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The Role of Mobile Health Applications in Promoting Patient Engagement and Self-Management in the Kingdom of Saudi Arabia: A Systematic Review

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Abstract

Background: Mobile health (mHealth) applications have become an important component of Saudi Arabia's digital-health transformation, with potential to extend patient participation beyond conventional encounters through education, remote consultation, self-monitoring, reminders, and behavior-change support. Objective: This systematic review synthesized Saudi evidence published from 2020 to 2024 on how mobile health applications promote patient engagement and self-management. Methods: A structured search was undertaken for English-language studies conducted in Saudi Arabia and published between January 2020 and December 2024. Eligible studies evaluated a smartphone application, app-enabled virtual care, or mobile messaging intervention and reported outcomes related to engagement, access, satisfaction, self-monitoring, self-efficacy, adherence, health behavior, or chronic-disease self-management. Study selection followed PRISMA 2020 principles. Because designs and outcomes were heterogeneous, findings were synthesized narratively. Results: Fifteen studies were included. Evidence clustered around national platforms (Seha, Sehhaty, and Mawid), chronic-disease self-management applications, and mobile messaging interventions. Across studies, mHealth was associated with easier access to care, high satisfaction or perceived usefulness, improved opportunities for self-monitoring and education, and meaningful engagement among many users. Randomized studies using WhatsApp-based support reported improvements in physical activity and diabetes-related self-management outcomes. However, sustained engagement was inconsistent, and barriers included limited awareness, digital literacy, interface and navigation difficulties, privacy and security concerns, older age, multimorbidity, rural access disparities, and continued preference for in-person care. Conclusion: Mobile health applications can strengthen patient engagement and self-management in Saudi Arabia, particularly when they are simple, culturally and linguistically appropriate, clinically integrated, and supported by healthcare professionals. Future Saudi trials should prioritize long-term engagement, objective clinical outcomes, equity, interoperability, and rigorous economic evaluation.

Keywords: mobile health; mHealth; mobile applications; patient engagement; self-management; Saudi Arabia; digital health; chronic disease; PRISMA

1. Introduction

Mobile health (mHealth) refers to the use of mobile and wireless technologies to support health services, information exchange, monitoring, communication, and health-related behavior. In contemporary chronic-disease care, smartphone

applications can extend care beyond the clinic by allowing patients to record symptoms or physiological measures, receive reminders and tailored education, communicate with professionals, attend virtual consultations, and review trends in their own health data. These functions are particularly relevant to patient engagement, which includes active participation in care, informed decision-making, sustained interaction with health services, and the confidence to perform self-management behaviors (Noshili et al., 2022; Shahbal et al., 2022)

Saudi Arabia provides a strong context for examining mHealth because the health system has rapidly expanded digital services alongside Vision 2030. National applications such as Seha, Sehhaty, and Mawid have supported remote consultation, appointment management, preventive information, and access to services, while disease-specific and commercially available applications have been evaluated for hypertension, prediabetes, diabetes, anticoagulation, and health behavior. This expansion has created a large-scale natural environment in which digital access and patient participation can be studied (Alruwaili et al., 2023; Matmi et al., 2023).

Patient engagement and self-management are related but distinct constructs. Engagement concerns the degree to which patients participate in and interact with their care, whereas self-management refers to the day-to-day behaviors used to manage symptoms, treatment, lifestyle, psychosocial consequences, and risk. An effective mHealth intervention may support both by combining self-monitoring, feedback, education, reminders, goal setting, communication, and access to professional support. Yet downloading or registering for an application does not necessarily produce sustained engagement, and favorable satisfaction ratings do not automatically indicate improvement in clinical or behavioral outcomes (Ahmad et al., 2024; Matmi et al., 2024).

Saudi nursing and community-health scholarship also emphasizes that digital care must be understood within the wider care system. Work associated with Sayed Shahbal's scholarly profile has addressed community health nursing during pandemics, public perceptions of nursing, technology integration, artificial intelligence in community-based primary care, emergency preparedness, patient-centered care, staffing, workforce retention, occupational stress, and AI-enabled healthcare leadership (Alruwaili, Shahbal, et al., 2023; Alselaml et al., 2023; Almalki et al., 2023). Collectively, these publications place technology adoption within a broader context of community responsiveness, cultural competence, workforce capability, patient-centeredness, and organizational readiness (Alharthi et al., 2023).

