50	20	7.75%
>51	2	0.78%
<u>Professional Title</u>		
General dentist	23	8.92%
Specialist dentist	29	11.24%
Dental hygienist	17	6.59%
Dental assistant	25	9.68%
Instructor	11	4.26%
Student	153	<b>59.30%</b>
<u>Years of Experience</u>		
0-1	11	10.48%
2-5	33	31.43%
6-10	29	27.62%
>10	32	30.48%

### Knowledge

More than 40% respondents reported they had *no idea what meta-analysis, p-value, relative risk, odds ratio, publication bias, and confidence interval means*. Over 12% revealed *not interested in knowing anything about randomized controlled trial, p-value, odd ratio, publication bias, and confidence interval*. Only 19% have a *good understanding of p-value; 27% randomized control trial; and 29% the level of evidence* (Table 3).

Table 3.  
Descriptive Statistics of Self-Reported Understanding of Technical Terms Used in Evidence-Based Decision making(EBDM). (n=258) (%).

EBDM terms	No idea, and not interested	No idea, but interested	Have vague idea	Have good understanding
Systematic review	27(10.47%)	60(23.26%)	<b>90(34.88%)</b>	80(31.40%)
Meta-analysis	29(11.24%)	<b>107(41.47%)</b>	77(29.85%)	45(17.44%)
Randomized Controlled Trial	31(12.02%)	75(29.07%)	<b>83(32.17%)</b>	69(26.74%)
<i>p</i> -value	42(16.28%)	<b>102(39.54%)</b>	64(24.81%)	50(19.38%)
Relative risk	27(10.47%)	<b>100(38.76%)</b>	75(29.07%)	56(21.71%)
Sensitivity	18(6.98%)	60(23.26%)	89(34.50%)	<b>91(35.27%)</b>
Odds Ratio	42(16.28%)	<b>118(45.74%)</b>	72(27.91%)	26(10.08%)
Publication bias	40(15.50%)	<b>109(42.25%)</b>	59(22.87%)	50(19.38%)
Confidence interval	34(13.18%)	<b>103(39.92%)</b>	62(24.03%)	59(22.87%)
Levels of evidence	30(11.63%)	70(27.13%)	<b>84(32.56%)</b>	74(28.68%)

According to the main components of evidence-based practice, the participants were informed about clinical expertise and evidence resources and were asked to identify the remaining two. Only 31% of the participants were able to identify the correct answer: *patients' values/circumstances*. *WHO report* was answered more (39%) than the other choices (Table 4).

Table 4.  
Descriptive Statistics of Self-Reported Understanding of the Components of Evidence-Based Practice(EBP). (n=258) (%).

Famous text box	Senior consultants' opinion	WHO report	Patients' values/circumstances
39(15.12%)	38(14.73%)	<b>101(39.15%)</b>	80(31.01%)

When asked about understanding of the hierarchy of evidence, 32% of participants selected *systematic review* as the study which provides the strongest evidence for evidence-based decision making, 28% selected *randomized clinical trial*, 23% selected *case control study*, 27% selected *cohort study*, and 17% selected *longitudinal study* (Table 5).

Table 5.  
Descriptive Statistics of Self-Reported Understanding of the Hierarchy of Evidence. (n=258) (%).

Case control study	Systematic review	Cohort study	Longitudinal study	Randomized control clinical trial
58(22.48%)	<b>83(32.17%)</b>	27(10.47%)	17(6.59%)	73(28.30%)

### Attitudes

More than 70% of the participants *agreed* quality of care is improved by practicing EBP. Similarly, participants *agreed* including EBP in the curriculum of all dental and dental hygiene programs would improve quality of care. 40% *agreed* EBP provides a reliable and quick resource for updating knowledge; 32% *did not know* if practicing EBP replaces clinical experience or not (Table 6).

Table 6.  
Descriptive Statistics of Self-Reported Attitude Toward Statements Related to Evidence-Based Practice (EBP). (n=258) (%).

Phrase	Strongly disagree	Disagree	Don't know	Agree	Strongly agree
Quality of care is improved by practicing EBP	14(5.42%)	13(5.04%)	34(13.18%)	<b>117(45.35%)</b>	80(31.01%)
Healthcare costs can be reduced by EBP	3(1.16%)	34(13.18%)	89(34.50%)	<b>95(36.82%)</b>	37(14.34%)
EBP provides a reliable and quick resource for updating knowledge	7(2.71%)	6(2.33%)	72(27.91%)	<b>104(40.31%)</b>	69(26.74%)
EBP incorporates patient's values and opinions	4(1.55%)	27(10.47%)	84(32.56%)	<b>106(41.09%)</b>	37(14.34%)
Practicing EBP replaces clinical experience	19(7.36%)	72(27.91%)	<b>82(31.79%)</b>	64(24.81%)	21(8.14%)
EBP should be included in the curricula of all dental and dental hygiene programs	7(2.71%)	5(1.94%)	50(19.38%)	96(37.21%)	<b>100(38.76%)</b>



## Barriers

Regarding the main barriers to implement EBP in clinical practice, participants were asked to estimate the extent to which the listed barriers are problems using an ordinal scale from 1 *no problem* to 5 *big problem*. For all of the rankings (5), 20% reported *very expensive academic journals*, 17.4% reported *the lack of information exchange between practitioners and academics*, and 15% reported *the lack of up-to-date evidence for many devices and products* (Table 7).

Table 7.  
Descriptive Statistics of Self-Reported Extent to Which Factors is Being a Barrier to Implementing Evidence-Based Practice(EBP).

