



Impact of Digital Health Interventions on Managing Chronic Diseases Among Middle Eastern Populations

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Abstract

The growing burden of chronic diseases, such as diabetes, cardiovascular disease, and hypertension, has prompted an increased focus on the use of digital health interventions (DHIs) in healthcare management. This study examines the adoption and effectiveness of DHIs among Middle Eastern populations, specifically in Kuwait, Saudi Arabia, and the UAE. Using a cross-sectional, quantitative approach, data were collected from 500 participants through a structured survey. The results revealed that 70% of participants used DHIs, with mobile apps being the most commonly utilized tool. Additionally, 65% of DHI users reported improved health outcomes, particularly in disease monitoring and medication adherence. Despite these positive outcomes, 15% of participants found DHIs ineffective, highlighting barriers such as technological literacy and accessibility. The findings suggest that while DHIs hold great potential for managing chronic diseases, efforts to improve access and usability are necessary to ensure broader adoption and greater effectiveness. Policymakers and healthcare providers are encouraged to integrate DHIs into national healthcare strategies, particularly in underserved and rural populations.

INTRODUCTION

Chronic diseases, particularly non-communicable diseases (NCDs) such as diabetes, cardiovascular disease, and hypertension, have emerged as some of the most pressing global health challenges in the 21st century. Unlike communicable diseases that are often episodic and preventable through vaccination or short-term interventions, NCDs are typically lifelong conditions that require sustained management, lifestyle modification, and continuous access to healthcare resources. Globally, the World Health Organization (2020) reports that more than 70% of deaths are attributed to NCDs, underscoring the immense toll these conditions impose on individuals, families, health systems, and national economies. The Middle East has been identified as a region of particular concern, as rapid demographic shifts, increasing life expectancy, and accelerated urbanization have created fertile ground for the proliferation of chronic diseases. These health burdens are exacerbated by

sedentary lifestyles, dietary transitions toward high-calorie and low-nutrient foods, and high rates of tobacco consumption, all of which have become entrenched within the region's social and cultural dynamics (Rahim et al., 2014; Anyanwu, 2023; D'Innocenzo et al., 2019).

The severity of the problem can be seen in country-level statistics. For example, in Kuwait, approximately 37.5% of adults are diagnosed with diabetes, one of the highest prevalence rates globally (International Diabetes Federation, 2023). This staggering figure reflects not only biomedical concerns but also systemic challenges in healthcare delivery, prevention strategies, and public health awareness. Similar patterns of high NCD prevalence have been reported in Saudi Arabia, Qatar, and the United Arab Emirates, placing immense strain on healthcare infrastructure and public financing. Beyond the clinical dimension, the economic repercussions are profound: NCDs reduce productivity, increase healthcare costs, and undermine national development goals. Addressing these conditions, therefore, requires multifaceted strategies that extend beyond conventional medical approaches (Patil et al., 2024; Tenea-Cojan et al., 2025).

In this context, digital health interventions (DHIs) have gained increasing attention as innovative and potentially transformative tools for managing chronic diseases (Jensen, 2024; Sleven, 2025; Bashi et al., 2020; Asif & Gaur, 2025). DHIs encompass a broad array of technologies, including mobile health (mHealth) applications, wearable devices that monitor vital signs, telemedicine platforms facilitating remote consultations, and electronic health records (EHRs) that enable more integrated and coordinated care (Kruse et al., 2017). These technologies promise several benefits: patients can engage in self-monitoring, physicians can provide real-time feedback, and healthcare systems can improve efficiency by reducing unnecessary hospital visits. Importantly, the Middle East presents favorable conditions for the adoption of DHIs, given the rapid expansion of smartphone penetration, widespread internet access, and strong governmental interest in digital transformation in health sectors (Ghazal et al., 2021; Alhashmi, 2025; Al-Shorbaji & Alhuwail, 2022). If leveraged effectively, DHIs could bridge gaps in access, enhance disease surveillance, and personalize patient care.

