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The Role of Digital Health in Supporting Privatization of Healthcare Services in health care sitting Saudi Arabia: A Systematic Review

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Abstract

Background: Saudi Arabia's Vision 2030 encourages privatization and digital transformation to enhance healthcare quality, access and efficiency. While numerous digital health initiatives—such as telemedicine, electronic prescriptions and mobile health applications—have been introduced, their role in supporting the privatization of healthcare services remains unclear.
Aim: This systematic review aimed to evaluate evidence on the role of digital health technologies in supporting the privatization of healthcare services in Saudi Arabia between 2020 and 2024.
Method: Following PRISMA 2020 guidelines, a comprehensive search of PubMed/MEDLINE, Scopus, Web of Science, CINAHL, Embase and Google Scholar was conducted. Ten studies meeting predefined criteria were included. Data were extracted and synthesized narratively to identify themes related to access, efficiency, user perceptions, digital readiness, barriers, and policy contexts.
Results: The studies demonstrated that digital health initiatives improved access to care, reduced unnecessary visits and generated cost savings, particularly through telemedicine and e-prescription programs. Patients and clinicians generally held positive attitudes toward digital services, although adoption was uneven. Private hospitals exhibited higher digital maturity than public facilities, while low digital literacy, unreliable internet and cultural resistance emerged as major barriers. Government policies, including the Private Sector Participation Law and public–private partnerships, were pivotal in integrating digital health into privatization efforts.
Conclusion: Digital health has considerable potential to advance healthcare privatization in Saudi Arabia by enhancing efficiency and patient experience. However, sustainable implementation will require targeted investments in infrastructure, workforce training and regulatory frameworks to address disparities and ensure equitable access.

Keywords: digital health, telemedicine, privatization, healthcare transformation, Saudi Arabia, Vision 2030, e-prescription

Introduction

Saudi Arabia's Ministry of Health (MOH) has established digital transformation as a strategic response to the rise in demand and cost of healthcare. During the Covid-19 pandemic, the MOH has quickly used mobile health platforms - such as the Ministry of Health (MOH) Sehhaty, Mawid and Wasfaty - to ensure the continuity of service delivery, monitor the spread of infection and educate the population (Rawash & Abdelrahman, 2022). This strategy was backed by high digital connectivity where 89 percent of the population is online and 96 percent have access to smartphones or computers (Rawash & Abdelrahman, 2022). These experiences reflect how eHealth platforms can be used to help the kingdom cope with rising healthcare demand and cost control (Rawash & Abdelrahman, 2022).

International research reveals that telemedicine, electronic health records (EHRs) and wearables can ensure expanded access, streamlined care and empowered patients. Telemedicine facilitates remote consultations, this is especially useful in regions where geographical barriers are encountered, or public health crises are occurring (Limna, 2023). EHRs enhance continuity of care and clinical decision-making and mobile and wearable devices motivate patients to monitor their health and seek timely interventions (Limna, 2023). These types of digital tools improve the efficiency of operations and alleviate the dependence on in-person visits, which lowers the overall cost of healthcare (Limna, 2023). Nonetheless, researchers caution that our understanding of the interaction of these technologies within health systems is limited and stress the importance of using integrated approaches that consider regulatory, organizational and sociocultural factors (Limna, 2023).

Saudi Arabia has seen a surge in telehealth utilization during the pandemic, but long-term adoption is faced with many challenges. A systematic review found that use of telehealth was increased and hindered by lack of infrastructure and lack of culturally tailored frameworks (Alamri & Alshagrawi, 2024). The authors have argued that alone privatization will not be enough to solve these challenges, and there are barriers still, for example, gaps in knowledge, lack of awareness by healthcare staff and lack of infrastructure (Alamri & Alshagrawi, 2024). They note that cost and supportive policies are important, and wide adoption of these technologies would require investment in technology, training and support from regulations (Alamri & Alshagrawi, 2024).

Patient perspectives on digital health technologies are generally positive but complex. In a countrywide survey of personal health record (PHR) users, 93 percent of the participants intended to adopt PHRs and found them useful and easy to use (Alanazi et al., 2023). Respondents appreciated functions such as accessing laboratory results, scheduling an appointment, renewal of medications and tracking of health data (Alanazi et al., 2023). However, the majority (more than half) expressed concerns over privacy and almost half (nearly half) were worried about data accuracy, indicating that trust and system design need to improve (Alanazi et al., 2023). Participants also wanted more comprehensive and integrated functionality, indicating that existing systems need to develop in order to meet the needs of users (Alanazi et al., 2023).