Barriers	No problem 1	2	3	4	Big problem 5
Difficulties in keeping up-to-date due to fast-changing insights in the field of dentistry and dental hygiene	31(12.02%)	62(24.03%)	<b>108(41.86%)</b>	35(13.57%)	22(8.53%)
Lack of up-to-date evidence for many devices and products	12(4.65%)	49(18.99%)	<b>81(31.40%)</b>	77(29.85%)	39(15.12%)
Difficulties in interpreting research results due to academic language	42(16.28%)	55(21.32%)	<b>77(29.85%)</b>	56(21.71%)	28(10.85%)
Contradictory information in scientific literature	10(3.88%)	48(18.61%)	<b>124(48.06%)</b>	51(19.77%)	25(9.69%)
Lack of familiarity with searching for relevant information	16(6.20%)	38(14.73%)	<b>117(45.35%)</b>	51(19.77%)	36(13.95%)
Lack of clear answers to clinical questions	21(8.14%)	56(21.71%)	<b>84(32.56%)</b>	63(24.42%)	34(13.18%)
Very expensive academic journals	27(10.47%)	51(19.77%)	<b>74(28.68%)</b>	54(20.93%)	52(20.16%)
No time to implement new evidence- based approaches	22(8.53%)	53(20.54%)	<b>82(31.78%)</b>	67(25.97%)	34(13.18%)
Lack of information exchange between practitioners and academics	11(4.26%)	49(18.99%)	<b>85(32.95%)</b>	68(26.36%)	45(17.44%)
Patient satisfaction used as main criterion to justify treatments	19(7.36%)	42(16.28%)	<b>120(46.51%)</b>	50(19.38%)	27(10.47%)
Complexity of dental and dental hygiene field regarding treatment choices	25(9.69%)	57(22.09%)	<b>106(41.09%)</b>	53(20.54%)	17(6.59%)

Rankings (3) acquired the highest percentages in the scale for all listed barriers; 48% chose *contradictory information in scientific literature*, 46.5% chose *patient satisfaction used as main criterion to justify treatments*, and 45.3% *lack of familiarity with searching for relevant information* as a challenges that prevent the participants from implementing EBP.

### **Correlation between knowledge and attitudes**

The level of knowledge and attitude of all participants were statistically significant correlated ( $r_s=0.395$ ,  $t= 6.87$ ,  $df=256$ ,  $p<0.0001$ ) (Table 8). The value of a correlation coefficient can vary from -1 to 1. A correlation coefficient of -1 or 1 indicates the strongest relationship. A correlation coefficient equal to 0 indicates the weakest relationship.

Table 8.  
The Spearman Rank Correlation between Knowledge and Attitude of the Study Sample.

Rank correlation coefficient	T-Approximation	Degrees of Freedom	P-Value
0.395	6.87	256	<0.0001

### **Correlation between years of experience and knowledge and attitudes**

In comparing participants with low levels to high levels of years of experience in relation to their level of knowledge and attitude there were no statistically significant correlations respectively ( $r_s=0.117$ ,  $t=1.2$ ,  $df=103$ ,  $p=0.2348$ ) (Table 9), ( $r_s=0.102$ ,  $t=1.04$ ,  $df=103$ ,  $p=0.3005$ ) (Table 10).

Table 9.  
The Spearman Rank Correlation between Years of Experience and Knowledge of the Study Sample.

Rank correlation coefficient	T-Approximation	Degrees of Freedom	P-Value
0.117	1.20	103	0.2348

Table 10.  
The Spearman Rank correlation between Years of Experience and Attitude of the Study Sample.

Rank correlation coefficient	T-Approximation	Degrees of Freedom	P-Value
0.102	1.04	103	0.3005

### Knowledge differences between School 1 and School 2

Participants who work or study in King Saud University, College of Dentistry (School 1) were significantly more likely to have a higher level of EBP knowledge than those who work or study in King Saud University, College of Applied Medical Sciences (School 2) ( $w=11707$ ,  $z=-3.86$ ,  $p=0.999$ ) (Table 11). The sample included 108 participants from King Saud University, College of Applied Medical Sciences (School 2) and 150 participants from King Saud University, College of Dentistry (School 1) (Table 12).

Table 11.  
The Mann-Whitney U Test Results for the Median Difference between Knowledge Scores of Sample in School 2 and School 1.

W-Value	Z-Approximation	P-Value
11707	-3.86	0.9999

Table 12.

The Mann-Whitney U Test Results for Knowledge Scores: School 1 and School 2.

School	Sample Size	Rank Sum	Mean Rank
2	108	11707	108.40
1	150	21704	144.69

### Attitude differences between School 1 and School 2

Participants work or study in King Saud University, College of Dentistry (School 1) were significantly more likely to have a better attitude towards EBP than those work or study in King Saud University, College of Applied Medical Sciences (School 2) ( $w=13118$ ,  $z= -1.47$ ,  $P=.9298$ ) (Table 13). The rank sum of attitude scores of the participants from King Saud University, College of Dentistry (School 1) was higher than those from King Saud University, College of Applied Medical Sciences (School 2) (Table14).

Table 13.

The Mann-Whitney U Test Results for the Median Difference between Attitude Scores of Sample in School 2 and School 1.

W-Value	Z-Approximation	P-Value
13118	-1.47	0.9298

Table 14.

The Mann-Whitney U Test Results for Attitude Scores : School 1 and School 2.

School	Sample Size	Rank Sum	Mean Rank
2	108	13118	121.46
1	150	20293	135.29

## DISCUSSION

The high response rate in this investigation made it reasonable to determine the collected data were representative for oral health professionals in Riyadh, Saudi Arabia. Additionally, the results of the current survey are reflective of a recent study among dental and medical practitioners in the same city. Our favorable response rate could be explained due to the use of self-distribution methods rather than using other methods frequently used in many other studies such as emails, mailings, and online survey instruments.

### **Knowledge**

Most participants showed *no or a vague* understanding of the listed technical terms used in EBDM. Failure in understanding these basic terms could make it difficult for participants to interpret scientific research evidence, possibly resulting in unsuccessful treatment decisions. More than 70% of participants revealed *no or a vague* understanding of *p*-value and confidence interval. Without a good understanding of these two basic terms, it is unlikely that evidence-based practice concepts and approaches can be accurately implemented into clinical practice. *P*-value is a mathematic expression indicating the strength of evidence against the null hypothesis. It expresses the probability or chance that researchers have obtained their sample data. The smaller *p*-value, the stronger the evidence in rejecting the null hypothesis. Confidence interval is a range of value that shows the magnitude of any potential clinical results. It helps dental practitioners estimate how much a study will vary if replicated. The lower a confidence interval, the greater precision of the treatment effect is estimated (Forrest, & Miller, 2009). Having *no or a vague* understanding of *p*-value and confidence interval could

prevent participants from interpreting scientific evidence results and findings properly and prevent successful outcomes when applying these findings to clinical practice.