Nonetheless, the integration of DHIs into Middle Eastern healthcare systems is neither straightforward nor universally effective. Several contextual barriers hinder their adoption. Cultural attitudes toward technology and healthcare such as preferences for face-to-face consultations or skepticism toward digital solutions can limit acceptance. In addition, disparities in digital literacy and socioeconomic inequalities restrict the ability of certain populations, particularly rural and low-income groups, to benefit from these technologies (Al-Dmour et al., 2020; Rydzewski, 2025). Healthcare providers themselves may face challenges related to training, workload, and institutional readiness for digital transitions. Furthermore, data security, privacy, and regulatory frameworks remain underdeveloped in many Middle Eastern countries, raising concerns about trust and ethical governance. These factors underscore the need for cautious optimism: while global evidence points to the efficacy of DHIs in improving patient adherence, glycemic control, and cardiovascular outcomes, their success cannot be uncritically transplanted into the Middle Eastern context without careful adaptation (Alharbi et al., 2020).

This study aims to contribute to this emerging field by systematically examining the adoption and effectiveness of DHIs in managing chronic diseases within Middle Eastern populations. By analyzing both patient and provider perspectives, as well as institutional and policy-level factors, this research situates digital health within the broader socio-cultural, economic, and technological realities of the region. The study does not only address a gap in the literature but also aligns with urgent public health priorities, as Middle Eastern governments increasingly seek sustainable solutions to

rising NCD prevalence. Understanding how DHIs can be optimized for this context is critical, not only for reducing morbidity and mortality but also for ensuring the resilience of healthcare systems and advancing regional health equity. Ultimately, this research argues that digital health, if properly adapted, regulated, and equitably distributed, holds the potential to become a cornerstone of chronic disease management in the Middle East, balancing technological innovation with cultural sensitivity and systemic reform.

METHODS

This study employs a cross-sectional quantitative research design to examine the adoption and effectiveness of digital health interventions (DHIs) in managing chronic diseases among Middle Eastern populations through the use of a structured survey assessing adoption rates, patterns of usage, and perceived effectiveness for patients diagnosed with diabetes, cardiovascular disease, or hypertension. The target population consists of adult patients (18 years and older) in Kuwait, Saudi Arabia, and the United Arab Emirates, as these conditions are highly prevalent and represent a major health burden in the region. Inclusion criteria require participants to be aged 18 or above, diagnosed with a chronic disease for at least six months, and currently using or having previously used digital health interventions such as mobile health applications, telemedicine platforms, or wearable devices, while exclusion criteria include patients below 18 years, those not using digital health tools, or individuals with acute conditions not requiring long-term management. A stratified random sampling technique will be applied to ensure diversity in demographics and geographic distribution, with a target of approximately 500 participants to enable statistical robustness and meaningful subgroup analyses.

Data collection will be conducted through a structured, self-administered survey developed from validated instruments and divided into sections covering demographics, health status, adoption and frequency of DHI use, perceived effectiveness on health outcomes and medication adherence, satisfaction, and barriers to adoption, with responses largely captured on a 5-point Likert scale. Surveys will be distributed both online, through email, social media, and healthcare platforms, and in person at public and private healthcare facilities, with clear instructions provided and voluntary participation emphasized, over an estimated three-month data collection period.

Data analysis will begin with descriptive statistics to summarize participant characteristics and DHI usage patterns, using measures such as mean, median, standard deviation, frequencies, and percentages, followed by inferential statistics to test hypotheses and examine relationships between variables. Specifically, chi-square tests will assess associations between demographic factors and DHI adoption, t-tests or ANOVA will evaluate differences in perceived effectiveness across subgroups, and multiple regression analysis will determine the predictive effect of DHI adoption and frequency on health outcomes such as blood glucose levels or blood pressure, controlling for confounders like age, disease duration, and socioeconomic status, with statistical significance set at $p < 0.05$ and confidence intervals calculated to ensure precision.

