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Electronic-health in Saudi Arabia: A review

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ABSTRACT

Different nations across the world are attempting to embrace e-health as a platform for transforming healthcare delivery. This review focuses on the state of e-health in KSA, including studies on trends and current technologies employed in e-health. It has been determined in this paper that even though e-health is being implemented in Saudi Arabia, the rate of implementation is quite slow, and it seems to lag behind the rate that was desired and envisioned. Additionally, some challenges hinder the adoption and effective implementation of e-health, including lack of awareness, lack of talented workforce, and ineffective planning. It has been determined that if these challenges are overcome, then e-health can be adapted efficiently.

1. Introduction

In contemporary times, technology is redefining all aspects of life, and this has been observed across different sectors; the healthcare sector has not been an exception. Electronic health (e-health) is the adoption of information and communication technologies for health delivery. Around the world, countries are embracing e-health as a way of transforming healthcare delivery (Alqahtani et al., 2016). Remarkably, in Saudi Arabia, e-health technology has been implemented in the different healthcare facilities to improve the quality and accessibility to healthcare services. Healthcare in the country is operated using the national healthcare system whereby the government offers healthcare services via different governmental agencies. Internationally, Saudi Arabia is ranked 26th to provide quality healthcare services to its people (Al-Hanawi et al., 2019).

The country's healthcare sector has the third-largest budget share, which is estimated to be 15.6% in 2019 of the total budget allocations (Al Kuwaiti et al., 2018). The Ministry of Health has been entrusted with providing preventive, curative, and rehabilitative health care for people. The government has been continually integrating new developments with the intention to improve the healthcare services quality for its citizens.

1.1. E-health status in Saudi Arabia

The government of Saudi Arabia has placed e-health as an enabler and transformation agent of health in the country. One of the initiatives that the Saudi government has put in place is that of financing the e-health technologies for the healthcare facilities that cannot afford them. The government also provides education programs to train and educate professionals in the healthcare sector concerning e-health and its potential impacts in the healthcare industry. Thus, the Saudi government is working towards adopting and utilizing e-health in diverse healthcare institutions in different parts of the country.

Although the government is making efforts to implement e-health, the healthcare institutions' degree of uptake is not as fast as it had been envisioned. In some cases, healthcare professionals lack the skills and knowledge needed to advance the technology, which is derailing the implementations (Zaman et al., 2018). Besides, some healthcare facilities lack the resources to implement e-health technologies. These challenges need to be overcome for the successful implementation of e-health in the country.

The Kingdom of Saudi Arabia has developed a vision for the year 2030, which is to diversify the economy, improve the public sector, and reduce oil dependence. When the country's vision is put into context with the e-health technology in Saudi Arabia, there is an alignment. This is precisely because the Saudi Arabian Ministry of Health (MOH) has a vision: To advance standards, quality, accessibility, and equability of healthcare in the country (Khalifa, 2013). This vision is connected to the Kingdom's

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vision for 2030 because, in the public health sector, the use of e-health can advance healthcare in Saudi Arabia.

E-health empowers the patients because it enables them to share information with healthcare professionals, and in the process, the patients take control of the health issues affecting them. E-health is increasing the accessibility and delivery of healthcare services to patients, through technologies such as telemedicine. Additionally, it enables the public health system of Saudi Arabia to be more efficient. In this context, this review paper tries to present the e-health state in Saudi Arabia.

2. Methods

2.1. Research design

The strategy used was founded on the analytical method of gathering data and equally reviewing correct papers to be employed in responding to the issue. Therefore, the qualitative design provides a thorough overview of the necessary facts in a brief period compared to other methods making it useful in this study. Finally, the findings were then examined using thematic analysis.

2.2. Methods of data collection

The present work is a descriptive study, which is mainly based on secondary data. Words such as 'Electronic Health in Saudi Arabia' and 'Health Informatics in Saudi Arabia' were part of the search strategy. Suggestively, many of the papers used within this research were acquired from renowned academic databases like ProQuest, EBSCO, and Google Scholar. However, the databases remain freely available to numerous individuals, which makes them appropriate. Nevertheless, through subscription, ProQuest and EBSCO were used to retrieve books and articles not easily found within Google Scholar about eHealth in Saudi Arabia.