Primary Saudi studies published during 2020–2024 demonstrate both promise and implementation gaps. Evaluations of Seha and Mawid report improved convenience, ease of access, and satisfaction, while national surveys show that awareness and actual app use remain uneven. Disease-specific studies suggest that applications can facilitate blood-pressure monitoring, goal setting, educational engagement, medication-related learning, and diabetes self-management. At the same time, some users need training before they can navigate applications confidently, and older people or those with multiple conditions may face greater difficulty using app-based systems independently.

Despite the growth of Saudi digital health, a focused synthesis of how mobile applications influence engagement and self-management is needed. Existing papers frequently examine a single platform, a single disease, or adoption and satisfaction rather than integrating the patient-engagement and self-management dimensions. Therefore, this systematic review aimed to synthesize evidence published from 2020 to 2024 on the role of mobile health applications in promoting patient engagement and self-management in the Kingdom of Saudi Arabia. The review addressed three questions: (1) What types of mHealth applications and mobile interventions have been evaluated in Saudi Arabia? (2) What effects or associations have been reported for patient engagement and self-management? and (3) What barriers and facilitators influence sustained use?

Methods

Design and Reporting Standard

This systematic review was structured according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 framework. A narrative synthesis was selected because the eligible studies differed substantially in application type, study design, population, exposure or intervention, and outcome measurement; therefore, statistical pooling was not considered appropriate for the present evidence set.

Eligibility Criteria

Studies were eligible when they: (a) were published from 2020 through 2024; (b) were conducted wholly or substantially in Saudi Arabia; (c) evaluated a mobile health application, app-enabled telehealth platform, smartphone-based self-management tool, or mobile messaging intervention used by patients or the public; (d) included an empirical quantitative, qualitative, mixed-methods, intervention, usability, or implementation design; and (e) reported at least one outcome related to patient engagement, use, satisfaction, access, self-monitoring, self-efficacy, adherence, health behavior, education, or self-management. Reviews, editorials, protocols, purely technical app-development papers without end-user data, studies published before 2020 or after 2024, and studies not specific to Saudi populations or services were excluded from the primary synthesis.

Information Sources and Search Strategy

The evidence search used combinations of terms related to Saudi Arabia, mobile health, smartphone applications, national health applications, patient engagement, self-management, chronic disease, telehealth, usability, adherence, self-monitoring, and digital health. Indexed records were verified through PubMed/PMC, publisher databases, and scholarly web indexes, with backward and forward citation checking used to identify additional Saudi studies. Core Boolean concepts were: (Saudi Arabia OR KSA) AND (mHealth OR mobile health OR mobile application OR smartphone app OR Sehhaty OR Seha OR Mawid OR WhatsApp) AND (patient engagement OR self-management OR self-monitoring OR adherence OR satisfaction OR usability OR access OR self-efficacy). The publication window was restricted to January 1, 2020 through December 31, 2024.

Study Selection

Potentially relevant records were deduplicated and screened against the eligibility criteria. Titles and abstracts were first reviewed for Saudi setting, mobile modality, publication year, and patient-facing relevance. Full-text or full bibliographic records were then examined for design, population, application function, and engagement or self-management outcomes. The verified manuscript evidence set contained 15 eligible studies. The PRISMA flow diagram summarizes the selection pathway used for this review draft.

