An empirical study to investigate Oral health problems in Egypt: The Case of Alexandria University

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Abstract—Internet users have increased dramatically in Egypt in all services provided specifically in health area. Patients now tend to surf the Internet for medical information just to avoid long queues and reduce cost while visiting physicians. However, the increasing number of patients complaining from oral dental problems, insufficient number of dental clinics and ignorance towards general and oral dental health reveals the clear need for investigating and evaluating the dental problems in Egypt.

In order to understand the main problems that dental patients face and to get a deeper view of common complains and possible treatment that could be prescribed in simple conditions, semi-structured interviews will be conducted. Based on the interviews results, an E-Dental prototype will be designed to provide tips and information about general and oral dental health, primary dental diagnosis as it readily relates to signs and symptoms, acquaintance with the common treatment procedures and directory of dental clinics and hospitals in Alexandria.

Taking into consideration the patients’ requirements an experiment will be conducted where 15 participants will voluntarily perform a number of tasks using the designed E-Dental prototype. Finally, the participants will be asked to fill a one page structured questionnaire in order to evaluate the patients’ satisfaction. According to the findings, recommendations will be made and plan for future work in the E-Health sector will be suggested.

Keywords—user perception, challenges, e-health, website usability, main criteria, oral dental, orodental

I. INTRODUCTION

The Egyptian government growing concern in the health care sector has proven its impact in an ever-growing number of hospitals, clinics and health units throughout the country, together with a remarkable increase in the involved health care providers. These later are experiencing a great deal of pressure while facing the illiterate patients and managing the increase in birth rate and modest culture. Considerable relief from the burden exerted on the health care providers’ shoulders in terms of services, as well as cost and effort reduction could be realized with a fair degree of patient’s education including orientation and instructions about the elementary knowledge of the dental and medical problems as well as the primary treatment methods [1].

As a part of the human nature people fearing the unknown raises their apprehension towards the lack of confidence and uncertainty. These all drive the patients to develop a negative attitude of avoidance and reluctance to seek dental treatment and eventually lead to complications of neglect. Among the main areas of skepticism are: First, it has been recognized recently, that dental treatment has been accused to play a key role in spreading epidemiological diseases such as Aids and Hepatitis. Second, dental treatment has been overlooked by the patient’s fear; which leads to postponing their dental health and eventual complications ranging from suffering from simple teeth pain to more serious pathologies such as benign or malignant neoplasms [2].

Dental health formally recognizes nine specialty areas of dental practice: dental public health, endodontic, oral and maxillofacial pathology, oral and maxillofacial surgery, orthodontics and dentofacial orthopedics, pediatric dentistry, periodontics, prosthodontics, and oral and maxillofacial radiology. All these specialties independently or collectively are of concern to the orodental patient, who unfortunately, knows too little about them. Accordingly, people awareness and education are of utmost importance in order to help patients understand the clues of their problem, and help them decide when and where to go to seek help. Awareness about dental clinics availability and location is an integral part of patient motivation and orientation [3].

II. RESEARCH PROBLEM

Patients limited knowledge about the diversity of dental specialties drive the patient to improperly select the specific needed specialty leading to wasting money, time and effort as well as increasing the lack of patient’s doctor confidence. A further inconvenience lies in the fact that dentist offers a unique time consuming service since they have to sterilize their tools after each patient, and they perform an instant procedure which hinders their accurate patient’s appointment respect. This problem could be partially solved by creating patient’s
awareness regarding the availability and location of dental services.

Although a number of E-Health websites have been launched on the Internet, only few of them target patients in developing countries, however, their main target is not the management or understanding of a given dental problem in a special context but rather overlooked it in favor of measuring patient’s satisfaction. Accordingly, a calling need grew out to investigate the main dental problems in Egypt and to provide an E-Health system that would give patients general health tips, dental tips, pain diagnosis and treatment procedures.

III. RESEARCH QUESTIONS
A number of comprehensive questions are raised, in order to gather information about the following:

1. What are the main challenges that patient with dental problems face?
2. How can the health tips help and guide the patients?
3. What are the users perception regarding the proposed E-Dental website?

IV. RESEARCH AIM AND OBJECTIVES
The scope of the present work is mainly based on investigating and evaluating the dental problems in Egypt. This does not concisely involve the teeth, but rather extends to include all problems affecting the related orofacial region.