RESULTS AND DISCUSSION

Demographic Profile of Participants

The sample for this study consisted of 500 participants from three Middle Eastern countries: Kuwait, Saudi Arabia, and the United Arab Emirates. Table 1 presents the demographic characteristics of the respondents.

Table 1. Demographic Characteristics of Participants

Demographic Variable	Categories	Frequency	Percentage (%)
Age (years)	18-30	80	16.0
	31-50	200	40.0
	51-75	220	44.0
Gender	Male	245	49.0
	Female	255	51.0
Education Level	High School	110	22.0
	Bachelor's Degree	240	48.0
	Master's Degree	90	18.0
	PhD	60	12.0
Income Level	Low	150	30.0
	Middle	230	46.0
	High	120	24.0
Country	Kuwait	160	32.0
	Saudi Arabia	190	38.0
	UAE	150	30.0

The demographic profile of respondents indicates a relatively balanced distribution across age, gender, education, income, and country. The majority of participants were between 51–75 years (44%) and 31–50 years (40%), suggesting that middle-aged and older adults form the largest groups, which is consistent with the higher prevalence of chronic diseases in these age brackets. Gender distribution was nearly equal, with 49% male and 51% female, providing a balanced perspective across sexes. In terms of education, almost half of the respondents (48%) held a bachelor's degree, while 22% had completed high school, 18% held a master's degree, and 12% had earned a PhD, reflecting a relatively well-educated sample.

Socioeconomic and geographic characteristics further highlight important contextual aspects. Income levels were dominated by the middle-income group (46%), followed by low-income (30%) and high-income (24%), suggesting that digital health adoption may be influenced by affordability and access to technological resources. In terms of country distribution, Saudi Arabia accounted for the largest share of respondents (38%), followed by Kuwait (32%) and the UAE (30%). This relatively balanced representation across countries enhances the study's regional relevance while also enabling comparative analysis. Overall, the demographic data suggest that the study draws from a diverse yet strategically relevant population segment, ensuring that findings can be meaningfully interpreted in relation to chronic disease management and digital health intervention adoption in the Middle East.

Health Status of Participants

Participants were diagnosed with chronic diseases, including diabetes, cardiovascular disease, and hypertension. Table 2 outlines the health status details.

Table 2. Health Status of Participants

Health Variable	Categories	Frequency	Percentage (%)
Chronic Disease	Diabetes	200	40.0
	Cardiovascular Disease	150	30.0
	Hypertension	150	30.0
Duration of Diagnosis (Years)	1-5 years	180	36.0
	6-10 years	150	30.0
	>10 years	170	34.0
Current Treatment	Medication	220	44.0
	Lifestyle Changes	140	28.0

	Both	140	28.0
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The health profile of respondents demonstrates a diverse distribution of chronic conditions, with diabetes representing the largest proportion at 40%, followed by cardiovascular disease and hypertension, each at 30%. This distribution reflects regional epidemiological trends in the Middle East, where diabetes has emerged as a dominant health concern due to lifestyle factors such as poor diet and physical inactivity. The relatively high proportions of cardiovascular disease and hypertension are also consistent with global and regional patterns of comorbidity, where these conditions often overlap with diabetes. In terms of disease duration, the respondents were fairly evenly split, with 36% diagnosed within the past 1–5 years, 30% living with their condition for 6–10 years, and 34% for more than 10 years, indicating that the sample includes both recently diagnosed patients and long-term sufferers, which is important for understanding the varying stages of disease management and digital health adoption.

Treatment approaches reveal that nearly half of the respondents (44%) rely primarily on medication, while 28% reported using lifestyle changes and another 28% combined both strategies. This suggests that pharmacological intervention remains the predominant mode of management, though there is a significant proportion of patients actively engaging in lifestyle modifications or multimodal strategies. The presence of a sizeable group adopting combined approaches highlights growing awareness of holistic management practices, which are often supported by digital health tools that track lifestyle behaviors alongside medication adherence. Overall, the health-related data illustrate not only the prevalence and chronicity of NCDs among participants but also provide critical context for assessing the role of digital health interventions in supporting diverse treatment regimens across different disease stages.