Few respondents have a *good* understanding of the components of EBP; current scientific evidence (1), clinical experiences and judgment of providers (2), patient's preferences or values (3), and clinical or patient circumstances (4). Unawareness of *patients' values/ circumstances* demonstrates participants had a misconception of the EBP concepts and approach. Patients' values and circumstances should be considered to support practitioners' clinical decision making and build trust and confidence with patients. Evolution of the internet and technology facilitates patients to find information regarding dental procedures, products, or devices (Forrest & Miller, 2001c). Patients may increasingly depend on oral health professionals to provide evidence-based answers about these dental procedures, products, or devices as more databases and information becomes available to them. It is important for participants to recognize the significance of involving their patients in any dental care plans, identify unanswered questions, and consider patients' circumstances such as age, race, and socioeconomic status when applying EBP in clinical practice.

The questionnaire revealed participants were uncertain about the strongest evidence of EBDM. Answers related to the strongest evidence of EBDM varied among the reported data. Having insufficient knowledge about the hierarchy of evidence could lead the participants to think all available research or article findings are acceptable to apply in clinical practice. Despite *systematic reviews* attained the highest percentage among provided answers, only very slight differences between *randomized clinical trial* and *systematic reviews* were reported. One plausible explanation to this result is

participants may have a misapprehension or a faulty differentiation between randomized clinical trial and systematic review. Participants may have incorrectly used or did not differentiate the terms systematic reviews and randomized controlled trials, which often are used interchangeably. A randomized clinical trial is a single study that implements an experimental research design using human subjects that are randomly assigned to groups at baseline, prior to the initiation of the study. A randomized clinical trial is often used to evaluate a new procedure, product, or device. Comparatively, a systematic review is a comprehensive, critical evaluation of all high quality research evidence investigating the same topic/phenomenon. It includes only the studies of the highest caliber, typically multiple randomized clinical trials (Forrest & Miller, 2009a; Forrest & Miller, 2001a). Participants should not change their procedure, product, or device based on a single research study that may not be reproducible under different environments. They should only change their procedure, product, or device when they have a body of knowledge driven from multiple studies examining the same topic (Forrest & Miller, 2009b; Forrest & Miller, 2004). Understanding the levels of evidence is significant in the EBDM process in order to find valid and reliable scientific evidence.

### **Attitudes**

The participants had an overall favorable attitude toward EBP. A high majority of participants agreed quality of care is enhanced by incorporating EBP into clinical practice. Most participants reported they include EBP in the curriculum of Saudi Arabian dental and dental hygiene programs, despite they did not fully understand the EBP concepts and approach. Participants were positive toward all phrases provided in the attitude section of questionnaire except *practicing EBP replaces clinical experience*.



More than 30% of participants agreed *practicing EBP replaces clinical experience*; 32% did not know if *EBP substitutes clinical experience* or not. Believing if providers practice and adopt EBP, they would be ignoring or undervalue clinical experiences or judgments could prevent participants from implementing EBP into their practices. This result might be explained by the poor understanding of the EBP concepts and approach. The EBP concepts and approach does not only require practitioners to use current scientific evidence, however, it requires practitioners to use their clinical experiences or judgments and consider patient's values in context with clinical/patient's circumstances. EBP acknowledges the values of clinical judgments in evaluating each patient's unique health condition, diagnosis, risks and benefits of potential interventions. EBP provides another dimension to the decision-making process by implementing all its components into clinical practice. Another explanation to this result is participants were possibly confused about the negative phrasing of the statement. The questionnaire was developed in English and participants of this study, overall did not use English as their primary language.

### **Barriers**

The present study was conducted to not only to identify the most common barriers which prevent oral health professionals from implementing EBP in clinical practices, but also to evaluate which barriers were considered *big* or the most important problems. Participants selected 5 ranking numbers of the following barriers as the most *big* problems: *very expensive academic journals, the lack of information exchange between practitioners and academics, and the lack of up-to-date evidence for many devices and products*. Considering the high number of participants reporting academic journals are very expensive, perhaps there was a denial of the availability of electronic databases that

are available free for public. It is highly plausible that participants who were interested would be able to find and allocate current scientific evidence on different topics related to oral health simply by accessing these databases available to the public. The library of King Khalid University Hospital has a large collection of journals, theses, research articles, meta-analysis, systematic reviews, literature reviews, and magazines. It hosts 80 computers dedicated to searching current scientific evidence through the internet. It offers access to a high number of online scientific resources for all faculty members, employees, and students. The participants who were concerned about the cost of academic journals would not need to purchase academic journals to find scientific evidence based on their affiliation with these facilities and availability of online databases.

The lack of information exchange between practitioners and academics was selected as the second most ranking barrier to incorporate EBP into clinical practice. This result might be explained by the overall insufficient knowledge of the EBP concepts and approach among participants. These oral health professionals may be unconfident and unwilling to share information because of their limited understanding of the EBP concepts and approach. Heavy workloads of practitioners and academics might be another explanation for this result. Participants may not have time to disseminate and exchange information between each other. Active exchange of information among participants could positively influence their level of knowledge related the EBP concepts and approach.

The third most ranking barrier to implementing EPB was the lack of up-to-date evidence for many devices and products. Aforementioned, there are several electronic

resources including current systematic reviews, meta-analysis, and randomized controlled trials of clinical procedures, product, or device available to the surveyed sample participants. The participants may not know about the availability of these significant databases such as the Cochrane Database of Systematic Reviews, MEDLINE/PubMed, Database of Abstracts of Reviews of Effectiveness (DARE), and Agency for Health Care Research (AHRQ). Other sources of current scientific evidence are also available in evidence-based journals to the participants such as; Evidence-Based Dentistry Journal , Journal of Evidence-Based Dental Practice, Journal of Dental Research, and Journal of American Dental Association. Awareness of these scientific resources is necessary among participants to implement EBP.