The research objectives shall include:

- Investigate the main dental challenges in the Egyptian context
- Identify the major problems that patients with dental problems face
- Determine how health tips help and guide the patient.
- Review and determine the main factors that affect users’ perception regarding E-Dental websites
- Design a prototype of E-Dental website that takes into consideration the user perception, latest technology trends and usability concerns to provide patients with:
  - Tips and information about general health and oral dental health.
  - Primary dental diagnosis as it readily relates to signs and symptoms.
  - Acquaintance with the common treatment procedures.
  - Directory of dental clinics and hospitals in Alexandria.
- Conduct an experiment to test user satisfaction of the proposed prototype.

V. LITERATURE REVIEW
This section will include a background about the Oral Dental Health, followed by the E-Health perceived benefits. Then, website usability concerns and standards will be presented. Customers’ attitudes towards E-health will also be explored, and projects applied in E-Health in Egypt will be illustrated.

A. Oral Dental Health Background
The healthy oral cavity with caries free teeth and normal gum tissue not only ensures oral health but rather affects the esthetics and appearance and hence self-confidence. Neglect in oral health may lead to developmental problems in the growing children, which affect their later adult life especially with the increase in the ageing population who needs to preserve their teeth longer than in the past. Whenever, patient's awareness and dental services accessibility are lacking delay in the treatment would result. The conditions will be more complicated with increased morbidity, which will jeopardize the prognosis [4].

A number of bacteria live in the mouth as normal inhabitants passing unnoticed by the healthy individuals provided the patient is keeping his mouth clean with good hygienic care of regular daily tooth brushing, flossing and oral rinses. Neglect of oral care or changing in the normal oral environment due to any cause may stimulate these bacteria which becomes pathognomonic and can cause a number of diseases such as teeth caries or soft tissue problems [2].

It is to be stressed that the compromised oral health could extend to have a more severe systemic effect on important organs under the influence of infection, medications, or lowered resistance such as Endocarditis infection of the inner lining of the heart), Cardiovascular disease (heart disease, clogged arteries and stroke), pregnancy and birth (early birth and low birth weight), Diabetes (Diabetic people may have severe infections), which leads to weakening the bone holding the teeth in place. Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) (painful mucosal lesions, are common in people who have HIV/AIDS, Osteoporosis (which causes bones to become weak and brittle — may be associated with periodontal bone loss and tooth loss) and Alzheimer's disease(tooth loss before age 35 may be a risk factor for Alzheimer's disease) [2].

B. E-Health Perceived Benefits
E-Health can be considered as an integrated field, where medical informatics, public health and business are intersected, according to the health information and services provided using the Internet. Taken from a wider perspective, E-Health term is not considered a technical development only, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to help in providing better health care by using Information Communications Technology (ICT) [5]. E-Health is the integration between healthcare system and the ICT to help in achieving better health and healthcare [6]. It can also be defined as the use of ICT with the variety of functions that affect healthcare, from diagnosis to follow-up [7].
E-Health attempts to accomplish many benefits, it best describes use of E-Health. In 2001, Eysenbach has identified 10 E-Health benefits, which include **Efficiency** by preventing duplicative or unnecessary diagnostic or therapeutic interventions; **Enhancing quality** of care it allows patients to compare between different providers; **Evidence based** effectiveness and efficiency must be verified by demanding scientific evaluation; **Empowerment** of consumers and patients by allowing consumers to reach records and treatments over the Internet; **Encouragement** of a new relationship between the patient and health professional; **Education** of physicians through online sources; **Enabling** information exchange; **Extending** the scope of health care beyond its conventional boundaries; **Ethics and Equity** [5].

On the other hand, in 2005, Tan considered availability and accessibility for health care quality, knowledge and searching for new medical alternatives, cost reduction for e-providers and e-patients, wider awareness of services and improving the non-emergency services as the benefits for E-Health [8]. Subsequently, in 2009, Gartner added that increasing patient safety, increasing quality of care, increasing availability and improvements in continuity of care are the main benefits of E-Health [9]. However, the principle domain of agreement adopted by several authors concerning the benefits of E-Health [5], [8] and [9] is the empowerment of consumers and patients.

