Review Article

Onumajuru et al. AJPHN 2024; 1 (X): - http://doi.org/10.62377/1p736r19

Digital Health Utilisation in Nigeria: A Scoping Review

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Abstract

Submitted: 18.02.2024
Accepted: 24.05.2024
Published: 27.05.2024

Background: The widespread use of mobile phones and technologies in Nigeria presents a unique opportunity that the country can take advantage of in improving access to healthcare. However, evidence on digital health utilization among Nigerians is limited. Therefore, a scoping review was conducted using the PCC (Population, Concept, Context) framework, under the Joanna Briggs Institute guidelines, in which a systematic mapping of available evidence on digital health utilization by patients and healthcare professionals in Nigeria was carried out. **Methods:** The databases PubMed, CINAHL and MEDLINE with full text via EBSCOhost were thoroughly searched for relevant peer-reviewed articles from the inception of digital health technology until October 2023. Using the eligibility criteria as reference, abstracts and full-texts of 170 articles were screened and 13 records were ultimately selected for the review. **Results:** Of the 13 included articles, six provided evidences on digital health utilization by health professionals and seven provided evidences on digital health utilization by patients. Patients were enthusiastic about digital health use but the cost of owning a mobile phone was an important barrier. Health professionals had mixed feelings about digital health utilization; whereas perceived usefulness of the technology was an important motivator, lack of computer literacy was an important barrier. **Conclusion**: The study shows that there is limited published research on digital health utilization in Nigeria. Crucially, very little has been studied about what impact concerns about patient data privacy and safety have on digital health utilization in Nigeria. Further primary research on the motivators of and barriers to digital health utilization by healthcare workers and patients in Nigeria is recommended.

Keywords: eHealth; mHealth; mobile health; electronic health records; digital health

Introduction

The World Health Organization (WHO) defines digital health as the systematic application of information and communications technologies, computer science, and data to support informed decision-making by individuals, the health workforce, and health systems, to strengthen resilience to disease and improve health and wellness (World Health Organization, 2023). Over the past few decades, digital health has come to represent a fundamental change to the way people around the world access their healthcare.

Nigeria is Africa's most populous country and its largest economy, but it has an overburdened and under-resourced healthcare system (United Nations Nigeria, 2022). Nigeria is consequently off-track with achievement of several of its health indicator targets for the sustainable development goals as it struggles with high levels of maternal mortality, infant and child morbidity and mortality, and poor management of infectious diseases and non-communicable diseases (Sachs et al., 2023). People living in rural and under-served areas of the country have little access to good quality healthcare. On the other hand, Nigeria has witnessed increasing access to mobile devices in recent years. As at early 2023, its mobile phone penetration rate stood at 87.7% of the population and its internet penetration was 55.4% (Kepios, 2023). There is great potential for expanding the people's access to good quality healthcare by taking advantage of the widespread adoption of mobile and internet technologies.

For the purposes of our study, we have adopted Chan's broad separation of digital health into eHealth and mHealth (2021). Chan notes that eHealth refers to the use of information and communication technologies for health and exists mainly in the form of electronic health records or electronic medical records. "Electronic health records" refers to information about a patient's health which have been compiled during interactions with the patient within and across health organisations. In this work, we have used the terms eHealth, electronic health records and electronic medical records interchangeably. mHealth refers to "the medical and public health practice supported

Onumajuru et al. AJPHN 2024; 1 (X): - http://doi.org/10.62377/1p736r19

by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs) and other wireless devices" (Chan, 2021).

Although several studies have demonstrated the immense value of digital health utilisation in the developed countries in which they are widely used, very little is known about the extent to which digital health in Nigeria is utilised by patients or by the healthcare workers who care for them. There is also not much information available about the factors that could serve as enablers of or hindrances to the utilisation of mHealth and eHealth by patients and healthcare providers.

Despite the enormous potential that digital health has for solving the problem of providing access to good quality care for Nigerians, particularly those living in underserved, hard-to-reach places, no study has mapped existing literature on digital health utilisation in Nigeria. Therefore, this study aims to map evidence on the utilisation of eHealth and mHealth technologies by patients and healthcare professionals in Nigeria, and what factors enable or hinder that utilisation.

Method

This scoping review aims to map evidence available about the degree to which digital health tools are accepted and utilised by healthcare providers and patients in Nigeria. A scoping review was selected because of a dearth of published primary research material on the subject. The scoping review has been performed according to the 2015 Joanna Briggs Institute (JBI) guidelines. A search was conducted for peer-reviewed quantitative, qualitative, and mixed-methods studies which dealt with the use of digital health tools by health practitioners and by patients in Nigeria. The findings have been documented following the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-analysis: Extension for Scoping Review (PRISMA-Scr).

The research questions that this study addresses are:

- What evidence is available on the utilisation of digital health by health professionals and patients in Nigeria?
- What factors influence digital health utilisation by these groups?

The framework used to determine the eligibility of the research question is the Population, Concept and Context (PCC) framework which was developed by the JBI. A breakdown of that framework is set out in Table 1.