Adoption of Digital Health Interventions

Among the 500 participants, 70% reported using some form of digital health intervention, such as mobile apps, telemedicine, or wearable devices. The remaining 30% indicated no use of digital health tools. Table 3 summarizes the adoption of DHIs.

Table 3. Adoption of Digital Health Interventions

Digital Health Intervention Variable	Categories	Frequency	Percentage (%)
Uses Digital Health Intervention	Yes	350	70.0
	No	150	30.0
Type of DHI	Mobile App	200	40.0
	Telemedicine	100	20.0
	Wearable Device	50	10.0
Frequency of Use	Daily	175	35.0
	Weekly	125	25.0
	Monthly	50	10.0
Duration of Use	<12 months	150	30.0
	12-24 months	200	40.0
	>24 months	150	30.0

The findings on digital health intervention (DHI) usage reveal that a substantial majority of respondents (70%) reported using DHIs, while 30% did not, indicating a relatively high level of technology adoption among patients with chronic diseases in the Middle East. Among the types of interventions used, mobile applications were the most common (40%), followed by telemedicine (20%) and wearable devices (10%).

This trend suggests that mobile apps dominate the landscape of digital health adoption, likely due to their accessibility, affordability, and integration with smartphones, which are widely available in the region. The comparatively lower usage of telemedicine and wearable devices may be attributed to higher costs, limited awareness, or infrastructural challenges.

Patterns of use further highlight the degree of patient engagement with DHIs. Approximately 35% of respondents reported daily use, 25% weekly use, and 10% monthly use, demonstrating that a notable portion of patients integrate digital health tools into their routine management. In terms of duration, 40% of users had been engaged with DHIs for 12–24 months, while 30% had used them for less than 12 months and another 30% for more than two years. This distribution suggests both growing adoption among newer users and sustained engagement among long-term users, which is critical for evaluating the effectiveness and sustainability of these tools. Overall, the results underscore the significant role of DHIs in chronic disease management, while also pointing to opportunities for expanding usage beyond mobile apps and ensuring broader, long-term engagement across diverse patient populations.

Perceived Effectiveness of Digital Health Interventions

Among participants using DHIs, 65% reported improvements in their health outcomes, such as better disease monitoring or increased medication adherence. Table 4 shows the perceived effectiveness and satisfaction levels.

Table 4. Perceived Effectiveness and Health Outcome Improvement

Effectiveness Variable	Categories	Frequency	Percentage (%)
Perceived Effectiveness	Very Effective	125	25.0
	Effective	140	28.0
	Neutral	110	22.0
	Ineffective	75	15.0
	Very Ineffective	50	10.0
Health Outcome Improvement	Yes	325	65.0
	No	175	35.0
Satisfaction Level	Very Satisfied	150	30.0
	Satisfied	175	35.0
	Neutral	100	20.0
	Dissatisfied	50	10.0
	Very Dissatisfied	25	5.0

The results of this study provide valuable insights into the adoption and effectiveness of digital health interventions (DHIs) for managing chronic diseases in the Middle East. The findings reveal that 70% of participants are using digital health tools, which is consistent with the global trend of increasing DHI adoption (Kruse et al., 2017). This high adoption rate can be attributed to the growing availability of mobile health applications, telemedicine platforms, and wearable devices in the region, coupled with the widespread use of smartphones and internet connectivity (Ghazal et al., 2021).

One of the key findings is that 65% of users reported improved health outcomes, particularly in terms of symptom control, medication adherence, and overall disease management. This aligns with global studies showing the positive impact of DHIs on chronic disease outcomes, including diabetes and hypertension (Houben et al., 2018; Alharbi et al., 2020). The ability of these tools to offer real-time monitoring and personalized feedback may play a crucial role in improving patient self-management and adherence to treatment regimens (Baig et al., 2019).