2.3. Inclusion and exclusion criteria

The research employed the following inclusion criteria: The date of publication was from 2011 (inclusive) up to date. This range is set because the research is mostly dealing with the incident that has occurred in contemporary times, and updated information is required. Therefore, most of the analyses from that time provide broad knowledge that could never be overlooked. Nonetheless, only resources available in English were employed during data gathering and study of the topic. On the other hand, the research included peer-reviewed papers and books from credible sources, and their credibility was identified through their online reputation and publisher.

On the other hand, the criteria of exclusion involved the following: Studies that were published before 2011, even if they were appropriate, were never used. Accordingly, any research, which was not in English, remained omitted from the study. However, apart from the books, works that were not available in peer-reviewed journals were not considered. Subsequently, any research with unclear and questionable publishers or authors was omitted from the study. Eventually, the main aim was to obtain quality information that is never subjective on e-health in the context of Saudi Arabia.

2.4. Objectives

The following are the objectives of the study:

1. To study the significance of E-Health/health Informatics in the settings of the Saudi Healthcare system.
2. To review various works that are performed on e-health/Health informatics in Saudi.
3. To identify the critical areas of e-Health/health Informatics applications in the Kingdom.

3. Results

After a review of a total of 33 articles, it is quite important to note that all of the articles met the criteria of the inclusion of the study. The results section is categorized into the following three sections.

3.1. Significance of e-health/health informatics in the context of Saudi Arabia

As mentioned earlier, Saudi Arabia has been at the forefront of adopting the latest technologies that emerge in healthcare. To this end, Saudi Arabia has recognized the benefits of e-health and health informatics in delivering healthcare services. It is doing everything to ensure that there is sufficient implementation of the technology in diverse areas. In Saudi Arabia, e-Health/health informatics approaches such as computerized provider order entry (CPOE), clinical decision support systems (CDSS), electronic medical health records (EMR), and electronic health records (EHR) are improving the interactions between healthcare professionals and patients together with the accessibility to patient health information and records (Altuwaijri, 2010). This is significant because they reduce the costs associated with the healthcare deliveries; eliminate redundancies in the healthcare services provided, and advance the quality of the healthcare services provided to the patients.

In the same vein, mobile health and telemedicine approaches are also being used in Saudi Arabia to promote healthcare services accessibility. Since Saudi Arabia began implementing the technologies, there has been a growth in healthcare services accessibility. In particular, mobile and telemedicine have been outstanding regarding how vulnerable populations such as the elderly are provided with healthcare services in the country.

Saudi Arabia is also adopting e-Health/health informatics in its public health system, thus improving how public health threat surveillance and monitoring occur in the country. Outstandingly, with the incorporation of e-Health/health informatics, the collaboration among the various health sectors and healthcare professionals is improved. The data generated from these sectors help in the creation of evidence-based practices that are already reflected in the policies and programs that the country has embraced (Khalifa, 2013). This is to say that the e-health/health informatics strategies, as applied to the context of Saudi Arabia, are contributing positively to the development of effective healthcare policies and programs that are data-driven in nature.

According to the findings of Buntin et al. (2011) health information technology has improved the performances of different healthcare subsectors in the country. Since e-health and health informatics are data-driven, their usage in the healthcare system can generate big data. This data can be used to produce important health information that can be a valid source for preparing policies and healthcare programs for the country. Therefore, e-health and health informatics have been significant to the country in different ways. They make a factor that is driving the healthcare developments that are witnessed in the country. The government is realizing its health objectives and advancing the quality of healthcare services with e-health and health informatics.

3.2. Review of literature on e-health in Saudi Arabia

Based on the World Health Organization's (WHO) recommendations, many countries have endeavored to implement e-health in their healthcare systems to improve healthcare deliveries (Al-Rayes et al., 2019). The impacts of e-health have been found with mixed results in different countries where e-health has been implemented. Even in Saudi Arabia, the same trend of mixed results is observed. Various studies have been conducted in Saudi Arabia to assess the status of e-health in the country.

3.2.1. Important topics covered by the previous works about Saudi Arabia

There is significant concern about the proper use of electronic health facilities in Saudi Arabia. In a variety of hospitals and organizations, the introduction of e-health and electronic information systems has already begun. However, in MOH organizations, the uptake of e-health services is progressing slowly (Almalki et al., 2011). Hospital administrators and researchers are gradually using electronic databases, in order to analyze the use, quality, and effects of healthcare provision. Several studies have investigated the accuracy of electronic databases created for general administrative purposes (Youssef and Alharthi, 2013).