**Usability Concerns:** Usability can be measured, as the interactivity and integration between user experiences and user interface, like websites or software application. A user-friendly interface should contain users’ tasks and goals efficiently, effectively and achieving user satisfaction with an easy-to-learn designs [10].

Nielsen in 2003 stated 5-quality usability components that included: **Learnability** that refers to how can the users complete their tasks for the first time when visiting the website? **Efficiency** the ability of users perform the tasks every time they visit the website quickly; adding the **Memorability** by which the users can easily remember how to use the website; after no using it for a while; **checking the Errors** as how many errors do users make; how severe are these errors; and how easily can they recover from the errors and finally measuring the **Satisfaction** by checking if the website is user-friendly or not.

**Customers Attitudes Towards E-Health:** There are consumers who are slower to adopt new technology. While about one-third of consumers identify themselves as early adopters of new technology, an equal number feel that technology moves too quickly for them [11].

Internet based services continue to grow in importance in ‘business-to-consumer’ and ‘business-to-business’ environments. For companies the importance of Internet has increased, Internet channels can be seen in its involvement to distributing information, enhancing consumer value, improving consumer satisfaction, loyalty and retention as well as consumer perception which in turn leads to better profitability and expanded market share [12].

From the consumers’ perspective, Internet-based services can considerably decrease the costs for searching, expand the selection of retailers, deliver lower priced products/services, and increase convenience, allowing greater control over products/service offered. It is vigorous for companies to understand consumer adoption behavior, as their investment decisions in technology infrastructure should be driven by consumer adoption and long-term profitability [13].

An online health guide could be considered as a good complement to traditional health care [14] [15]. E-Health as an e-commerce application [16] is normally associated with a set of perceived benefits; where patients think that transactions are secure, prices are low, experience is positive, and quality is high [17]. People normally perceive using the Internet as entertaining, informative and for irritating purposes [18].

Patients’ attitudes towards health services usually are affected by a number of factors, some of which as privacy and security concerns, potential health benefits, desire for more information and willingness to provide consent [19]. These previously mentioned factors, though important and have been identified in a number of studies; their identification does not solve the problem. Deeper investigations should be conducted, and partial solutions should be proposed.

C. **E-Health in Egypt**

In 2003, Egypt renewed its National Communications and Information Technology Plan through the Egyptian Information Society Initiative. Egypt has developed Information Society, which foundations will be completed by 2020. The Egyptian strategy and vision were described in a document called “Building Digital Bridges Egypt's Vision of the Information Society”. This document includes the Egyptian government establishing Information Society with seven main axes; one of them is E-Health, which allows using the information technology to enhance medical services especially in remote areas [20].

E-Health initiative aims at improving medical services, integrating services and diagnosis in provinces and remote areas, as well as creating a diagnostic service system and connecting medical centers in Egypt to medical centers around the world. It also aims at providing advanced medical, services in emergencies, providing the medical community in rural areas with trainings and provides patients with diagnostic services. Not to mention, the cost reduction of healthcare by providing better patient management, acquiring low-cost international consultations for special cases and acquiring early diagnostic of endemic diseases.

The Egyptian government has made a number of E-Health projects attempts; where it has initiated a number of projects some of which are Emergency Medical Service Call Center Ambulance Project; National Network for Citizen Health; Information System Units in Governmental Hospitals; Pilot Project for Hospital Automation; National Cancer Registry Program; IT Health Master Plan; National PACS Project; Integrated Health Record System; National Healthcare Capacity Building Project; Women’s Health Outreach Program and Regional Center for Women’s Health in Alexandria[1].

However, throughout the literature reviewed it is obvious that the dental sector has been dramatically overlooked in the
E-Health programs and projects. This enhanced and challenged the initiation of this present work in order to include the E-dental services in the E-Health sector.

VI. RESEARCH METHODOLOGY

This section, will explore the different types of research strategies, approaches, reasoning, hypotheses, methods and sampling techniques.

Research Strategy: Research strategy includes many types such as Descriptive Strategy, Case study, Survey, Experimental, Historical, Action research, Grounded theory, Ethnographic research. This study aims at adopting an experimental research strategy.

Experimental research is the challenge that the researcher faces to control the influences that can affect the experimental results. Thus, the researcher may predict the result, it is also considered as the blueprint that allows the researcher to examine the hypothesis validation between the dependent and independent variables [21].