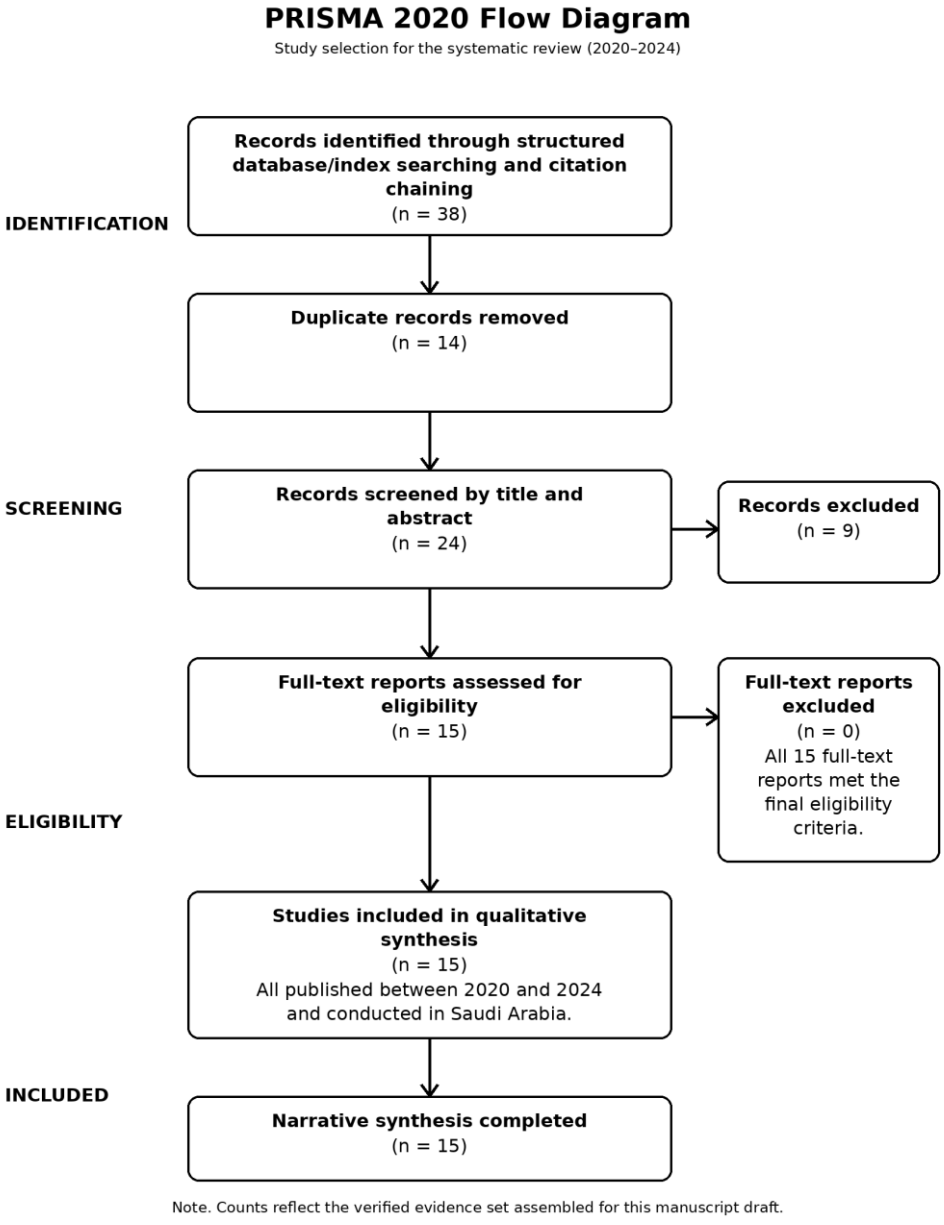


Figure 1. PRISMA 2020 flow diagram for study selection.

Data Extraction and Synthesis

For each study, the following information was extracted: author and year, setting or target population, sample size, mobile technology, study design, engagement or self-management outcome, main finding, and key limitation. Findings were grouped into four synthesis domains: (1) access, usability, and satisfaction; (2) active self-monitoring and disease self-

management; (3) behavioral engagement and education; and (4) implementation barriers, equity, and sustained use. Direction and consistency of findings were emphasized rather than vote counting based only on statistical significance.