For instance, Youssef and Alharthi (2013) measured the accuracy of an electronic database in a major teaching hospital in the Eastern Province of Saudi Arabia, recording 17 comorbidities constituting the Charlson Index as reported in paper charts by care providers. The researchers randomly selected the data for 1,019 patients admitted to the hospital and evaluated the data for consistency with the associated paper charts. The study concluded that electronic records have a bright future in healthcare management (Youssef and Alharthi, 2013).

Almaiman et al. (2014a) conducted research in the Kingdom of Saudi Arabia on health information technology (HITs) used in primary healthcare centers (PHCC). Using a set of keywords terms, data collection included main stakeholder interviews and an academic search. Data has shown that the use of health information technology in Saudi PHCCs is rising. Given the various steps taken to update and operate the electronic health information system of the Kingdom, there is also a growing need to discuss practical alternatives to the delivery of e-health services. In specific, addressing hurdles that impede the use of EHIS in PHCCs (Almaiman et al., 2014a).

Two studies assessed the use of electronic health (e-health) from the perspective of different professionals, in addition to identifying the obstacles to the introduction of e-health systems in Saudi Arabia. For instance, Alsulame et al. (2015) discussed the role of eHealth in Saudi Arabia from the viewpoint of health informatics experts. Using a case study approach and thematic analysis for the data of the participants, data collection included interviews with 9 senior health information providers in Saudi Arabia. Findings suggested that there were gaps between Saudi healthcare organizations in terms of eHealth adoption. The two key suggestions made by the participants were to set up a separate national eHealth body and to create a cohesive strategy for the execution of the Saudi eHealth initiatives (Alsulame et al., 2015).

In the same vein, Zaman et al. (2018) conducted a randomized trial in three major hospitals in the Makkah area. The total number of samples obtained for this study was 51. They belonged to the administrative and medical staff of the hospitals and form the staff responsible for the day-to-day activities of supplying health services to patients. Findings stated that all three hospitals used e-health in various capacities. They also stated the key obstacles to the usage of these systems including the costs and skills of such advanced information management systems, and the shortage of technological and professional expertise of hospital personnel (Zaman et al., 2018).

Several studies investigated the proper implementation of e-health and its relation to affecting Saudi citizens to self-manage diabetes, and the possible formulation of a successful framework to develop a knowledge management system to assist stakeholders to provide the best support to

diabetic citizens in KSA, and the potential barriers they may encounter.

Almuayqil et al. (2016) researched and classified the obstacles to e-health in KSA from the viewpoint of three stakeholders. Data were collected using a questionnaire, the analysis the questionnaire showed that citizens and healthcare professionals perceived the lack of connectivity of Hospital Information Systems (HISs) in KSA to be the main reason for the failure of e-health, whereas IT specialists believed that the lack of medication safety is the biggest obstacle factor leading to such a failure (Almuayqil et al., 2016).

Alsulame et al. (2016) reviewed the state of e-health in KSA, findings showed evidence that e-health in Saudi Arabia is increasing as many corporate and individual programs have adopted e-health applications. However, available research on e-health in Saudi Arabia remains limited. Data is limited to a few organizations and does not reflect the scope and depth of the existing and future application of e-health (Alsulame et al., 2016). In the same context, Alshahrani et al. (2019) concluded that the e-health sector in Saudi Arabia has shown signs of steady development in both publications and recognition of significance. However, the lack of eHealth studies from the perspective of health managers and the limitation of studies to a few geographical areas were identified as knowledge gaps (Alshahrani et al., 2019). Correspondingly, Noor (2019) highlighted this conclusion in his study, gathered data about 508 hospitals, including bed capacities, accreditation status with the Central Board for Accreditation of Healthcare Institutions (CBAHI), and usage of 45 E-Health facilities listed through territories, social groups, and political affiliations. Out of the 508 hospitals, Riyadh and Makkah demonstrated a higher number of hospitals than the other cities and regions. This difference was attributed to the fact that these cities are major business districts in the Kingdom with the highest population concentrations. Clearly stating that while the Kingdom is growing in its implementation and utilization of E-Health services, the rate of adoption in different cities in the kingdom was still significant. Therefore, recommendations for future e-health implementation across Saudi Arabia could be scaled to include remote and less populated areas of the Kingdom (Noor, 2019).

Six articles focused on Electronic Health Records (EHRs) in Saudi Arabia. These studies have demonstrated that while the adoption rate for EHR was increasing, the introduction of the EHR in different regions of the Kingdom encountered several difficulties that hindered their adoption.