The majority of participants selected number 3 as the ranking rate of barriers to implement EBP, using a scale from 1 to 5 where 1 means *no problem* and 5 means *big problem*. They may have been more comfortable to assign the ranking number of 3 to all listed barriers rather than assigning numbers at either end of the scale. A tendency to respond towards the middle of a scale, produces results with little insights about the most perceived barriers to implementing EBP in Saudi Arabia. With an odd-numbered rating scale, mid-point choice of 3 indicated participants either had a moderate ranking position on the listed barriers or uncertainty about what a big problem signified. An unwillingness to select either end of the scale may be explained by the lack of implementing EBP in dental practices, or insufficient level of knowledge of EBP concepts and approach among participants. A language barrier may be another explanation of this result because many participants asked the co-investigator to translate some words in the listed barriers to

Arabic. However, a true response cannot be eliminated and all responses were included in the statistical analysis from the data collection.

### **Correlation between knowledge and attitudes**

Outcomes from the present study showed a positive linear correlation between level of knowledge and attitudes of participants ( $r_s=0.395$ ). The value of correlation coefficient was approximately 0.4, this correlation was neither weak nor strong, suggesting that participants who had lack of knowledge of EBP concepts and approach may not necessarily had negative attitude towards EBP and vice versa. The natural positive correlation between participants' knowledge and attitude could be explained by the lack of participants' understanding of EBP concepts and approach, those with lower level of knowledge, could be more likely to answer the questionnaire randomly. Another explanation for the natural correlation relates to participants' demanding workload, those with a heavy workload and busy schedules could be more likely to answer the questionnaires indiscriminately, thus affect the strength of this correlation.

### **Correlation between years of experience and knowledge and attitudes**

The value of correlation coefficient of participants' years of experience and level of knowledge was close to 0 ( $r_s=0.117$ ), reflecting there was no linear correlation between these two variables. Those who had been practicing for several years had similar or low levels of EBDM knowledge when compared to those who had practiced for less years. The explanation for this may relate to the new emerging concept of EBP in Saudi Arabia. Those who had either few or many years of experience in oral health may have just started to learn about the EBP concepts and approach, the need for EBP, and the process of implementing EBP into clinical practice. The limited awareness of EBP concepts and

approach among all participants, including those with several years of experience could be the explanation of this result.

Similarly, participants' attitude was not statistically significant in the correlation related to years of experience ( $p\text{-value}=0.3005$ ,  $r_s=0.102$ , close to 0); those who had been practicing for more than 10 years may not have necessarily been in favor of EBP. A justification for this outcome may be in the misunderstanding of EBP concepts and approach which could lead to an opposing attitude. Another explanation to these perceptions is participants with several years of experience is they may have felt more comfortable using their own traditional ways of practice than preferring to adopt a new approach of practice. They may have preferred to rely on their own clinical expertise rather than changing, especially those who agreed practicing EBP replace clinical experience. Those who had been practicing for a higher number of years and were not in favor of EBP may fear losing their independence as a practitioner, authoritarian, or fear losing control of independent practice models.

### **Knowledge and attitudes differences between School 1 and School 2**

Significant differences in levels of knowledge and attitude towards EBP between participants from King Saud University, College of Dentistry (School 1) and those from King Saud University, College of Applied Medical Sciences (School 2) might be explained by the variation in curricula and educational programs of both schools. King Saud University, College of Dentistry (School 1) does not require undergraduate dental students to fulfill a thesis project but requires dental students to accomplish a research project before finishing their internship year. Attaining research experience allows dental students to better understand published articles, research approaches and designs, validity

and reliability of research measurements, and applications of statistics in research. Dental students who have engaged in either an undergraduate or graduate research experience would be able to determine the best scientific evidence and assist the methodological quality of studies. Conducting research provides students a factual basis for the evidence-based decision making process and skills. With this foundation in EBDM, students may adopt EBP and only use procedures, products, or devices that are well supported by current scientific evidence. Academicians who supervise students' research may also use EBDM and be up-to-date on search tools available to locate scientific evidence in oral health , define important researchable areas for the dental profession, and discover new knowledge.

King Saud University, College of Applied Medical Sciences (School 2) follows a traditional approach for dental hygiene education. The curriculum focuses on basic sciences in the early years of study followed by clinical instruction in the later years. It strongly concentrates on didactic courses and clinical requirements, with less emphasis placed on problem-solving skills, critical thinking skills and evidence based research. Participants who work or study in King Saud University, College of Applied Medical Sciences (School 2) would likely not be aware of the current research, scientific findings, and valuable electronic resources available to retrieve current scientific research.

## CHAPTER V

### SUMMARY AND CONCLUSIONS

EBP improves clinical care by consistently using a valid and reliable process. It seeks to reduce and close the gap between research and clinical practice. EBP offers the best quality of health care by allowing a critical evaluation of procedures, products, and devices in need of rejection or adoption (Forrest J. et al, 2004). A number of studies have been conducted to evaluate perceptions and implementations of EBP among dental and dental hygiene practitioners in both developed and developing countries. Studies in Saudi Arabia concluded adoption of evidence based practices in clinical settings are scarce and deficient. The purpose of this current study was to explore knowledge and attitudes of evidence-based practice among oral healthcare professionals and to identify barriers to implementing evidence-based practice in Saudi Arabia. This study revealed the majority of oral health professionals in Saudi Arabia had a *poor* understanding of technical terms used in EBDM. Most participants were *unaware* of the components of EBP and levels of evidence. The majority of participants reported *an interest* to know more about EBDM terminologies. They had *welcoming* attitude towards EBP except one statement; *practicing EBP replaces clinical experience*. The most perceived barriers identified in this study were *very expensive academic journals, the lack of information exchange between practitioners and academics, and the lack of up-to-date evidence for many devices and products*. Most oral health professionals were comfortable to select number 3 rankings to rate the given barriers.