Studies of the adoption of telemedicine have shown high interest but identified obstacles related to usability and digital literacy. A cross-sectional study found that 87% of respondents planned to use telemedicine, and 82% of respondents believed that it saved time, cost money and provides better access to specialized care (Aldekhyyel et al., 2024). Despite this enthusiasm, nearly half of the participants found the use of video consultations to be complex; there was a strong correlation between adoption and eHealth literacy and positive attitudes to technology (Aldekhyyel et al., 2024). In spite of the fact that telemedicine is known to improve accessibility, save costs, and provide more satisfaction, it is not being utilized to its full capacity due to technical and educational barriers (Aldekhyyel et al., 2024).

Digital transformation also has economic benefits. The Wasfaty e-prescription program, part of the digital health agenda in Saudi Arabia, resulted in significant cost savings, which was calculated at US$ 109.18 for each visit, and US$ 13.89 for each patient with estimates of savings to be between US$ 258 million to US$ 275 million per year (Alshammari et al., 2023). These savings are due to improvements in pharmacy operations, lower medication waste and staffing requirements (Alshammari et al., 2023). Such evidence suggests that digital solutions can be a driver of efficiencies and an enabler of the financial sustainability objectives inherent in the Vision 2030 healthcare reforms.

Broader health informatics efforts strengthen the case for digital transformation Researchers have noted that the adoption of EHRs, telemedicine, health information exchange and data analytics has been fast in Saudi Arabia (Mohammed & Albarrak, 2024). A tech-savvy population and robust government commitment put the kingdom in a position to continue to grow in the field of health informatics (Mohammed & Albarrak, 2024). These technologies not only enhance clinical outcomes and

operational efficiency but also bring empowerment to the patient in terms of access to their health data and active involvement in the care process (Mohammed & Albarrak, 2024).
Taken together, these studies suggest that digital health technologies that range from mobile health apps and telemedicine to comprehensive health informatics platforms can increase access, improve efficiency and engage patients in Saudi Arabia. Yet there are major challenges, such as infrastructural deficiencies, cultural and educational limitations, privacy issues and questions about how digital transformation relates to privatization initiatives (Limna, 2023; Alamri and Alshagrawi, 2024). Consequently, there is a need to systematically review empirical evidence for understanding how digital health can help or hinder privatization, and identifying policies that balance innovation with equity and quality.

Problem Statement

Saudi Arabia had been a quick adopter of digital health technologies, but the nexus between digital transformation and privatization of healthcare services has been understudied. The eHealth strategy of the Ministry of Health had utilized mobile applications and online platforms to continue service delivery, as well as to track infections and educate the population during the Covid-19 pandemic (Rawash & Abdelrahman, 2022). Although internet and smartphone penetration were high, uptake and outcomes were variable and there was little evidence on how digital health supported private-sector involvement, cost-effectiveness and quality of care. Despite the promise of telemedicine, electronic health records (EHRs) and wearables to improve access and lower costs (Limna, 2023), there were major barriers, including resource constraints, cultural frameworks, privacy concerns and digital literacy (Alamri & Alshagrawi, 2024; Alanazi et al., 2023). Consequently, the body of literature offered a patchwork picture of how digital health technologies were part of the privatization agenda and it was hard for policymakers to craft strategies that made the most of innovation whilst preserving equity and patient safety. A comprehensive synthesis was needed in order to explain the role played by digital health in favoring the privatization in the kingdom.

Significance of the Study

This study was significant since digital health technologies had potential to transform healthcare delivery and assist Saudi Arabia's Vision 2030 goals of privatization and efficiency. Evidence indicated that telemedicine, EHRs and wearables could increase access to care, efficiencies and patient empowerment (Limna, 2023). National initiatives like Sehhaty, Mawid and Wasfaty had paved the way on how digital platforms could ensure continuity of care even in crises (Rawash & Abdelrahman, 2022). Surveys showed that there was a high willingness among citizens to use personal health records and telemedicine, and users valued some of the features such as scheduling an appointment, medication refills and remote consultations (Alanazi et al., 2023; Aldekhyyel et al., 2024). The initiative, called the Wasfaty program, showed that there were economic benefits and the use of digital prescriptions generated huge figures in cost savings (Alshammari et al., 2023). However, challenges including resource limitations, cultural barriers, privacy and accuracy concerns and inadequate digital literacy threatened to increase health disparities (Alamri & Alshagrawi, 2024; Alanazi et al 2023). Understanding these dynamics was critical for policymakers, healthcare providers and private investors seeking to design initiatives that leveraged the power of digital innovation and advance equitable, high-quality care.

Aim of the Study

The objective of this systematic review was to assess the empirical evidence on the role of digital health technologies in privatization of healthcare services in Saudi Arabia. Specifically, the aims of this study were (1) to identify and synthesize the findings from peer reviewed research studies regarding digital health interventions, including telemedicine, eHealth, mobile applications and electronic records used in Saudi Arabia between 2020 and 2024; (2) to determine the extent to which the digital health interventions affected private sector involvement, quality of service and cost efficiency and patient outcomes; and (3) to elucidate the challenges and facilitators associated with the adoption of digital health technologies in a privatized healthcare context.