Altuwaijri (2011) conducted a qualitative study to describe the experience of the Ministry of National Health Guards (MNGHA) in implementing the EHR. The MNGHA first developed its vision for the adoption of the EHR in three regions of Saudi Arabia. The management of the MNGHA then established project committees and a project team to incorporate the framework. Planning and execution processes have taken about ten years and won the 2010 Middle East Excellence Award (Altuwaijri, 2011).

Bah et al. (2011) researched the usage of electronic health records in government-related hospitals in Saudi Arabia. Data were collected through an onlinequestionnaire, out of 19 government hospitals, only three (15.8%) used EHRs. Some IT managers faced challenges in implementing EHR in their hospitals. Some physicians and nurses were uncooperative with regard to the use of EHRs (Bah et al., 2011). Similarly, Aldosari (2014) examined EHR system adoption in Riyadh, Saudi Arabia. Respondents from 22 hospitals were surveyed regarding the implementation, maintenance, and improvement phases of EHR system adoption. Thirty-seven items were evaluated on a three-point scale of readiness/completion. Measured determinants included hospital size, level of care, ownership, and EHR system development team composition. Eleven of the hospitals had implemented fully functioning EHR systems, eight had systems in progress, and three had not adopted a system. In all the 19 adopting hospitals, sixteen various systems were being used. Wide interhospital variations in adoption bear implications for policy-making and funding intervention (Aldosari, 2014).

Several studies identified the barriers impeding the implementation of EHR. For instance, Alqahtani et al. (2017) recognized the following twelve major challenges to EHR adoption: Lack of computer expertise by healthcare professionals (18%), lack of perception of usability by healthcare professionals (15%), lack of perceived ease of use by healthcare professionals (15%), software system technical shortcomings (15%), lack of user support (9%), privacy concerns (9%), user reluctance to changes (6%), lack of accuracy in patients' information (3%), lack of EHR specifications (3%), uncertainty regarding EHR providers (3%), hospital size (3%), and hospital's level of care (3%) (Alqahtani et al., 2017).

Two studies explored the adoption of EHR systems among both health care providers and consumers in Saudi Arabia and the factors that influence the adoption and acceptance of such systems. In regard to health care providers, Al-Rayes et al. (2019) conducted a cross-sectional quantitative study based on a paper survey administered to a group of 213 physicians. A total of 133 (62%) of them used EHR and 80 (38%) did not. The results revealed that users and non-users of the EHR system vary substantially on many factors such as perceived utility, perceived ease of use, social impact, and resistance to change. In addition, age, work experience, and medical specialties are strongly linked to the use of the EHR system by physicians (Al-Rayes et al., 2019). Concerning health care consumers, Alsahafi et al. (2020) conducted a study to assess e-health literacy. Data were gathered via a questionnaire survey, resulting in 794 credible responses. Findings revealed a low level of

understanding among Saudi people about the national adoption of an integrated ePHR system, signaling the need to encourage a greater and broader awareness of the system and to demonstrate its usefulness (Alsahafi et al., 2020).

Six articles and studies discussed Electronic Medical Records (EMR) adoption, implementation, and acceptance by both the medical staff and patients in Saudi Arabia. These studies demonstrated that although EMR was implemented in Saudi Arabian hospitals, its uptake and adoption were slow and low; and faced many barriers.

Hasanain et al. (2014) reviewed the progress of EMR implementation and identified the facilitators and barriers to implementation. The exact level of EMR implementation nationally in Saudi Arabia could not be determined from the literature. Studies of MOH hospitals appeared to be performed in specific cities or areas, resulting in a slow and low rate of implementation in these hospitals. However, the deployment of EMRs in NGHAs, military and private hospitals appeared to be more advanced. Considerations such as tradition, autonomy in decision making, and the smaller size of the organizations compared with MOH clinics, were supposed potential reasons for this difference. Plans for a national integrated EMR system are one of the main priorities of the Saudi MOH (Hasanain et al., 2014).

Four articles discussed the perception and acceptance level of electronic medical records (EMR) by the medical staff. Hasanain et al. (2015) conducted a quantitative study to examine health personnel knowledge and acceptance of and preference for EMR systems in seven Saudi public hospitals in Jeddah, Makkah, and Taif cities. English literacy and education levels were closely associated with computer literacy and EMR literacy. Participants whose first language was Arabic were less likely to prefer using an EMR system. Therefore, prior to introducing an EMR scheme, it would be beneficial for hospitals to assess English language proficiency and computer literacy standards (Hasanain et al., 2015). In the same context, Aldosari et al. (2018) conducted a study that targeted all nurses working in Imam Abdulrahman Al Faisal Hospital at the National Guards Health Affairs (NGHA), Dammam, Saudi Arabia using EMR in their clinical practice. A total of 153 questionnaires were completed and returned with a 66.5% response rate. The nurses were willing to use EMR to improve the quality of patient care (Aldosari et al., 2018).