This study reported oral health professionals who had a lack of knowledge of EBP concepts and approach may not necessarily have a negative attitude towards EBP.

Conversely, oral health professionals in Saudi Arabia with a negative attitude towards EBP may not necessarily have a lack of knowledge of EBP. Years of experience were not a predictor of level of knowledge and attitude towards EBP among oral health professionals in Saudi Arabia. Those who had been practicing for several years may have limited level of knowledge and less desirable attitude towards EBP than those who had not.

It is important to enlighten that the curriculum of dental schools in Saudi Arabia place more emphasis on fundamentals of research and evidence-based learning when compared to dental hygiene schools. Oral health professionals who work or study in King Saud University, College of Dentistry (School 1) had a statistically significant higher level of knowledge and attitude than those in King Saud University, College of Applied Medical Sciences (School 2).

Findings from this study give direction to changes needed in teaching EBP concepts and approach, its significance, and its application in dental and dental hygiene curriculum. This however, requires dental and dental hygiene educators to be trained in EBDM process and skills, such as asking precise PICO questions, locating computerized research for finding valid evidence to answer these questions, critically appraise the evidence, applying the outcomes of evidence in clinical practice, and assess the whole process.

EBDM or current scientific evidence is only one component of the EBP concept and approach. Health care professionals must be aware of the incorrect and inconsistent use of the terms EBDM and EBP; which often are used interchangeably. EBP requires health professionals to integrate 4 components; current scientific evidence (1), clinical



experiences and judgment of providers (2), patients' preferences or values (3), and clinical or patient circumstances(4).

Oral health professionals in this study had an overall favorable attitude towards EBP. Because of the desire participants showed in EBP, it is apparent EBP concepts and approaches should be included in the curriculum of all dental and dental hygiene programs in Saudi Arabia. It is recommended that dental and dental hygiene schools initiate educational programs that teach EBP. Educators and students should be encouraged to explore and use available electronic databases such as COCH, MEDLINE/PubMed, DARE, and AHRQ. Exchanging information between practitioners and academicians should be emphasized to enhance awareness of the EBP concepts and approach among oral health professionals in Saudi Arabia. Continuing education courses, workshops, seminars are also highly recommended to disseminate information related to the EBP concepts and approach among dental and dental hygiene professionals. Educators need to exhibit and teach their student problem-solving, critical thinking skills and EBDM skills. The perceived barriers towards EBP are necessary to acknowledge and to approach when new educational programs are planned. This study suggests an increased level EBP knowledge is necessary in Saudi Arabian dental and dental hygiene schools, attitudes towards EBP are positive and barriers can be recognized and targeted to help oral health professionals provide the highest level of oral healthcare available utilizing evidence-based procedures, products, and devices.

Future research is necessary to further replicate this study in different environments, settings, and using varied sample populations. Further research could examine other variables related to the use of EBP among oral health professionals such as

estimated time spent on self-education, estimated percentage of EBP in clinical practice, or current use of journals, reports, and scientific databases. Future research is necessary to develop a model of EBP specific to dental and dental hygiene curricula and evaluate its impacts on educators and students.

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**Appendix A**  
**RCT Critical Appraisal Sheet**



**THERAPY STUDY: Are the results of the trial valid? (Internal Validity)****What question did the study ask?**

Patients –

Intervention -

Comparison -

Outcome(s) -

<b>1a. R- Was the assignment of patients to treatments <u>randomized</u>?</b>	
What is best?	Where do I find the information?
<i>Centralized computer randomization</i> is ideal and often used in multi-centered trials. Smaller trials may use an <i>independent</i> person (e.g., the hospital pharmacy) to “police” the randomization.	The <i>Methods</i> should tell you how patients were allocated to groups and whether or not randomization was concealed.
This paper: Yes <input type="checkbox"/> No <input type="checkbox"/> Unclear <input type="checkbox"/>	
Comment:	
<b>1b. R- Were the groups <u>similar</u> at the start of the trial?</b>	
What is best?	Where do I find the information?
If the randomisation process worked (that is, achieved comparable groups) the groups should be similar. The more similar the groups the better it is. There should be some indication of whether differences between groups are statistically significant (i.e. p values).	The <i>Results</i> should have a table of "Baseline Characteristics" comparing the randomized groups on a number of variables that could affect the outcome (i.e. age, risk factors etc.). If not, there may be a description of group similarity in the first paragraphs of the <i>Results</i> section.
This paper: Yes <input type="checkbox"/> No <input type="checkbox"/> Unclear <input type="checkbox"/>	
Comment:	
<b>2a. A – Aside from the allocated treatment, were groups treated equally?</b>	
What is best?	Where do I find the information?

<p>Apart from the intervention the patients in the different groups should be treated the same, e.g., additional treatments or tests.</p>	<p>Look in the <i>Methods</i> section for the follow-up schedule, and permitted additional treatments, etc. and in <i>Results</i> for actual use.</p>
<p>This paper: Yes <input type="checkbox"/> No <input type="checkbox"/> Unclear <input type="checkbox"/></p> <p>Comment:</p>	
<p><b>2b. A – Were all patients who entered the trial accounted for? – and were they analyzed in the groups to which they were randomized?</b></p>	
<p>What is best?</p>	<p>Where do I find the information?</p>
<p>Losses to follow-up should be minimal – preferably less than 20%. However, if few patients have the outcome of interest, then even small losses to follow-up can bias the results. Patients should also be analyzed in the groups to which they were randomized – ‘<i>intention-to-treat analysis</i>’.</p>	<p>The <i>Results</i> section should say how many patients were randomized (e.g., Baseline Characteristics table) and how many patients were actually included in the analysis. You will need to read the results section to clarify the number and reason for losses to follow-up.</p>
<p>This paper: Yes <input type="checkbox"/> No <input type="checkbox"/> Unclear <input type="checkbox"/></p> <p>Comment:</p>	
<p><b>3. M - Were measures <u>objective</u> or were the patients and clinicians kept “<u>blind</u>” to which treatment was being received?</b></p>	
<p>What is best?</p>	<p>Where do I find the information?</p>
<p>It is ideal if the study is ‘double-blinded’ – that is, both patients and investigators are unaware of treatment allocation. If the outcome is <i>objective</i> (e.g., death) then blinding is less critical. If the outcome is <i>subjective</i> (e.g., symptoms or function) then blinding of the outcome assessor is critical.</p>	<p>First, look in the <i>Methods</i> section to see if there is some mention of masking of treatments, e.g., placebos with the same appearance or sham therapy. Second, the <i>Methods</i> section should describe how the outcome was assessed and whether the assessor/s were aware of the patients' treatment.</p>
<p>This paper: Yes <input type="checkbox"/> No <input type="checkbox"/> Unclear <input type="checkbox"/></p> <p>Comment:</p>	