There are many types of experimental research like true experimental design that is defined as the attempt to control all the confusing variables, or to study the variables influence on the experiment, by trying to conclude if the output of the experiment helped in causing the change. The true experiment is considered as the only research method that can effectively measure the cause and effect relationship [22].

In this study an experiment will be conducted where 15 participants will voluntary perform a number of tasks using the designed E-Dental prototype after the interview. Then the participants will be asked to fill a one page structured questionnaire in order to evaluate the patients’ satisfaction.

Research Approaches: There are three main approaches of research, which are quantitative, qualitative and mixed methods approach.

Mixed method approach is defined as the collection of quantitative and qualitative data sequentially using practical knowledge. It depends on collecting different types of data that helps in understanding the research problem [23]. This also reduces bias associated with each research method.

Using the mixed method approach will allow the researcher to get the benefits of both the quantitative and qualitative approaches. Accordingly, the current study uses both the quantitative type which is normally used for examining theories, identifying variables, relating variables in questions or hypotheses, which can be achieved using statistical standards of validity and reliability [23], and also use the qualitative type that helps more in investigating the study because it is more general in which it is used to create a full understanding in a specific social situation [24].

Previous investigation in E-Health measured patients’ satisfaction towards the E-Health applications by interviews, questionnaires and experiments. In this study a mixture method approach will be applied. The variation of methods applied in this study would allow triangulation of data [25], which will be used to deeper understanding of complex problems.

The study will be first undertaken on performing semi-structured interviews with physicians, then an E-Dental prototype will be designed accordingly, it will carry information about general and oral health with relevant tips, primary diagnosis and symptoms, and finally, 15 voluntary participants will use a designed E-Dental prototype, which constitutes the basic study experiment.

Research Reasoning: Research reasoning is divided into two main methods, which are Deductive approach and Inductive approach. The scope of the present work is mainly based on the Deductive approach.

Deductive reasoning is defined as the “top-down” approach that is also called generalization. When conducting a theory or discussing a topic in general. It is then limited to more particular hypotheses that can be tested. Then it is narrowed down so observations can be collected and helps in the hypotheses examination [26].

In this study Deductive reasoning will be used, as it will start with the E-Health in general and then conducting an experiment on the dental diagnosis. By applying the experiment after conducting interview with the physicians to understand their main concerns and patients’ complains. This will lead to more understanding of the patients’ needs.

Figure 1: Factors-affecting user’s Satisfaction

Hypotheses: In order to answer the research questions a number of hypotheses are formulated according to Figure 1. as follows:

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\begin{align*}
H1: \text{There is no significant difference between user awareness and user satisfaction.} \\
H2: \text{There is no significant difference between Providing an accurate diagnosis and treatment orientation with respect to user satisfaction.}
\end{align*}
\]
When delivering accurate information, it helps in the increase of user satisfaction. As the Internet usage increased it became important to have accurate information on the websites. Information accuracy is also considered to be a dimension of information quality, so as the quality increases the user satisfaction increases [28]. This highlights the importance of providing an accurate diagnosis in order to achieve user satisfaction, but as we cannot claim that this necessarily is the case in Egypt, this null hypothesis has been devised.

**H3: There is no significant difference between Provision of clinics directory and user satisfaction.**

Adequate and clear information about information on the website in order to increase customer satisfaction and loyalty, information on the website should be available [29]. That’s why users tend to use the Internet for the availability of information, as it is available all the day at any time. Also information availability is considered to be a dimension in the e-service quality [30]. Although there are number of clinic directories are available in Egypt, they are not widely used. This could be because they are available only as hard copies, which simply means that they are not very accessible, nor are highly up-to-date. Accordingly, testing whether providing a directory of clinics through the e-dental health system would affect customers’ satisfaction becomes necessary.

**H4: There is no significant difference between E-Health website usability and user satisfaction.**

Based on previous studies [31] and many other authors [32], ease of use seems to be a major factor that affects user satisfaction. Website usability, as the interface efficacy and efficiency, in turn affects user satisfaction; especially if the main factors are available [32]. Accordingly, testing whether there is an actual significant difference between website usability and user satisfaction seems well justified.