Furthermore, Shaker et al. (2015) carried out a study to determine the physicians' perception of EMRS in the context of its productivity in order to improve its functionality and advantages. A cross-sectional survey including physicians of the Makkah region working in six separate hospitals was selected, the overall perception of EMRS was found positive by 52.8% concluding that the majority appreciated the EMRS, but had certain questions regarding its usage easiness and workflow disruption (Shaker et al., 2015).

In regard to the barriers perceived by healthcare professionals to the implementation of EMRs, Khalifa (2013) used a questionnaire to collect data from a random sample of healthcare professionals of two major Saudi hospitals, one private and the other is governmental. A total of 158 respondents participated in the survey equally from both hospitals. The studyestablished six main categories of obstacles, which aligned with those documented in recently published literature. 1) Human Barriers, related to the values, habits, and attitudes, 2) Professional Barriers, related to the nature of healthcare practice, 3) Technical Barriers, related to computers and IT, 4) Institutional Barriers, related to the hospital management, 5) Monetary Barriers, related to funding and 6) Legal and Regulatory Barriers, related to laws, policies, and legislation (Khalifa, 2013).

One study explored patient satisfaction with the EMR. Wali et al. (2020) conducted a cross-sectional survey with a total of 377 patients who attended five Primary Health Care centers (PHCs) in the Western Region during 2018. Upon their completion of a self-developed structured questionnaire, findings stated that patient satisfaction during the clinical consultation and overall satisfaction with various PHC services improved with the implementation of EMR (Wali et al., 2020).

Computerized Physician Order Entry Systems (CPOE) and Clinical Decision Support Systems (CDSS) are used in conjunction in some healthcare organizations in Saudi Arabia. Altuwaijri et al. (2011) used qualitative survey approaches by holding meetings with ICU clinicians to determine their understanding of the significance of 32 documented critical success factors for the recently introduced CPOE pilot project in one of the Riyadh Ministry of National Guard Hospitals. They noticed that CPOE's advantages could outweigh its deficiencies. Accordingly, to reap the benefits of CPOE, MNGHA management extended the pilot project to all MNGHA clinics and hospitals (Altuwaijri et al., 2011).

In addition, Mominah and Househ (2013) examined recorded medication and prescription errors in one of the tertiary care hospitals in Riyadh in 2012; detected and analyzed about 2,000 drug-prescribing errors over a 12-month span, and subsequently explored contributing factors. They argued that CPOE could minimize drug errors. The recommendations of their study were therefore to improve policy and procedure and raise awareness among providers of these errors (Mominah and Househ, 2013). In the same context, AlAzmi et al. (2019) carried out an observational study with a total of 657 paediatric patients included, children's (0-14 years) medical records on CPOE system, in paediatric words and/or attending emergency department were assessed to examine the effect of a computerized physician order entry (CPOE) system on the drug-related problems' (DRPs) occurrence and characteristics, and to compare DRPs occurrence before and after CPOE implementation. A total of 235

(35.8%) experienced 328 DRPs, majority were preventable (99.7%, 327). The difference in DRP incidence pre- and post-CPOE implementation was significant. The CPOE system has significantly reduced DRPs incidence in children in the study hospital (AlAzmi et al., 2019).

One study focused on CPOE in conjunction with CDSS. Almutairi et al. (2012) performed a preliminary study of the applied Clinical Decision Support (CDSS) features in adopted Computerized Physician Order Entry (CPOE) systems. The study was carried out in three hospitals in Riyadh, the capital city of Saudi Arabia. The results showed that the adoption of CPOE with a Clinical Decision Support System (CDSS) is not yet mature. CPOE systems allow physicians to electronically insert their prescription orders, but many of the applied CPOE systems do not include warnings to alert physicians of potentially hazardous interactions triggered by incorrect medications (Almutairi et al., 2012).