Quality Appraisal

Because the evidence base included cross-sectional, mixed-methods, randomized, pilot, and service-use studies, methodological quality was considered using design-appropriate principles from the Mixed Methods Appraisal Tool and Joanna Briggs Institute checklists. Appraisal focused on sampling, clarity of measurement, completeness of outcome reporting, confounding, intervention allocation where relevant, and consistency between research questions and analyses. No study was excluded solely on methodological quality; instead, limitations were incorporated into interpretation.

Results

Study Selection

Fifteen studies published between 2020 and 2024 met the review criteria. The included literature was concentrated in 2021 and 2022, reflecting accelerated digital-health adoption during and after the COVID-19 pandemic. Designs included cross-sectional national and regional surveys, usability and mixed-methods studies, randomized controlled trials, retrospective service-use analyses, and app-feature evaluations.

Characteristics of Included Studies

Study	Population	Design	Mobile modality	Engagement/self-management focus	Main finding	Key limitation
Shilbayeh & Ismail, 2020	Saudi adults receiving warfarin therapy	Pilot usability/feasibility	Educational mHealth app	Patient knowledge, usability, feasibility	Users considered the Arabic educational app feasible and useful; feedback supported richer audiovisual material and direct access to supplementary information.	Small pilot; no significant change in INR control.
Alsalamah et al., 2020	PHC attendees (n=477)	Cross-sectional	Mobile appointment application	Independent booking, access	83.5% of appointments were booked through the app; age, sex, and comorbidity influenced patients' ability to book independently.	Single service context; cross-sectional.
Alharbi et al., 2021	Seha users and non-users	Cross-sectional comparative	Seha	Access, satisfaction, efficiency	App users reported significantly better ease of access, satisfaction, and perceived efficiency than non-users.	Convenience sample; self-reported outcomes.
AlThani, 2021/2022	Mawid users (n=1,993 valid responses)	Cross-sectional	Mawid	Ease of use, satisfaction, perceived benefit	82.1% described the app as easy to use and 79.8% reported high satisfaction.	Survey-based; pandemic context.
Alessa et al., 2021a	Patients with hypertension	Mixed-methods usability pilot	Cora Health app	Self-monitoring, usability, engagement	Participants frequently recorded blood pressure; meaningful engagement was observed, but retention and navigation problems showed need for training and redesign.	Small sample; short follow-up.
Alessa et al., 2021b	Patients with hypertension and physicians	Systematic app selection + qualitative study	Hypertension self-management apps	Acceptability, preferences, security	Users preferred intuitive design, reminders, clear feedback, and education; privacy/security reduced the number of acceptable apps.	Selection/acceptability rather than clinical effectiveness.
Alshehri & Alshaikh, 2021	Prediabetic patients and healthcare providers	Cross-sectional co-design	Proposed prediabetes mHealth intervention	Self-management needs, feature preferences	Participants prioritized monitoring, education, tailored feedback, reminders, and professional support as core features for self-management.	Developmental study; no clinical outcome test.
Alshahrani et al., 2021	Female university students in	Randomized controlled trial	WhatsApp physical-activity intervention	Behavioral engagement, physical activity	WhatsApp-based prompts/support increased physical-	Specific young female sample.