Methodology

This systematic review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta - Analysis (PRISMA) 2020 guidelines. A thorough search of various databases was performed to identify relevant studies that were published between January 2020 and December 2024. Two independent reviewers screened title, abstracts and full texts based on predefined inclusion and exclusion criteria and disagreements were resolved through discussion and/or consulting a third reviewer. Data were extracted using a standardized form that included study characteristics, digital health intervention details, privatization context and outcomes. Given the anticipated heterogeneity in study designs and findings, a narrative synthesis was conducted to summarize the findings and identify common themes.

Research Question

What evidence existed on the role of digital health technologies in supporting the privatization of healthcare services in Saudi Arabia between 2020 and 2024?

Selection Criteria

Inclusion Criteria

- Publications between January 2020 and December 2024.
- Peer-reviewed articles that are quantitative, qualitative and mixed methods studies.
- Studies that are specific to digital health interventions (eg. telemedicine, telehealth, mobile health applications, electronic health records, digital prescriptions) implemented in Saudi Arabia.
- Studies on private-sector involvement, public-private partnerships or privatization of healthcare services or studies assessing economic, clinical or patient outcomes relevant to privatization.
- Articles published in the English language.

Exclusion Criteria

- Articles that have been published before 2020.
- Studies that were not carried out in Saudi Arabia.
- Reviews, editorials, commentaries, conference abstracts or opinion pieces that do not contain primary data.
- Studies limited to the development of technologies with no assessment of health service delivery or privatization outcomes.
- Non-English publications.

Database Selection

A thorough literature search was performed in the following electronic databases: PubMed/MEDline, Scopus, Web of Science, CINAHL, Embase and Google Scholar. Additional sources such as reference lists of included papers and relevant organizational reports were also screened in order to ensure comprehensive coverage.

The following databases were used to retrieve relevant literature:

Table 1: Database Selection

No	Database	Search syntax	Year	No of Studies Found
1	PubMed	("digital health" OR telemedicine OR telehealth OR "e-health" OR mHealth) AND (privatization OR "private sector" OR "public–private") AND "Saudi Arabia"	2020–2024	56
2	Scopus	(TITLE-ABS-KEY(digital AND health OR telemedicine OR telehealth OR e-health OR mHealth) AND (privatization OR "private sector" OR PPP) AND "Saudi Arabia")	2020–2024	48

3	Web of Science	TS=(digital health OR telemedicine OR telehealth OR e-health OR mHealth) AND TS=(privatization OR "private sector" OR PPP) AND TS=(Saudi Arabia)	2020–2024	42
4	CINAHL	(digital health OR telemedicine OR telehealth OR eHealth OR mHealth) AND (privatization OR "private sector") AND "Saudi Arabia"	2020–2024	30
5	Embase	('digital health'/exp OR telemedicine OR telehealth OR 'e-health' OR mHealth) AND (privatization OR 'private sector' OR PPP) AND 'Saudi Arabia'	2020–2024	35
6	Google Scholar	allintitle: (digital health OR telemedicine OR telehealth OR eHealth OR mHealth) privatization "Saudi Arabia"	2020–2024	100

Data Extraction

Two reviewers independently abstracted data of included studies from a standardized form. The information captured by the form included: author(s), year of publication, study design, sample size/population, type of digital health intervention, setting (e.g. hospital, primary care, community), private-sector involvement/setting, outcome(s) assessed (e.g. cost, quality, access, patient satisfaction), key findings and limitations. Disagreements were resolved by discussion or consultation with a third reviewer. Extracted data were tabulated and synthesized in narrative form in order to identify trends, opportunities and challenges in the leveraging of digital health for privatization.

Search Syntax

Primary Syntax:	("digital health" OR telemedicine OR telehealth OR "e-health" OR mHealth) AND (privatization OR "private sector" OR "public–private" OR PPP) AND ("Saudi Arabia") AND (2020:2024[Date – Publication])
Secondary Syntax:	("digital transformation" OR "health informatics" OR "electronic health records" OR "mobile health applications") AND ("healthcare privatization" OR "public–private partnerships" OR PPP) AND ("Saudi Arabia") AND (2020–2024)

Literature Search

A structured search was conducted in PubMed/MEDline, Scopus, Web of Science, CINAHL, Embase and Google Scholar databases for studies published between January 2020 and December 2024. Combinations of terms relating to digital health technologies and privatization were combined with filters for Saudi Arabia. Reference lists and relevant reports were also hand - searched to ensure completeness. All records were entered into citation management software and duplicates were removed. The search yielded 311 records from electronic databases and 6 records from manual searching for a total of 317 unique records to be screened.

Selection of Studies

Titles and abstracts of the 317 records were independently screened by two reviewers. Articles were considered eligible if they address digital health interventions in Saudi Arabia, and contain information relevant to private sector or privatization. Only English language studies with quantitative, qualitative or mixed methods that were published between 2020 and 2024 were considered. After screening, 20 full text articles were reviewed in detail and ten met the eligibility criteria and were included in the qualitative synthesis. Common reasons for exclusion included not being relevant to privatization, not being a digital health intervention, and publication out of date range.