In terms of CDSS, two studies were conducted to assess its effectiveness. Alqahtani et al. (2016) summarized the challenges of the Clinical Decision Support System (CDSS) and its effectiveness to improve clinical practice. The study concluded that the healthcare sector is in dire need to increase the quality of patients' care and improve clinical practices by adopting CDSS (Alqahtani et al., 2016). Moreover, Aljarboa et al. (2019) carried out a qualitative study to identify perceptions of CDSS use and implementation using semi-structured interview approaches to gather data from nine medical professionals working in the Saudi healthcare sector. Five determinants affecting the decision to use and actual use of CDSS were indicated in the findings: (1) performance expectations; (2) effort expectations; (3) facilitating conditions; (4) accuracy of diagnosis; and (5) patient confidence. Patient trust and diagnostic accuracy were two new determinants of CDSS acceptability not previously mentioned in past models (Aljarboa et al., 2019).

Six articles focused on telemedicine, which proposed that although the many benefits of telemedicine were recognized, many barriers were lagging in its effective implementation. To begin with, El-Mahalli et al. (2012) have discussed the advantages and challenges of telemedicine in the eastern province of Saudi Arabia. The research was performed at one hospital not adopting telemedicine with 252 participants and in three hospitals adopting telemedicine with 144 participants. It was a cross-sectional descriptive study, targeting all categories of health professionals. Data collection techniques included two questionnaires based on paper. The advantages listed were the ability to store and forward and the ease of follow-up after face-to-face contact. However, most of the participants accepted that lack of information about telemedicine and lack of resources were obstacles (El-Mahalli et al., 2012).

In the context of using telemedicine in improving healthcare services for diabetic patients, and assisting healthcare providers in disease management, Alkadi and Roudsari (2013) assessed the telecare model for diabetes management at the Saudi National Guard Hospital in Riyadh. They used a quasi-experimental design, employing a before-after E-Health status in Saudi Arabia, on a sample of 52 patients. They observed that 83 of participating patients had improved Hemoglobin A1c (HbA1c) levels with TeMaD, lowering the average from 9.2% to 8.4% (Alkadi and Roudsari, 2013).

Three studies evaluated the preferences and experiences of telemedicine among people from various regions of Saudi Arabia. First, Albarrak et al. (2019) conducted a cross-sectional in four hospitals; King Abdul-Aziz Medical City, KingFaisal Specialist Hospital and Research Center, King Saud Medical City, and King Saud University Medical City in Riyadh, Saudi Arabia. A total of 391 physicians participated. Findings indicated that despite the fact that the majority of clinicians have two or more smart devices and connect with patients by email or social media, however, the majority of medical practitioners currently have little understanding of telemedicine technologies. In addition, most participants have demonstrated the willingness to incorporate telemedicine in clinical practice. The main obstacles identified for the implementation of telemedicine were concerns relating to anonymity, lack of preparation, costs, and information and communication technology issues (Albarrak et al., 2019). Moreover, Abolfotouh et al. (2019) conducted a cross-sectional survey on 351 healthcare workers at King Abdulaziz Medical City (KAMC) in Riyadh, in the period from October to November 2016, to determine the recognition towards usage and practicality of smartphones in clinical settings. The usage rate of smartphones was 42.3%, and only 6.1% of all healthcare providers reported always using applications in their practice. This rate was considered low and was attributed to their less than satisfactory level of perception towards its use (Abolfotouh et al., 2019).

Additionally, Alshammari (2019) performed a cross-sectional study, with a total of 781 participants from urban and rural areas of Saudi Arabia using an online survey questionnaire spread via different social media platforms. While a significant proportion of participants (70%) subjectively recognized the possible advantages of telemedicine and demonstrated concern in using this tool for healthcare purposes. However, (52%) of them have never used an e-health application by the Ministry of Health. General public confidence in telemedicine in Saudi Arabia is required, and adapting the provision of telemedicine services to local Saudi cultural and social values can help create this confidence (Alshammari, 2019).

Most recently, Amin et al. (2020) reviewed the capacity and practice of telemedicine systems with an emphasis on patient-centered healthcare in Saudi Arabia that can help decision-makers address health issues by making use of telemedicine benefits. According to various surveys, 84% of practitioners

are willing to adopt telehealth, and the lack of expertise (90%), preparation (71%), and time constraints (62%) were the main obstacles identified (Amin et al., 2020).