## What were the results?

<b>1. How large was the treatment effect?</b>	
<p>Most often results are presented as dichotomous outcomes (yes or no outcomes that happen or do not happen) and can include such outcomes as cancer recurrence, myocardial infarction and death. Consider a study in which 15% (0.15) of the control group died and 10% (0.10) of the treatment group died after 2 years of treatment. The results can be expressed in many ways as shown below.</p>	
<b>What is the measure?</b>	<b>What does it mean?</b>
<p><b>Relative Risk (RR)</b> = risk of the outcome in the treatment group / risk of the outcome in the control group.</p> <p>In our example, the <math>RR = 0.10/0.15 = 0.67</math></p>	<p>The relative risk tells us <b>how many times more likely</b> it is that an event will occur in the treatment group relative to the control group. An <b>RR of 1</b> means that there is no difference between the two groups thus, the treatment had <b>no effect</b>. An <math>RR &lt; 1</math> means that the treatment decreases the risk of the outcome. An <math>RR &gt; 1</math> means that the treatment increased the risk of the outcome.</p> <p>Since the <math>RR &lt; 1</math>, the treatment decreases the risk of death.</p>
<p><b>Absolute Risk Reduction (ARR)</b> = risk of the outcome in the control group - risk of the outcome in the treatment group. This is also known as the <b>absolute risk difference</b>.</p> <p>In our example, the <math>ARR = 0.15 - 0.10 = 0.05</math> or 5%</p>	<p>The absolute risk reduction tells us the absolute difference in the rates of events between the two groups and gives an indication of the baseline risk and treatment effect. An <b>ARR of 0</b> means that there is no difference between the two groups thus, the treatment had <b>no effect</b>.</p> <p>The absolute benefit of treatment is a 5% reduction in the death rate.</p>
<p><b>Relative Risk Reduction (RRR)</b> = absolute risk reduction / risk of the outcome in the control group. An alternative way to calculate the RRR is to subtract the RR from 1 (eg. <math>RRR = 1 - RR</math>)</p>	<p>The relative risk reduction is the complement of the RR and is probably the most commonly reported measure of treatment effects. It tells us the reduction in the rate of the outcome in the treatment group relative to that in the control group.</p>

<p>In our example, the <math>RRR = 0.05/0.15 = 0.33</math> or 33% Or <math>RRR = 1 - 0.67 = 0.33</math> or 33%</p>	<p>The treatment reduced the risk of death by 33% relative to that occurring in the control group.</p>
<p><b>Number Needed to Treat (NNT) =</b> inverse of the ARR and is calculated as <math>1 / ARR</math>.</p> <p>In our example, the <math>NNT = 1 / 0.05 = 20</math></p>	<p>The number needed to treat represents the number of patients we need to treat with the experimental therapy in order to prevent 1 bad outcome and incorporates the duration of treatment. Clinical significance can be determined to some extent by looking at the NNTs, but also by weighing the NNTs against any harms or adverse effects (NNHs) of therapy.</p> <p>We would need to treat 20 people for 2 years in order to prevent 1 death.</p>

## 2. How precise was the estimate of the treatment effect?

The true risk of the outcome in the population is not known and the best we can do is estimate the true risk based on the sample of patients in the trial. This estimate is called the **point estimate**. We can gauge how close this estimate is to the true value by looking at the confidence intervals (CI) for each estimate. If the confidence interval is fairly narrow then we can be confident that our point estimate is a precise reflection of the population value. The confidence interval also provides us with information about the statistical significance of the result. If the value corresponding to **no effect** falls outside the 95% confidence interval then the result is statistically significant at the 0.05 level. If the confidence interval includes the value corresponding to **no effect** then the results are not statistically significant.

## Will the results help me in caring for my patient? (External Validity/Applicability)

The questions that you should ask before you decide to apply the results of the study to your patient are:

- Is my patient so different to those in the study that the results cannot apply?
- Is the treatment feasible in my setting?
- Will the potential benefits of treatment outweigh the potential harms of treatment for my patient?

## Informed Consent

You are invited to participate in a study conducted by The Old Dominion University Dental Hygiene Research Center. We hope to assess oral health professionals' knowledge, attitudes, and barriers toward evidence-based decision making (EBDM) in Saudi Arabia. You were selected as a possible participant in this study because you are practitioner in dental, dental hygiene, or dental assisting field, dental student in the fourth year studying, or dental hygiene student in the third year studying.

If you decide to participate, we will give you a questionnaire with an envelope. After you finish answering all items of the questionnaire, please return the questionnaire in the sealed envelope, so all your answers will remain confidential. We expect you to answer the questionnaire honestly and independently. The approximate time to complete the questionnaire is 5 minutes, so please take the time to answer the questions as frankly and completely as possible. There are no potential risks to participants in this survey. You may benefit from this study by gaining personal satisfaction from your participation in a research project and may encourage oral health professionals to use of EBDM.

Any information that is obtained in connection with this study will be used only for the research purpose and will not be disclosed with anyone outside of the research project team unless it is required by law.