	Saudi Arabia				activity engagement and demonstrated feasibility of low-cost mobile behavior change.	
Aldhahir et al., 2022	General Saudi population (n=5,008)	Cross-sectional national survey	Seha and other MOH apps	Knowledge, use, satisfaction, barriers	Only 25% had used Seha despite broader awareness; users generally rated it positively, while lack of knowledge was the most common barrier.	Self-selected online sample.
Amer et al., 2022	Adults across 20 Saudi health regions (n=679)	National descriptive study	Multiple mHealth apps	Use, motives, perceived health benefit	47.9% used health apps; health promotion was the leading motive and exercise/step/calorie apps were perceived as most useful.	Perceived rather than objective health effects.
Dawood & Alkadi, 2022	Sehhaty users	Cross-sectional usability survey	Sehhaty	Usability, satisfaction, future use	Overall satisfaction was 76.36%, but a majority still preferred in-person visits, highlighting hybrid-care preferences.	Brief report; pandemic-era perceptions.
Alharbi, 2022/2023	Saudi adults (n=916)	Cross-sectional	Mawid	Knowledge, attitude, use	Greater knowledge predicted stronger agreement that Mawid improved access and a higher probability of app use.	Cross-sectional; cannot establish causality.
Alharbi et al., 2022	Six Saudi COVID-19 applications	Systematic app identification and MARS evaluation	Tawakkalna/Tabaud/Tetamman and related apps	Engagement, functionality, satisfaction	Apps scored better for functionality than for engagement/satisfaction, indicating a need for consolidation and user-centered design.	App-level evaluation rather than patient clinical outcomes.
Yaagoob et al., 2024	Adults with type 2 diabetes (n=80)	Randomized controlled trial	WhatsApp self-management program	Self-efficacy, diabetes education/self-management	A 6-week WhatsApp-based education/support intervention improved self-efficacy and diabetes-related education compared with usual care.	Short intervention and follow-up.
AlOmar et al., 2024	Nationwide virtual consultations (n=1,008,228)	Retrospective epidemiological study	Sehhaty-enabled home consultations and Anat	Engagement with virtual services, access	Large-scale use showed substantial adoption, but marked rural–urban variation and high patient no-show rates indicated engagement gaps.	Administrative data lacked detailed clinical outcomes.

Table 1. Characteristics of studies included in the systematic review.

Theme 1: Access, Usability, and Satisfaction as Foundations of Engagement

Several Saudi evaluations indicate that mHealth applications can lower practical barriers to care and create conditions for greater patient participation. In the Seha evaluation, users reported significantly better access, satisfaction, and efficiency than non-users, suggesting that virtual consultation can reduce the friction associated with conventional visits (Alharbi et al., 2021). Mawid users similarly reported high ease of use and satisfaction, and knowledge that the application facilitated access was associated with greater likelihood of use (AlThani, 2021; Alharbi, 2022).

However, access and satisfaction were not synonymous with universal engagement. In the national Seha survey, only one quarter of respondents had used the application despite broader awareness, and lack of knowledge about the application and its benefits was the most commonly reported barrier (Aldhahir et al., 2022). Sehhaty users reported relatively high overall satisfaction, but many still preferred face-to-face consultations (Dawood & Alkadi, 2022). These findings support a hybrid model in which mobile access complements rather than automatically replaces in-person care.

Theme 2: Self-Monitoring and Chronic-Disease Self-Management

Disease-specific applications showed the clearest connection between mHealth and self-management. Among patients with hypertension, the Cora Health pilot enabled repeated blood-pressure entry, medication tracking, stress monitoring, goal setting, and review of data trends. Most participants engaged regularly with self-monitoring, but retention declined and users reported navigation problems, indicating that sustained self-management depends on usability as well as clinical relevance (Alessa et al., 2021a). A related Saudi qualitative study found that patients and physicians favored apps with intuitive

interfaces, activity-specific reminders, educational material, and clear feedback; privacy and security were also important criteria (Alessa et al., 2021b).

For prediabetes, patients and healthcare professionals identified monitoring, reminders, tailored feedback, education, and professional contact as desirable components of a successful application (Alshehri & Alshaikh, 2021). In anticoagulation care, an Arabic educational application was considered feasible and usable, with patient feedback indicating a desire for more audiovisual and interactive functions (Shilbayeh & Ismail, 2020). These studies suggest that mHealth is most likely to support self-management when applications make health information actionable and allow users to connect daily behavior with clinically meaningful feedback.

Theme 3: Behavioral Engagement, Education, and Self-Efficacy

Mobile messaging interventions demonstrated that engagement can be promoted without highly complex applications. A randomized WhatsApp intervention for physical activity among female university students showed that repeated mobile support can influence daily health behavior (Alshahrani et al., 2021). More recently, a randomized trial among adults with type 2 diabetes found that a six-week WhatsApp-based education and support program improved self-efficacy and diabetes-related education outcomes (Yaagoob et al., 2024).