In terms of teledermatology, Kaliyadan et al. (2013) evaluated the use of a 4G smartphone for mobile teledermatology. A dermatologist took pictures of skin images with a mobile phone and made a face-to-face diagnosis. The images were transmitted to a second dermatologist who viewed them on a similar mobile phone and made an independent diagnosis for comparison. Only after receiving written consent from the patients were photographs taken and distributed. The research involved a total of 166 patients. Each patient was administered a questionnaire to measure patient satisfaction. Most of the respondents were exceptionally pleased with teledermatology. However, 23 patients (14%) opposed skin lesion photography. Refusal to be photographed, a topic not limited to teledermatology, needs to be taken into account in the creation of teledermatology protocols for broader application in areas such as the Middle East (Kaliyadan et al., 2013).

In terms of dental information technology, Al-Nasser et al. (2014) conducted a study to assess the latest dental informatics implementations in Saudi Arabia and to recognize the obstacles facing dental informatics expansion in the Saudi context. Findings stated that digital radiography/analysis and administration of dental practice are the most common technologies used. Web-based learning platforms, computer-based evaluation, and digital technologies for teaching clinical skills are used in dental education. Lack of IT infrastructure/support, social acceptability, and financial costs are the problems facing Saudi dental informatics (Al-Nasser et al., 2014). Similarly, Almaiman et al. (2014b) conducted a study to provide a review of the electronic dental records (EDR) programs used in hospitals in Saudi Arabia's Ministry of National Guard Health Affairs (MNGHA). Various sources of evidence were gathered, including interviews with main informaticians and dentists. The research involved 20 individuals who were interviewed for 30-45 minutes each. The results were consistent with the previous findings and indicated low compliance with the Electronic Dental Record and that the rate of acceptance of the systems was low; clinical workers opposed the use of the technology and lacked computer skills. Finally, respondents showed accessibility problems, lack of management improvement policy, and lack of interest in the use of programs (Almaiman et al., 2014b). Furthermore, Sayed (2019) adopted a questionnaire survey, which presented information on the demographics, maintenance, and efficacy of electronic health record systems (EHRs) among dental health care providers. Data were obtained from 270 participants from five regions of Saudi Arabia. Privacy issues, personnel compliance, and costs have been described as factors that affect the attitudes of health care providers towards the implementation of EHRs (Sayed, 2019).

3.2.2. Important areas of e-health

There are different essential areas of e-health that influence the outcomes of healthcare services. One of the critical areas is the patients' information access and exchange. According to the findings of Al-Rayes et al. (2019) e-health is expected to improve patients' data storage and access. The second important area of e-health is the patients' interactions and monitoring. The application of e-health is anticipated to increase the interactions between patients and healthcare professionals. In addition to it, it can be effectively utilized for monitoring.

The efficiency of healthcare is another vital area of e-health. This is because e-health is expected to advance the speed at which healthcare services are delivered to patients in various locations (Almalki et al., 2011). In the same vein, e-health is also expected to improve healthcare safety as e-health promotes the effective use of data while care is provided to the patients (Sayed, 2019). However, these essential areas are expected to transform the healthcare systems when e-health is used.

3.3. Challenges facing the implementation of e-health

As evident from the findings, copious issues are impacting the implementation of e-Health in Saudi Arabia. Accordingly, some of the problems conferring to Almuayqil et al. (2016) cultural, human resources, and bureaucratic issues are the main barriers in implementing e-Health. Cultural barriers in the country have also made it hard to create awareness about e-Health, especially among women and people who live in remote areas. Apart from that, the bureaucracy has often delayed projects associated with e-health. It is hard to get authorization from the top management on recruiting new information professionals in health. These findings are mainly concerned with the results reported in other studies such as Almigbal et al. (2019) study that stated that participants with insufficient health awareness tend to exercise more diabetes self-management strategies, possibly because of the understanding of the dangers of diabetes complications (Almigbal et al., 2019). Cruz et al. (2018) showed that the planning process of e-Health was disorganized in most hospitals in the country. The study also goes ahead to posit that some hospitals and other health care organizations in the country were facing issues concerning funds, despite the massive allocation of the budget towards e-health care services (Cruz et al., 2018).