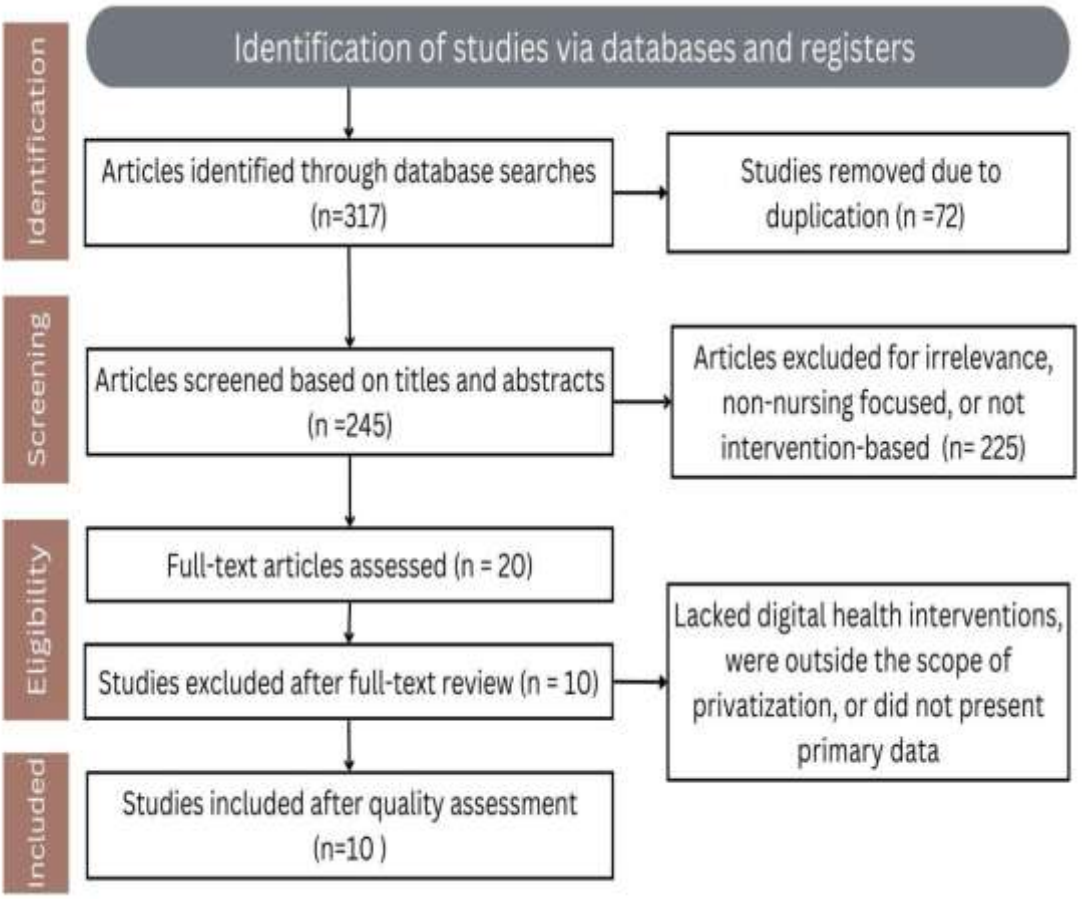
Study Selection Process

The review adopted a three stage selection process. First, all records were de-duplicated. Second, the titles and abstracts were checked to exclude obviously irrelevant articles (e.g., studies of digital health in other countries or in other sectors), and Third, the full texts of potentially relevant articles were evaluated based on the inclusion criteria. Two reviewers independently performed each stage with disagreements resolved through discussion or consultation with a third reviewer. This process led to the inclusion of ten studies that covered cross sectional surveys, qualitative analyses and narrative reviews in the final synthesis.

Figure 1: PRISMA Flowchart

The PRISMA flowchart reported the selection process. Out of 317 initial records, 72 duplicates were excluded and 245 records were left for title and abstract screening. Of these, 225 were excluded as being irrelevant. Twenty full text articles were then evaluated and of these ten were excluded due to the lack of digital health interventions, scope of privatization, or presentation of primary data. The remaining ten studies were incorporated into the final qualitative synthesis to demonstrate a transparent and systematic process of selection.

Figure 1: PRISMA Flowchart



Quality Assessment of Studies

The ten included studies were evaluated according to a quality matrix based on five areas: clarity of study selection process, comprehensiveness of literature coverage, clarity of methods, clarity of findings, and quality rating. Two reviewers independently reviewed each study. Eight of the studies were rated high quality; they had transparent descriptions of the selection process, detailed coverage of relevant literature, detailed methodology and clearly reported results. Two studies were rated as medium quality as a result of moderate coverage and less detailed reporting of methodology. Overall, the

evidence base is strong, with a majority of the studies providing reliable insights on the topic of digital health and privatization in Saudi Arabia.