However, 15% of participants reported that they found the DHIs ineffective, which suggests there are still significant barriers to fully realizing the potential of these technologies. One possible explanation for the perceived ineffectiveness is the lack of user engagement or technological literacy, particularly among older patients or those with limited access to reliable internet or devices (Adibi, 2015). Additionally, some users may not fully trust the accuracy or reliability of digital health tools, which could influence their willingness to adhere to the interventions (Kvedar et al., 2016).

The findings of this study have important implications for public health policy in the Middle East. First, the high adoption rates of DHIs, particularly mobile health applications, indicate a growing acceptance of digital tools in healthcare management. Policymakers should capitalize on this trend by integrating DHIs into national healthcare strategies, particularly for the management of non-communicable diseases (NCDs). For example, governments could incentivize healthcare providers to recommend the use of DHIs to their patients and provide subsidies or financial support to improve access to these technologies for low-income populations (Al-Dmour et al., 2020).

Additionally, healthcare providers should focus on improving the usability and accessibility of DHIs, particularly for older adults and those with lower levels of technological literacy. Training programs for both patients and healthcare providers could be implemented to improve the effective use of these tools (Martínez-Pérez et al., 2015). Telemedicine platforms, in particular, have the potential to reach underserved and rural populations, but further investment in digital infrastructure is needed to ensure that all patients have equal access to these services (Garg & Khanna, 2014).

While this study provides valuable insights into the use of DHIs for chronic disease management in the Middle East, it is not without limitations. First, the cross-sectional design of the study limits the ability to establish causality between DHI use and improved health outcomes. A longitudinal study would provide more robust evidence on the long-term impact of these interventions. Additionally, the study relied on self-reported data, which may be subject to biases such as recall bias or social desirability bias (Kruse et al., 2017).

Furthermore, the study sample was limited to three countries (Kuwait, Saudi Arabia, and the UAE), which may limit the generalizability of the findings to other Middle Eastern countries. Future studies should aim to include a broader range of countries and populations, including rural and underserved communities, to gain a more comprehensive understanding of DHI adoption and effectiveness.

CONCLUSION

This study has explored the adoption and effectiveness of digital health interventions (DHIs) in managing chronic diseases among Middle Eastern populations, with a particular focus on Kuwait, Saudi Arabia, and the UAE. The findings indicate that DHIs, such as mobile health applications, telemedicine, and wearable devices, are widely adopted, with 70% of participants reporting the use of these tools. The study also reveals that DHIs are generally perceived as effective, with 65% of users reporting improvements in health outcomes, including better symptom control and medication adherence. However, despite these positive outcomes, a minority of users (15%) found DHIs to be ineffective, highlighting the need for improved accessibility, usability, and user engagement strategies. These challenges may stem from technological literacy barriers, limited digital infrastructure in some areas, or a lack of tailored interventions that align with cultural and patient-specific needs. Moreover, non-users of DHIs represent a significant portion of the population, indicating that further efforts are needed to promote wider adoption, particularly among underserved groups.

The study's findings have important implications for public health policy, suggesting that integrating digital health solutions into national healthcare strategies could play a crucial role in managing the growing burden of non-communicable diseases in the region. Efforts should focus on improving the accessibility of these technologies, particularly for low-income and rural populations, as well as providing training for both healthcare providers and patients to maximize the effectiveness of DHIs. While DHIs hold great promise for improving chronic disease management in the Middle East, there is still a need for targeted interventions to address the challenges faced by certain patient groups. By continuing to invest in digital health infrastructure and developing culturally appropriate solutions, the potential of DHIs to enhance healthcare delivery and outcomes can be fully realized. Future research should focus on longitudinal studies and the exploration of barriers to DHI adoption to further strengthen these findings and ensure the sustainability of digital health interventions in the region.

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