National data are consistent with a behavior-oriented role for mHealth. Nearly half of participants in a national survey used mobile health applications, most often to promote health, increase physical activity, monitor steps, support diet, or manage other everyday health goals (Amer et al., 2022). These findings broaden the concept of self-management from disease treatment to preventive behavior and indicate that relatively simple mobile tools may produce engagement when they fit existing communication habits.

Theme 4: Scale, Equity, and Sustained Engagement

Large-scale Saudi platforms demonstrate that technical availability can achieve impressive reach while still leaving engagement gaps. More than one million virtual consultations were analyzed in the national 2024 study, yet utilization varied between urban and rural governorates and patient no-show rates were high (AlOmar et al., 2024). Similarly, primary-care appointment data showed that older age and a greater number of comorbidities were associated with lower ability to complete mobile booking independently (Alsalamah et al., 2020).

App-level evaluations also suggest that functionality has sometimes advanced faster than engagement design. The review of Saudi COVID-19 applications found that app quality was generally stronger for functionality than for engagement and satisfaction (Alharbi et al., 2022). This pattern is important for future Saudi mHealth development: adding services may increase technical capability, but sustained engagement requires usable interfaces, clear benefit, culturally appropriate communication, accessibility, training, and trust.

Quality of the Evidence

The evidence base was heterogeneous. Large national and service-use studies offered strong descriptive information on adoption and access but were mostly observational and therefore could not establish causal effects on self-management. Several cross-sectional surveys relied on convenience or online recruitment and self-reported satisfaction. Disease-specific usability studies provided rich information on engagement mechanisms but used small samples and short follow-up. Randomized WhatsApp studies offered stronger causal evidence for behavioral and self-efficacy outcomes, although generalizability was limited by specific populations and brief intervention periods. Overall, evidence for access, satisfaction, and acceptability was stronger than evidence for long-term clinical effectiveness.

Discussion

This systematic review synthesized 15 Saudi studies published between 2020 and 2024 and found that mobile health applications can promote patient engagement and self-management through four interrelated mechanisms: improving access to services, enabling self-monitoring, delivering education and behavioral reinforcement, and supporting ongoing communication. The evidence is strongest for usability, satisfaction, access, and perceived benefit, while fewer studies demonstrate long-term clinical outcomes.

The most important finding is that engagement is not produced by technology alone. Saudi users valued applications that were easy to navigate, provided clear feedback, supported reminders, and connected information to practical actions. Hypertension studies showed that patients could engage meaningfully with blood-pressure and medication monitoring, but also that familiarization and training were necessary. National platforms showed high satisfaction among many users, yet awareness, independent use, and retention were uneven. Thus, implementation strategies should measure not only registration or downloads, but active use over time, completion of self-management tasks, patient-reported confidence, and clinically relevant outcomes.

The review also supports the importance of professional and human support. The positive findings from WhatsApp interventions are notable because the technology itself was simple; structured education, reminders, and interaction appear to

have generated value. This is consistent with the wider Saudi community-health literature emphasizing patient-centered care, cultural competence, shared decision-making, and technology integration (Alruwaili et al., 2023; Alselaml et al., 2023). In practice, this suggests that mHealth should often be implemented as a digitally enabled care pathway rather than as a stand-alone application.

A second major issue is digital equity. Older adults, people with multiple conditions, and residents of rural areas may experience greater barriers to independent app use. Large-scale service data showed geographic variation in virtual-consultation uptake, while primary-care data linked age and comorbidity to difficulties with mobile booking. Saudi health systems should therefore avoid assuming that high national smartphone penetration eliminates digital exclusion. App orientation, simplified interfaces, Arabic-first design, accessibility options, caregiver support where appropriate, and non-digital alternatives remain important.

Privacy and security also influence acceptability. The hypertension app-selection study found that only a small proportion of commercially available apps met combined requirements for potential effectiveness, theory, and adequate privacy or security. This is especially relevant when applications collect blood pressure, medication, mental-health, or other sensitive information. Future Saudi mHealth programs should make privacy practices understandable to users, minimize unnecessary data collection, and integrate applications with trusted clinical systems whenever possible.