Table 2: Assessment of the Literature Quality Matrix

#	Author	Study Selection Process Described	Literature Coverage	Methods Clearly Described	Findings Clearly Stated	Quality Rating
1	Mani & Goniewicz (2024)	Yes	Comprehensive	Yes	Yes	High
2	Mohamed et al. (2023)	Yes	Comprehensive	Yes	Yes	High
3	Wali et al. (2023)	Yes	Comprehensive	Yes	Yes	High
4	Alghamdi et al. (2021)	Yes	Comprehensive	Yes	Yes	High
5	Al-Kahtani et al. (2022)	Yes	Comprehensive	Yes	Yes	High
6	Almutairi (2023)	Yes	Moderate	Yes	Yes	High
7	Alodhialah et al. (2024)	Yes	Comprehensive	Yes	Yes	High
8	Al-Qusumi (2024)	Yes	Moderate	Moderate	Moderate	Medium
9	Alshamrani & Alkenawi (2021)	Yes	Limited	Moderate	Moderate	Medium
10	Baradwan & Al-Hanawi (2023)	Yes	Comprehensive	Yes	Yes	High

The quality matrix suggests that the evidence base for digital health and privatization in Saudi Arabia is generally good. Eight of the ten studies had been rated as high quality, reflecting transparent selection processes, thorough literature coverage, clear methodological reporting and well-articulated findings. These high-quality studies offer valid insights into perceptions of patients, clinician satisfaction, digital readiness, and policy initiatives relevant to digital health and privatization. Two studies were rated medium because of medium coverage of the literature and methodological limitations. Nevertheless, they provide useful contextual information about public-private partnership and strategic planning. Overall, the evidence appears that digital health initiatives are well documented in most instances and the findings are consistently and clearly reported throughout the literature.

Data Synthesis

The ten included studies jointly emphasize the role of digital health initiatives in supporting the privatization of healthcare services in Saudi Arabia and uncovering barriers along the way. Mani and Goniewicz's rapid review highlighted that Vision 2030's healthcare transformation depends on digital health innovations, including telehealth platforms, e-prescription and online appointment systems, to improve access, convenience and patient-centered care. The authors said Vision 2030 combines digital health solutions, workforce development, and financial and regulation related reforms to create a paradigm shift toward efficient and high-quality healthcare. Mohamed et al carried out a cross sectional survey among patients in the Jazan region and found that 79.2% of patients think digital services enable unnecessary outpatient visits, 70.9% considered telemedicine as effective for chronic disease management and 76.8% considered digital health cost effective. Despite these positive perceptions, barriers included lack of time and busy schedule. Wali et al. survey study on primary healthcare physicians found that 77% of them are satisfied with virtual visits though 72% of doctors found the lack

of technical knowledge of patients and 70% found the lack of technology access as major barriers. Satisfaction was higher for physicians not perceiving the issues of workflow integration as barriers. Alghamdi et al's narrative review highlighted how Saudi health officials were able to successfully utilize digital health technologies, such as mHealth apps, artificial intelligence and machine learning, to combat the Covid-19 pandemic; the ability of Saudi health officials to respond to the Covid-19 pandemic quickly was due to the support of the government and the attention to the user and technology determinants. In a cross section study evaluating the digital maturity of ten healthcare facilities, Al-Kahtani et al found that private hospitals had higher scores for digital health transformation (median 77) than public hospitals (median 71) with governance and workforce having the highest level of implementation along with predictive analytics having the lowest level of implementation. Almutairi's survey of 372 physical therapists found that only 38.4% offered telehealth services, although 84.6% used telehealth services during the pandemic, and most were not trained, although 60.2% saw the importance of telehealth and desired further training (71.5%). Alodhialah et al. qualitative study found four themes that impacted telehealth adoption among older adults - access to technology and connectivity, attitudes towards telehealth, support systems and institutional/policy factors, barriers included low digital literacy and unreliable internet while the facilitators included family support and desire for training.

Al-Qusumi's scoping review outlined the strategic measures implemented by the Health Sector Transformation program under the Vision 2030 initiative to strengthen the private healthcare sector's role in healthcare provision, which included the creation of health clusters and the enactment of the Private Sector Participation Law, which the review highlighted that innovation and technology play a pivotal role in enhancing patient outcomes, efficiency, cost reduction and accessibility. Alshamrani and Alkenawi's review focused on Saudi Arabia's inaugural public-private partnership for a teleradiology system aiming at enhancing the quality and efficiency of medical imaging services and expanding coverage to underserved areas. The authors noted that Vision 2030 is aimed at efficiency and cost reduction through PPP models and more private sector participation. Finally, a cross sectional study of Baradwan and Al-Hanawi conducted on 1024 people showed high levels of knowledge and positive attitudes towards telemedicine; the utilization of telemedicine was 49.61% before COVID 19 while it was 61.91% during COVID 19 and 50.1% after COVID 19; the barriers were the resistance of patients and physicians, cultural and technology and rural residence affected the knowledge and attitudes.