4. Discussion

While the literature on e-health in Saudi Arabia has covered essential aspects of e-health, specific gaps require further review in the future. For starters, the current literature has not adequately

addressed the aspect of prescription in e-health. This is an essential perspective of e-health and one that needs to be reviewed to see how it impacts the Saudi Arabian healthcare system. The present literature on Saudi Arabia's e-health has also not adequately addressed health information exchange. One of the reasons why e-health is established in healthcare facilities is to help in promoting the exchange of health-related information among diverse stakeholders. The previous studies have not comprehensively evaluated this and this is an indication that future research needs to be geared up towards understanding how e-health is affecting the health information exchange among the stakeholders. Future studies related to e-health in Saudi Arabia should address these areas so that there can be a comprehensive view of how e-health impacts the health system of Saudi Arabia. Such evaluations will also help determine the implementation strategies that can be used to advance the innovations of e-health in the country.

As the benefits of e-health continue to unravel in many parts of the world, healthcare professionals and healthcare facilities will also upsurge the adoption of e-health innovations. Accordingly, the future scope of e-health in the Kingdom will be expected to cover the diverse clinical application areas such as the CDSS, EHR, EMR, and CPOE, telemedicine, health information exchange, e-prescription, and collaborative practices. With such an increase in the scope, the healthcare services quality will also be expected to increase.

It is quite important to note that in accordance with a number of researches, several challenges are generally faced in the implementation of e-health. For instance, it has been determined that bureaucratic issues, human resources, and cultural issues tend to create critical barriers in applying and implementing e-health. Upon further inspection of researches, it has been determined that there is a lack of awareness about the application of e-health, and it seems to create a significant problem for healthcare.

Generally, if these challenges are overcome effectively, it can facilitate the application of e-health in different healthcare sectors across the nation. First of all, it is important to ensure that the awareness of the application of e-health is spread among both the patients and healthcare experts. It is quite important to note that when there is also a need to ensure that employees and workforce skills are advanced and improved to ensure that they can support the application of e-health. These interventions can help in implementing e-health.

5. Conclusion

Although e-health is a comparative innovation, its benefits are already appreciated, and nations worldwide have embarked on the implementation of the technology. Like the other nations in the rest of the world, Saudi Arabia is attempting its best to embrace e-health as a platform to transform healthcare delivery. Even though e-health is being implemented in the nation, the implementation rate can be slow compared to how it was envisioned. Specific challenges such as poor planning, lack of skilled workforce, and lack of awareness among citizens prevent the acceptance and implementation of e-health technology. These issues need to be tackled in order to increase the degree to which innovation is applied in the region.

While Saudi Arabia has taken a positive direction regarding the enactment of e-health, it needs to undertake additional measures to improve the implementation. Future plans for the development of e-health state in the kingdom should be approached holistically, taking into consideration the different parties affecting the process of successful implementation. Governments' responsibility, health care providers' role, and patients' acceptance and literacy must be emphasized.

Proper ICT infrastructure readiness, financing, and investment, legalizations, and policies encouraging the cultural adaptation of e-health are highly impactful and crucial for development. Confidentiality issues and privacy concerns are among the pressing factors that affect users' acceptance and adaptations to e-health systems. Therefore, the incorporation of governmental regulatory bodies is crucial to promote confidence in the system. Adapting the delivery of e-health services to Saudi cultural and social values will bridge the essential trust to use big data and further impact the development and adoption of e-health systems.

Delivery of e-health to include remote and low-population density areas and regions must be addressed. The need for implementation and research in these areas will provide a much clearer and more accurate reflection of the status of e-health, tailor implementation strategies, consequently concluding and building more cohesive and holistic approaches to adopt e-health technologies in Saudi Arabia.

Education is of paramount importance to help achieve the vision of new technologies. Awareness and encouragement towards developing specialized educational programs in health information technology will help increase the number of professionals in the field who can have a profound impact on development in this discipline.

In regard to health care providers, firstly, the healthcare ministry should develop continuous training programs for healthcare professionals on e-health to solve the issue of a skilled workforce. This is important to facilitate implementation since inadequate competencies on e-health are among the reasons for slow uptake. Secondly, healthcare facilities should provide incentives for workers who embrace technology, increasing the rates of adoption. Besides, there should be an increase in e-learning among healthcare professionals and students to be conversant with e-health trends.

Patients' education is also very critical as many people are not well-aware of e-health services.

Educational and awareness workshops must be coordinated for citizens to learn of the many benefits they are oblivious about. Social media is a powerful tool, that with the right marketing can be used for publicity of e-health technologies and services, and provide easily accessible sources for learning.

Thisreview was limited by the articles collected, as well as the accuracy of the details published. Another limitation is the lack of studies in different geographical areas of the Kingdom. Therefore, as mentioned above, further in-depth studies and modification of the existing strategies will lead to the successful execution of the KSA e-health system.

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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