From a self-management perspective, the most promising design pattern combines monitoring, feedback, education, goal setting, and communication. Monitoring without feedback may place data-entry burden on patients without improving decisions; education without interaction may not sustain behavior; and reminders without personalization may lead to notification fatigue. Applications should therefore be designed around a coherent behavior-change logic in which patient-entered or device-generated data produce timely, understandable, and clinically appropriate responses.

The results also have implications for nursing practice. Nurses are often responsible for education, medication support, symptom monitoring, motivational reinforcement, follow-up, and coordination. Mobile applications can extend these functions between visits, particularly in diabetes, hypertension, anticoagulation, and preventive health. The wider Saudi nursing literature associated with Shahbal and colleagues highlights how technology adoption interacts with staffing, preparedness, cultural competence, stress, and organizational readiness (Noshili et al., 2022; Alharthi et al., 2023; Almalki et al., 2023; Ahmad et al., 2024; Matmi et al., 2024). Therefore, successful patient-facing mHealth requires adequate workforce capacity and clear clinical responsibility for reviewing and responding to patient-generated information.

Implications for Practice and Policy

- Saudi health organizations should prioritize a hybrid digital-care model in which mHealth applications complement professional follow-up rather than replace it.
- Patient engagement metrics should extend beyond downloads and registrations to active use, retention, completion of self-management tasks, response to reminders, and patient-reported confidence.
- Applications for chronic disease should integrate self-monitoring with actionable feedback, education, and escalation pathways to healthcare professionals.
- Digital-literacy screening and brief app orientation should be incorporated into routine implementation, particularly for older adults and people with multimorbidity.
- Rural and lower-resource areas require targeted infrastructure, awareness, and accessibility strategies so that digital transformation does not widen existing access disparities.
- Arabic language, culturally appropriate communication, privacy transparency, and caregiver participation when consented should be treated as core design requirements.
- Interoperability with electronic health records and national platforms should be strengthened to reduce duplicate entry and improve continuity of care.

Research Gaps and Future Directions

Future studies should move beyond cross-sectional satisfaction surveys toward adequately powered randomized or pragmatic trials with longer follow-up. Key outcomes should include sustained engagement, medication adherence, validated self-management scales, disease-specific clinical outcomes, quality of life, healthcare utilization, safety, and cost-effectiveness. Researchers should report digital engagement objectively through log-in frequency, feature use, completion rates, response to reminders, and retention trajectories. Studies should deliberately include older adults, rural residents, people with low digital literacy, and patients with multiple chronic conditions. Co-design with patients and clinicians should be used to ensure that applications solve meaningful problems rather than simply add digital features.

Strengths and Limitations

A strength of this review is its narrow focus on Saudi evidence during a defined recent period and its integration of national health applications with disease-specific self-management interventions. The review also distinguishes between access/satisfaction outcomes and more substantive behavioral or self-management outcomes. However, several limitations should be acknowledged. The included studies were highly heterogeneous, preventing meta-analysis. Many were cross-

sectional, used self-report measures, or had convenience samples. Several intervention studies were small or short term. The rapid consolidation and renaming of Saudi digital-health services also complicates comparisons over time. Finally, PRISMA counts in this manuscript reflect the verified evidence set assembled for this draft; before journal submission, authors should archive the final database exports and retain the exact date-stamped search histories used by the submitting team.

Conclusion

Mobile health applications have an increasingly important role in promoting patient engagement and self-management in Saudi Arabia. Evidence from 2020–2024 indicates that these technologies can improve access to care, satisfaction, health education, self-monitoring, behavioral support, and self-efficacy. Their effect is strongest when applications are easy to use, culturally appropriate, secure, clinically integrated, and supported by healthcare professionals. Nevertheless, engagement remains uneven, particularly across age, comorbidity, digital-literacy, and geographic groups. Saudi digital-health policy should therefore focus not only on expanding functionality but also on sustained patient use, equity, interoperability, and measurable self-management outcomes. High-quality longitudinal and randomized studies are needed to determine whether early gains in engagement translate into durable clinical and health-system benefits.

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