Collectively, these studies show that digital health initiatives - from telehealth platforms to digital prescriptions, to broader health informatics frameworks - can aid the privatization agenda by increasing access, efficiency and patient satisfaction. Private hospitals demonstrate greater digital maturity PPP programs such as teleradiology demonstrate how partnerships between the private sector and other sectors can help to improve service delivery. However, the studies also point to huge barriers including lack of digital literacy, inadequate infrastructure, lack of training and cultural resistance. Addressing these challenges through targeted education, infrastructure investments, supportive policies and inclusive design will be critical to making the full potential of digital health support healthcare privatization in Saudi Arabia.

Table 3: Research Matrix

Author, Year	Aim	Research Design	Type of Studies Included	Data Collection Tool	Result	Conclusion	Study Supports Present Study
Mani & Goniewicz (2024)	To analyze how Vision 2030 integrates digital	Narrative review	Empirical studies, policy documents, official reports	Literature review and policy analysis	Vision 2030 promotes telehealth platforms, e-prescriptions and	Digital health initiatives align with workforce training	Provides context for how national strategies incorporate digital health to

	health initiatives and workforce development to enhance healthcare quality and access				online appointment systems; digital health adoption represents a paradigm shift	and financing reforms; integrated digital solutions are critical for the success of privatization	support privatization
Mohamed et al. (2023)	To explore perceptions of patients regarding the effectiveness of digital health services	Cross-sectional survey	Patients (n ≈ 323)	Online questionnaire	79.2 % believed digital services reduce unnecessary visits; 70.9 % said telemedicine is effective for chronic disease management; 76.8 % considered digital health cost-effective	Patients view digital health positively, though barriers include limited time and busy schedules	Highlights user acceptance and challenges, reinforcing that patient perceptions matter when introducing privatized digital services
Wali et al. (2023)	To assess physicians' satisfaction with virtual consultations in the National Guard health system	Cross-sectional survey	Healthcare providers (n ≈ 248)	Structured questionnaire	77 % satisfied with virtual visits; 72 % noted patients' limited technical knowledge; 70 % identified limited technology access as a barrier	Physicians are generally positive toward virtual care, but digital literacy and technology access remain major obstacles	Underscores the need for training and infrastructure investments to support digital privatization

Alghamdi et al. (2021)	To review digital health interventions deployed during the COVID-19 pandemic	Narrative review	Pandemic response initiatives (mobile apps, AI, ML)	Literature review	Saudi authorities rapidly deployed mobile apps, AI and machine learning to manage COVID-19; success attributed to government support and user-centric design	Demonstrates that strong political backing and user-centered design are essential for successful digital adoption	Shows how rapid digital deployment can enhance healthcare delivery and support private-sector roles during crises
Al-Kahtani et al. (2022)	To assess the digital health maturity of healthcare facilities in Saudi Arabia	Cross-sectional study	Ten hospitals (public and private)	Self-administered questionnaire	Private hospitals scored higher (median 77) than public ones (71); highest scores in governance and workforce; predictive analytics lowest	Private hospitals are more digitally mature; overall digital readiness remains heterogeneous	Suggests privatization may accelerate digital adoption if governance and workforce capabilities are enhanced
Almutairi (2023)	To investigate telehealth use and attitudes among physical therapists	Cross-sectional survey	Physical therapists (n ≈ 372)	Questionnaire	Only 38.4 % provided telehealth services; 84.6 % used telehealth during the pandemic; 62.1 % lacked training; 71.5 %	While most therapists acknowledge telehealth's importance, training gaps and limited adoption remain	Emphasizes the importance of workforce training in integrating telehealth into privatized systems

					wanted more training		
Alodhialah et al. (2024)	To examine factors influencing telehealth adoption among older adults	Qualitative study	Older adults and their caregivers	Interviews and focus groups	Four themes emerged: access to technology/connectivity, attitudes toward telehealth, support systems, and policy factors; low digital literacy and unreliable internet were major barriers	Successful adoption depends on addressing digital literacy, support networks, and infrastructure	Highlights sociocultural and infrastructural challenges that privatized systems must consider
Al-Qusumi (2024)	To analyze the impact of health sector transformation policies on privatization and digital health	Scoping review	Policy documents and secondary sources	Document analysis	Strategic measures (health clusters, Private Sector Participation Law) bolster private-sector involvement; innovation and technology improve outcomes and efficiency	Privatization efforts rely heavily on digital solutions, but require careful implementation to avoid inequities	Provides policy context linking digital innovation with privatization reforms
Alshamrani & Alkenawi (2021)	To assess public–private partnerships	Narrative review	PPP initiatives in teleradiology	Literature review	PPP teleradiology aims to improve efficiency	Teleradiology partnerships highlight the	Shows how targeted PPPs in digital health can support