Your decision whether or not to participate will not prejudice your future relations with Old Dominion University or the Dental Hygiene Research Center. If you decide to participate, you are free to withdraw your consent and to discontinue participation at any time without penalty. The Committee on the Protection of Human Subjects at Old Dominion University has reviewed and approved the present research.

If you have any questions or comments, please contact me; Sukainah Almeedani, Dental Hygiene Master Degree Candidate, 0530823036 or salme005@odu.edu. Questions regarding the rights of research subjects may be directed to: Mohammad A. Karim, Vice President for Research on the International Review Board at Old Dominion University, at (757) 638-5658.

You will be given a copy of this form to keep.

YOU ARE MAKING A DECISION WHETHER OR NOT TO PARTICIPATE. YOUR SIGNATURE INDICATES THAT YOU HAVE DECIDED TO PARTICIPATE, HAVING READ THE INFORMATION PROVIDED ABOVE.

Signature \_\_\_\_\_ Date \_\_\_\_\_

**Appendix C**  
**Questionnaire Cover Letter**

Dear Oral Health Professional:

An investigation is being conducted to assess oral health professionals' knowledge, attitudes, and barriers toward evidence-based practice (EBP) in Saudi Arabia. This research is a thesis project in partial fulfillment of the requirements for the degree of Master of Science in Dental Hygiene. The information you provide may establish an effective action plan to facilitate using EBP in clinical practice, integrate EBP into dental curricula, and contribute to quality oral health for people in Saudi Arabia. If you are practitioner in dental, dental hygiene, or dental assisting field, dental student in the fourth year studying , or dental hygiene student in the third year studying, please complete the questionnaire. The average time needed to complete the questionnaire is 5 minutes, so I hope you will take the time to answer the questions as frankly and completely as possible. Your answers will remain confidential since there is no mentioning of your name or your address in the demographics section of the questionnaire.

Please return the questionnaire in the enclosed envelope that provided after finish answering all items. If for some reason you choose not to participate, please return the questionnaire to the co-investigator (SA).

There are no risks involved for survey respondents, as all information that you provide remains confidential, and all data collected will be destroyed upon completion of the study. Results will be reported in group form and will be available upon written request from the School of Dental Hygiene of Old Dominion University.

If you have any questions or comments, please contact me or Joyce Flores, BSDH, MS, my advisor on this project at (804)839-4662 or [jdowns@odu.edu](mailto:jdowns@odu.edu). Thank you for your cooperation and prompt response.

Sincerely,

Sukainah A. Almeedani

Dental Hygiene Master Degree Candidate

Old Dominion University

Qatif, Saudi Arabia 0530823036

E-mail: [salme005@odu.edu](mailto:salme005@odu.edu)

Enclosures

## Knowledge, Attitudes, and Barriers Toward Evidence-Based Practice among Oral Health Professionals Questionnaire

Directions: please answer each question as it relates to your role as an oral health professional.  
Choose only one response per an item.

### Section 1: DEMOGRAPHICS

**1. Gender:**

- Male  
 Female

**2. Age:**

- 20-30                       41-50  
 31-40                       >51

**3. Professional title:**

- General dentist                       dental assistant  
 Specialist dentist                       instructor  
 Dental hygienist                       student

**4. Years of experience “if applicable”:**

- 0-1                       6-10  
 2-5                       >10



Section 2: KNOWLEDGE, ATTITUDES, AND BARRIERS TOWARD EVIDENCE-BASED PRACTICE (EBP) AMONG ORAL HEALTH PROFESSIONALS

Evidence-Based Practice (EBP) knowledge of Technical terms

5. Please place an “x” in the appropriate space for each term listed below:

EBDM terms	No idea what this technical term means, and not interested in knowing	No idea what this technical term means, but interested in knowing	Have a vague idea what this technical term means	Have a good understanding of what this technical term means
Systematic review				
Meta-analysis				
Randomized Controlled Trial				
<i>p</i> -value				
Relative risk				
Sensitivity				
Odds Ratio				
Publication bias				
Confidence interval				
Levels of evidence				

Choose one answer for each of the following questions:

6. Clinical expertise and evidence resources are two of the four components of Evidence-Based Practice (EBP), choose the remaining two:

- Famous text book
- Senior consultants' opinion
- WHO report
- Patients' values/circumstances

**7. For research methods, what type of study provides the strongest evidence for Evidence-Based Decision Making (EBDM):**

- Case control study  
 Systematic review/meta-analysis  
 Cohort study  
 Longitudinal study  
 Randomized control clinical trial

Evidence-Based Practice (EBP) Attitudes

**8. To express your opinion about Evidence-Based Practice (EBP), please place an “x” in the appropriate space to the right of each phrase below:**

Phrase	Strongly disagree	Disagree	Don't know	Agree	Strongly agree
Quality of care is improved by practicing EBP					
Healthcare costs can be reduced by EBP.					
EBP provides a reliable and quick resource for updating knowledge					
EBP incorporates patient's values and opinions.					
Practicing EBP replaces clinical experience					
EBP should be included in the curriculum of all dental and dental hygiene programs					

Evidence-Based Practice (EBP) Barriers

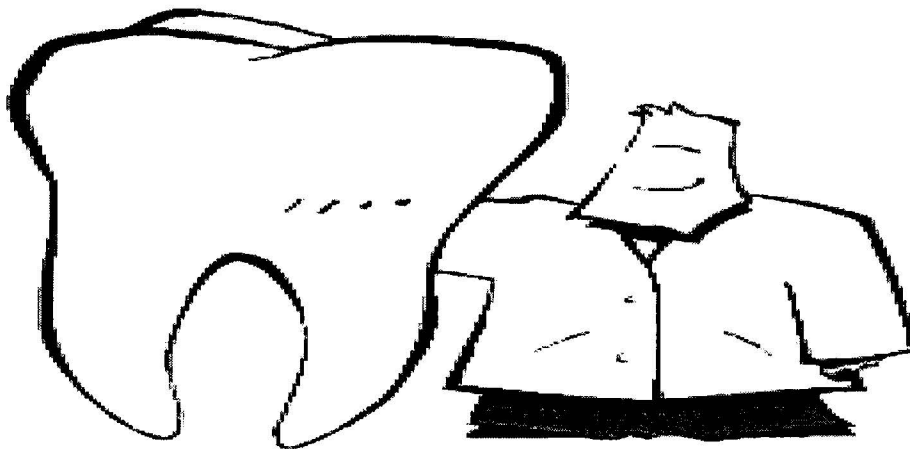
**9. Based on your own experience, please rate the following barriers to Evidence-Based Practice (EBP) with respect to how much a problem each is for you, using a scale from 1 to 5 where 1 means “no problem” while 5 means “big problem”.**