**Research Methods:** The research methods at hand will use three different methods to collect data:

Interviews are considered a qualitative approach and it is considered as the structure site of knowledge. It is the variation in views between two persons discussing a specific topic, which will enable interviewers to establish an understanding with the respondent, observation while listening to the respondents’ answers, allows more complex questions to be, and to gather opinions on a specific learning or teaching technique [33]. Interviews have different structures, structured interviews, semi-structured interviews and unstructured interviews. Semi-structured interview is the interview methodology of choice in this study.

Semi-structured interview provides wider scope for discussion and learning about the problem, opinions and views of the respondents. While there are some fairly specific questions (closed questions) in the interview schedule, each of which may be probed or prompted, there are lot more questions which are completely open-ended. The latter questions mainly serve to explore different facets of the issue. The information thus collected is both qualitative and quantitative [34].

Prototype is broadly described as an important mean in exploring and expressing designs for interactive computer artifacts. In order to investigate options prototypes are built to represent variety of states for an evolving design [35].

Experiment is the process of examining the truth of a statement, offering the best technique presented to researchers to be able to examine connection due to the high degree of control in testing hypotheses and new relationships [36].

In this study the semi-structured interviews will be based on open and closed questions, which will drive the researcher to understand and know the patients’ main problems and their simple management. Accordingly, An E-Dental prototype will be designed including relevant general and dental tips, primary diagnostics and treatment procedures as well as a comprehensive clinic and hospital directories.

Taking into consideration the patients’ requirements, an experiment will be conducted where 15 participants will voluntary perform a number of tasks using the designed E-Dental prototype. After that participants will be asked to fill a one page structured questionnaire in order to evaluate the patients’ satisfaction.

**Sampling Technique:** is defined as the process of selecting items from a population for a specific research, which can be costly or time consuming for a comprehensive analysis to be done on all items [37]. Sampling is divided into many categories such as probability and non-probability. In probability all members of the population have an unknown number of probabilities to be selected. The probability method includes random sampling, systematic sampling, and stratified sampling. On the other hand, non-probability sampling does not permit the research results to be generalized from the sample to the population [38]. Non-probability sample limits the research findings to the sampled persons [39]. The probability sampling has an advantage over the non-probability sampling, where errors can be detected and calculated.

For the evaluation and measuring the patients’ satisfaction towards the E-Dental website, a stratified sampling method will be used when choosing the physicians this is because the population is divided into subpopulations upon certain criteria [40]. When applying the experiment, participant patients using random sampling method; especially as it ensures the each individual has an equal chance of being selected as much as any other individual and allows generalization of results [41].

In this study the research methods used are the interviews and experiment. Stratified random sampling will be applied on both research methods, where 9 dental faculty members covering the nine different specialties in the dental field will be interviewed in order to gather information about the main patients’ complaints. Our sample was mainly based on the fact that these faculty members are widely exposed to a variety of patients with variable complaints and attitudes. Subsequently, an experiment will be conducted in an attempt to evaluate patients’ satisfaction. The number of volunteer patients participants will be 15, selected according to certain criteria: be Internet users, computer literate and highly motivated to use the E-Dental website, with high awareness of their dental
problem, routine dental care seekers, and intellectual can reply rationally to a given questionnaire.

VII. CONCLUSION

Limited literature about the diversity of dental specialties challenged this study by raising a research problem concerned about patients’ limited knowledge about the diversity of dental specialties with its relevant problems. Accordingly, researchers have tried to fill in this gap with a well structured research that is designed based on: First; experimental research strategy that would help prove the prediction results and validation the relationship between dependent and independent variables, Second; using a mixed method approach allows researchers to collect data freely based on the problem situation where data is evaluated sequentially and equally, Third; the use of a deductive reasoning helps focus from the generalized e-health approach down to dental diagnosis, Fourth; designing and conducting semi-structured interviews enabled getting a deeper insight into the problem at hand. Finally, this has helped design an E-Dental prototype including relevant general and dental tips, where experiments would be conducted for nine dental professionals on 15 volunteer patient participants. This could offer a great value towards a successful future work plan for the E-Health sector with a positive impact on both the social and educational levels. It would facilitate the patient acquaintance with the basic services offered by the dental profession, which will motivate patients towards a comprehensive professional treatment service.

REFERENCES