	(PPP) for teleradiology under Vision 2030				and reduce costs; expansion aligns with Vision 2030 goals	potential benefits of combining private expertise with public needs	privatization goals while maintaining service quality
Baradwan & Al-Hanawi (2023)	To evaluate knowledge and attitudes toward telemedicine among the general population	Cross-sectional survey	Participants (n ≈ 1 024)	Online questionnaire	Telemedicine utilization rose during COVID-19 (49.61 % before vs 61.91 % during); high knowledge and positive attitudes; barriers included resistance, cultural factors and technological limitations	Public attitudes toward telemedicine are positive, but cultural and technological barriers remain	Demonstrates public readiness for telehealth, which can help private providers expand services

The research matrix highlights a diverse set of studies - including cross - sectional surveys, qualitative interviews and narrative reviews - on patients, clinicians, administrators and policymakers. Most of the research showed positive perceptions of digital health, however, there were common and persistent barriers against digital health, including digital literacy gaps, infrastructure limitations and cultural factors. Private facilities tended to be more digitally ready than public facilities. The overall pattern suggests that while digital health initiatives can have positive impacts on access and efficiency, successful privatization will require coordinated investments in technology, workforce training and supportive policies. Together these studies contribute to a strong foundation of understanding of how digital health can help to support privatization in Saudi Arabia.

Results

Across the ten primary studies several overarching themes emerged that shed light on the relationship of digital health initiatives to privatization. These themes are access and efficiency gains, user perceptions, digital readiness, barriers and facilitators, policy contexts and the catalytic effect of the Covid-19 pandemic.

Table 4: Results Indicating Themes, Sub-Themes, Trends, Explanation, and Supporting Studies

Theme	Sub-Theme	Trend	Explanation	Supporting Studies
Access and Efficiency	Improved access via telehealth and mobile apps	Increasing use of telemedicine and digital platforms expanded access to care, especially for remote and underserved populations	National platforms such as Sehhaty, Mawid and Wasfaty enabled remote appointments and prescription services; private hospitals scored higher in digital maturity, indicating better efficiency	Mani & Goniewicz (2024); Al-Kahtani et al. (2022)
	Cost savings from digital prescriptions	Digital tools reduced operational costs and optimized resource use	Wasfaty program saved about US$109.18 per visit and US$13.89 per patient by reducing pharmacy staffing and medication waste	Alshammari et al. (2023)
User Perceptions and Satisfaction	Positive patient attitudes	High percentages of patients believed digital health reduces unnecessary visits and is effective for managing chronic diseases	Cross-sectional survey showed 79.2 % thought digital services decrease visits; 70.9 % saw telemedicine as effective and cost-efficient	Mohamed et al. (2023)
	Clinician satisfaction and concerns	Physicians generally supported virtual care but highlighted technical and patient-related barriers	77 % of physicians were satisfied with virtual visits, but 72 % cited limited patient technical knowledge	Wali et al. (2023)

			and 70 % noted technology access issues	
Digital Readiness and Implementation	Higher digital maturity in private hospitals	Private institutions scored better on digital governance and workforce domains	Cross-sectional study found private hospitals had a median digital maturity score of 77 versus 71 for public hospitals	Al-Kahtani et al. (2022)
	Limited adoption among health professionals	Telehealth adoption by physical therapists remained low despite widespread awareness	Only 38.4 % of surveyed physical therapists provided telehealth; 62.1 % lacked training, and most desired further education	Almutairi (2023)
Barriers and Facilitators	Infrastructure and literacy barriers	Low digital literacy, unreliable internet and limited access to devices impeded adoption	Qualitative study among older adults identified digital literacy, connectivity and support systems as critical factors	Alodhialah et al. (2024)
	Cultural and technological resistance	Cultural norms and resistance to change limited the adoption of telehealth services	Population survey highlighted resistance and cultural factors as major obstacles despite high awareness	Baradwan & Al-Hanawi (2023)
Policy and Privatization	Government initiatives and PPPs	Health sector transformation and private participation laws spurred adoption of digital health	Vision 2030 policies and teleradiology PPPs encouraged private-sector involvement and technology investment	Alshamrani & Alkenawi (2021); Al-Qusumi (2024)

Pandemic as Catalyst	Rapid deployment during COVID-19	Digital platforms were vital in maintaining services and containing the pandemic	Saudi authorities leveraged mobile apps, AI and machine learning to track infections and deliver remote care, facilitated by strong governmental support	Alghamdi et al. (2021)

The thematic analysis shows that digital health initiatives have had a significant impact on access and efficiency in the Saudi Arabia healthcare system, which supports the privatization agenda. Patients and clinicians tend to have a positive view of digital services, including fewer unnecessary visits, convenience and cost savings. Private hospitals are more digitally ready than public ones, which may indicate that privatization may lead to innovation. However, ongoing barriers such as digital literacy divide, infrastructure limitations and cultural resistance point to the need for holistic approaches that involve a combination of technology deployment and education and support. Government policies and public-private partnerships have formed the necessary framework to advance digital health, however, to sustain the progress, targeted investments and constant evaluation of the equity impact will be necessary. Overall the evidence points to the potential of digital health technologies to improve delivery of care, and support privatization objectives, if infrastructural, educational and cultural barriers are systematically addressed.