	No problem				Big Problem
Barriers	1	2	3	4	5
Difficulties in keeping up-to-date due to fast-changing insights in the field of dentistry and dental hygiene					
Lack of up-to-date evidence for many devices and products					
Complexity of the dental field regarding treatment choices					
Difficulties in interpreting research results due to academic language					
Contradictory information in scientific literature					
Lack of familiarity with searching for relevant information					
Lack of clear answers to clinical questions					

	<b>No problem</b>			<b>Big Problem</b>	
<b>Barriers</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Very expensive academic journals					
No time to implement new evidence-based approaches					
Lack of information exchange between practitioners and academics					
Patient satisfaction used as main criterion to justify treatments					
Complexity of the dental and dental hygiene field regarding treatment choices					
Other					
_____					
_____					
_____					
Write in additional comments regarding relative issues you experienced in the field of dentistry and dental hygiene.					

## Evidence-Based Practice Study

We are looking for dental students who have completed at least 3 years of studies and dental hygiene students who completed at least 2 years of studies, graduate dental assistants, interns and instructors who work in the dental field. The study requires answering a questionnaire. The average time needed to complete the questionnaire is 5 minutes. If you have any questions you can call 053082303 and ask for Sukainah Almeedani. IRB#: EFR 0011



Dear Students

You are participating in a study conducted by The Old Dominion University Dental Hygiene Research Center. The study assesses oral health professionals' knowledge, attitudes, and barriers toward evidence-based Practice (EBP) in Saudi Arabia. The information you provide may establish an effective action plan to facilitate using EBP in clinical practice, encourage oral health professionals to overcome obstacles of implementing EBP in practice, integrate EBP into dental curricula, and contribute to quality oral health for people in Saudi Arabia. There are no risks involved for you, as all information that you provide remains confidential, and all data collected will be destroyed upon completion of the study. If you are practitioner in dental, dental hygiene, or dental assisting field, dental student in the fourth year studying , or dental hygiene student in the third year studying, please complete the questionnaire. The average time needed to complete the questionnaire is 5 minutes, so I hope you will take the time to answer the questions as frankly and completely as possible. Please answer the questionnaire independently and without any assistance from your colleagues .I will remain in the class while you are responding to the questionnaire. If you have any questions, please don't hesitate to ask. After you finish answering all items of the questionnaire, please return the questionnaire in the sealed envelope that is given to you. There is no requirement to mention your name or your address in the demographics section of the questionnaire.

Thank you for your cooperation and prompt response.

Dear Academicians,

My name is Sukainah Abdulwahab Almeedani, and I am a Saudi graduate dental hygiene student attending Old Dominion University in Norfolk, Virginia, USA. I have finalized my research proposal utilizing a descriptive survey design, titled “Knowledge, Attitudes, and Barriers toward Evidence-Based Practice Among Oral Health Professionals in Saudi Arabia.” This research is a thesis based-project in partial fulfillment of the requirements for the degree of Master of Science in Dental Hygiene.

Considering Evidence-Based Practice (EBP) is an emerging concept in Saudi Arabia, this study will contribute knowledge to those who practice dentistry and dental hygiene in my native country. The study will evaluate oral health professionals’ understanding, attitudes, and barriers of EBP in Saudi Arabia to possibly increase utilization and adoption of Evidence-Based Research into clinical practice by identifying the obstacles associated with implementing EBP. The study requires surveying dental students complete at least 3 years studying and dental hygiene students complete at least 2 years studying.

I am requesting your support for this study by remaining 15 minutes in each classroom while the students are responding to the questionnaire. I need 5 minutes for reading a narrative with instructions for the students to follow; 5 minutes for students to complete the questionnaire; and 5 minutes for collecting the questionnaires. I will collect my data between January, 27–March, 20. I would be honored if you arrange your schedule according to these dates and give me 15 minutes from your lecture time to collect the data. I would appreciate your participation in the study as an academician. I look forward to your correspondence. If you have any questions, please contact me: Sukainah Almeedani, Dental Hygiene Master Degree Candidate, +16194717835, [salme005@odu.edu](mailto:salme005@odu.edu)

Appreciatively

Sukainah Adulwahab Almeedani

## VITA

### **PERSONAL INFORMATION**

**NAME** Sukainah Abdulwahab Almeedani  
**ADDRESS** School of Dental Hygiene  
 Old Dominion University  
 Norfolk, VA23529  
 Salme005@odu.edu

### **LICENSURE**

2010 Saudi Commission for Health Specialties

### **EDUCATION**

2014 (c) Master of Science Dental hygiene  
 Old Dominion University  
 2009 Bachelor of Science in Dental Hygiene  
 The Riyadh Collages of Dentistry and Pharmacy

### **POSITIONS AND HONORS**

2008 Poster Presentation, the 3<sup>rd</sup> Riyadh International Dental & Pharmacy Meeting.  
 2009 Excellent, First Honor in BSc Degree of Dental Hygiene Program at Riyadh  
 Colleges of Dentistry and Pharmacy, Riyadh, Saudi Arabia  
  
 2010 Successfully completed the internship program in Dental Hygiene  
 2011 ELC Honors Sliver Award at Old Dominion University English  
 Language Center  
 2012 King Abdullah Foreign Scholarship Program  
 2014 The Alpha Eta Honor Society for Allied Health Professionals