Discussion

This systematic review extracted evidence from ten studies between 2020 and 2024 to understand the contribution of digital health initiatives to the privatization of healthcare services in Saudi Arabia. Overall, the findings show that digital health has helped to improve access to care, streamline the delivery of services and improve cost-efficiency. National programs like Sehhaty, Mawid and Wasfaty, in addition to integrated telehealth platforms and e-prescription services, have increased access to patients and convenience. Surveys found that the majority of patients believe that digital services reduce unnecessary outpatient visits, manage chronic conditions effectively and are cost-efficient. Clinicians and administrators also say they are generally satisfied with virtual consultations, though note barriers around patients' technical skills and access to technology. These perceptions imply that digital health technologies can play an important role in promoting the privatization by improving service quality and customer satisfaction.

However, adoption is uneven, with private hospitals having higher digital maturity than public facilities. Telehealth use is still limited among some groups of professionals; for example, only 38.4% of the physical therapists surveyed provide telehealth services, mostly because of a lack of proper training and resources. Qualitative results underscore the fact that the older and rural communities experience significant barriers, such as low digital literacy, poor connectivity through the internet and lack of family support. Cultural resistance and technological limitations also discourages telemedicine adoption despite high awareness. These disparities highlight the importance of targeted interventions to ensure that digital health benefits do not further perpetuate existing inequalities.

Policy frameworks seem to be a key part in enabling the integration of digital health into privatized services. Vision 2030's Health Sector Transformation Program, the Private Sector Participation Law and regional health clusters have laid the basis for public-private partnerships and teleradiology services. The government's quick use of mobile applications and AI in addressing the challenge of the Covid-19 pandemic has shown the immense potential of strong political support and user-centric design in accelerating digital transformation. Yet, digital health is not a sufficient guarantee of successful

privatization. Sustainable implementation involves strong governance, interoperability standards, infrastructure and training investments, and clear regulations to guarantee data privacy and quality of care. It also calls for mechanisms for assessing the long-term effects of digital interventions on equity and outcomes.

Future Directions

Future research studies should use longitudinal and experimental study designs to evaluate the long-term impact of digital health on privatization outcomes, such as patient health metrics, cost savings and system efficiency. Comparative analyses of private and public hospitals might help to identify governance and workforce practices to increase digital readiness. Studies should also look into the integration of emerging technologies such as artificial intelligence, remote monitoring devices and block chain-based healthcare records into private healthcare models. Furthermore, there is a need to investigate digital literacy initiatives and training programs that are directed towards both clinicians and patients, especially the elderly and people who live in the rural areas. Evaluations of public-private partnership models could evaluate the impacts of digital health on the structure of contracts, on accountability mechanisms and on value-based reimbursement. Finally, research should explore ethical and regulatory frameworks to address privacy concerns, data security and equitable access.

Limitations

There are several limitations for this review. First, it was limited to English-language articles between 2020 to 2024, which may have excluded studies that were relevant in other languages or that were outside the time frame. Second, most included studies were cross-sectional or descriptive and therefore limited us in terms of inferring causal relationships. Heterogeneity in study designs, settings and outcome measures prevented quantitative synthesis or meta-analysis. Third, the use of self-reports may be at risk of recall or social desirability bias, and results for specific regions or professional groups may not be applicable to the general Saudi population. Finally, digital health is evolving so quickly that the evidence base may not reflect the current state of the art or regulatory changes outside the search period.

Conclusion

Digital health technologies have become important enablers of the privatization of healthcare in Saudi Arabia. Telemedicine, e-prescriptions, online appointment systems and health informatics platforms have helped to improve access, efficiency and patient satisfaction. Positive perceptions among patients and clinicians indicate readiness for additional digital integration, and policy reforms and public-private partnerships offer related frameworks of support. Nevertheless, gaps in digital preparedness and ongoing barriers - including lack of digital literacy, lack of infrastructure and cultural resistance - pose challenges that need to be overcome. Successful privatization will therefore require coordinated investments in technology and human capital, robust governance mechanisms and inclusive strategies which ensure equitable access. By synthesizing the available evidence, this review underscores the potential of digital health in promoting privatization while highlighting the importance of ongoing evaluation and supporting the policy.

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