Eligibility criteria

To be included in the review, papers needed to have focussed on or provided evidence of the utilisation of electronic medical records, eHealth or mobile health tools in patient care. Peer-reviewed journal papers were included if they were: published between 2000-2023, written in English, reported evidence of health workers or patients in Nigeria using mHealth or eHealth, reported how patients or health workers in Nigeria felt about using mHealth or eHealth, or identified factors that influenced the decision of health workers or patients in Nigeria to use mHealth or eHealth. Qualitative, quantitative and mixed-methods studies were included. This was to ensure that all aspects of the subject were thoroughly covered. Papers were excluded if they did not match the conceptual framework of the study, reported on digital health utilisation in places other than Nigeria, were case studies or case reports, design studies, and short communications, reported on digital health used for purposes of medical training and training of other health workers, reported on digital health tools like wearables, or reported on digital health but was not focussed on its utilisation by patients or by healthcare workers.

Literature search and data sources

A systematic literature search was conducted from PubMed as well as from CINAHL and MEDLINE with full text via EBSCOhost. The database searches conducted were from the inception of digital health technology until October 2023. The following keywords were used for the search: "digital health", "digital medicine", "electronic health", "eHealth", "mobile health", "mHealth", "telemedicine", "telehealth", "virtual medicine", "utilisation", "utilization", "use", "implementation", "adoption", "Nigeria", "Nigerian", "physician", "doctor", "nurse", and "health professional". Wildcards were used as appropriate to ensure that spelling variations did not exclude eligible results from the search. The Boolean terms AND and OR were used to separate the keywords. No date or language limitations were applied to the search, in order to widen the scope of the search and therefore to capture the full range of available literature on digital health utilisation. The search results were populated in Microsoft Excel and duplicates were removed.

Onumajuru et al. AJPHN 2024; 1 (X): - http://doi.org/10.62377/1p736r19

The study selection was done in two stages. An electronic database search was conducted, and article titles were screened, guided by the eligibility criteria. Then the abstracts and subsequently the full-text articles were screened to select those to be used for the study. The included selected articles were read for data extraction and data was subsequently charted on Microsoft Excel® on the following parameters: author and year of publication, study design, study setting, target population, digital health type, study focus and key findings from the study. See **Error! Reference source not found.**.

Table 1. PCC framework for defining the eligibility of the studies.

Determinant	Description
Population	Health professionals: this includes all categories of trained health professionals, including medical doctors, nurses, midwives, community health workers, pharmacists, pharmacy technicians, biomedical scientists, laboratory technicians, radiologists, and other allied health professionals working within healthcare facilities located in Nigeria. Patients: this includes all patients of all categories using any healthcare facility located in Nigeria.
Concept	Digital health: this includes all electronic health (e-health) and mobile health (m-health) tools as well as any other advanced computing tools used in the identification or detection and treatment of any form of disease, as well as in helping patients manage their clinical conditions without requiring their physical presence in the healthcare facility.
Context	Utilisation in Nigeria: this examines the extent to which the available digital health tools are utilised in Nigeria to achieve the detection, treatment and prevention of diseases.

Results screening

Database searches for this scoping review produced 2,697 articles, out of which 268 met the eligibility criteria for title screening. Of the 268 articles, 98 were dropped because they were duplicates, and this left 170 articles for abstract screening. These 170 articles were collected in a list populated on Microsoft Excel and thereafter, we commenced abstract and full-text screening. After abstract and full-text screening, a total of 157 articles were excluded, leaving a total of 13 articles that met the criteria for inclusion into the study and subsequent data extraction. (See Figure 1).

Characteristics of included articles

Out of the 13 included articles, six studies reported on digital health utilisation by healthcare workers (Onigbogi et al., 2018; Zayyad and Toycan, 2018; Ojo and Adegbile, 2021; Akwaowo et al., 2022; Ojo et al., 2022; Ayamolowo, Irinoye and Olaniyan, 2023), and seven studies reported on digital health utilisation by patients (Odigie et al., 2011; Obasola and Mabawonku, 2018; Olamoyegun et al., 2020; Eze et al., 2021; Peter et al., 2021; Olajubu, Fajemilehin and Olajubu, 2022; Itanyi et al., 2023); of the studies that reported on digital health utilisation by healthcare workers, one reported on use by doctors (Onigbogi et al., 2018), two studies reported on use by nurses (Ojo and Adegbile, 2021; Ayamolowo, Irinoye and Olaniyan, 2023), and three reported on use by mixed categories of healthcare professionals (Zayyad and Toycan, 2018; Akwaowo et al., 2022; Ojo et al., 2022); of the studies that reported on digital health utilisation by patients, three studies reported on mHealth use in the obstetric setting (antenatal and postnatal) (Obasola and Mabawonku, 2018; Olajubu, Fajemilehin and Olajubu, 2022; Itanyi et al., 2023), two reported on use by patients with chronic conditions like oncology patients (Odigie et al., 2011) and patients with diabetes mellitus (Olamoyegun et al., 2020), one reported on use by patients who were getting visual acuity assessments (Peter et al., 2021) and one reported on use by patients for routine vaccination appointments (Eze et al., 2021); The 13 included articles were methodologically diverse, comprising two

Onumajuru et al. AJPHN 2024; 1 (X): - http://doi.org/10.62377/1p736r19

qualitative studies (Olajubu, Fajemilehin and Olajubu, 2022; Itanyi et al., 2023), eight quantitative studies (Onigbogi et al., 2018; Zayyad and Toycan, 2018; Olamoyegun et al., 2020; Eze et al., 2021; Ojo and Adegbile, 2021; Peter et al., 2021; Akwaowo et al., 2022; Ojo et al., 2022), and three mixed method studies (Odigie et al., 2011; Obasola and Mabawonku, 2018; Ayamolowo, Irinoye and Olaniyan, 2023). All the included articles were published in English.

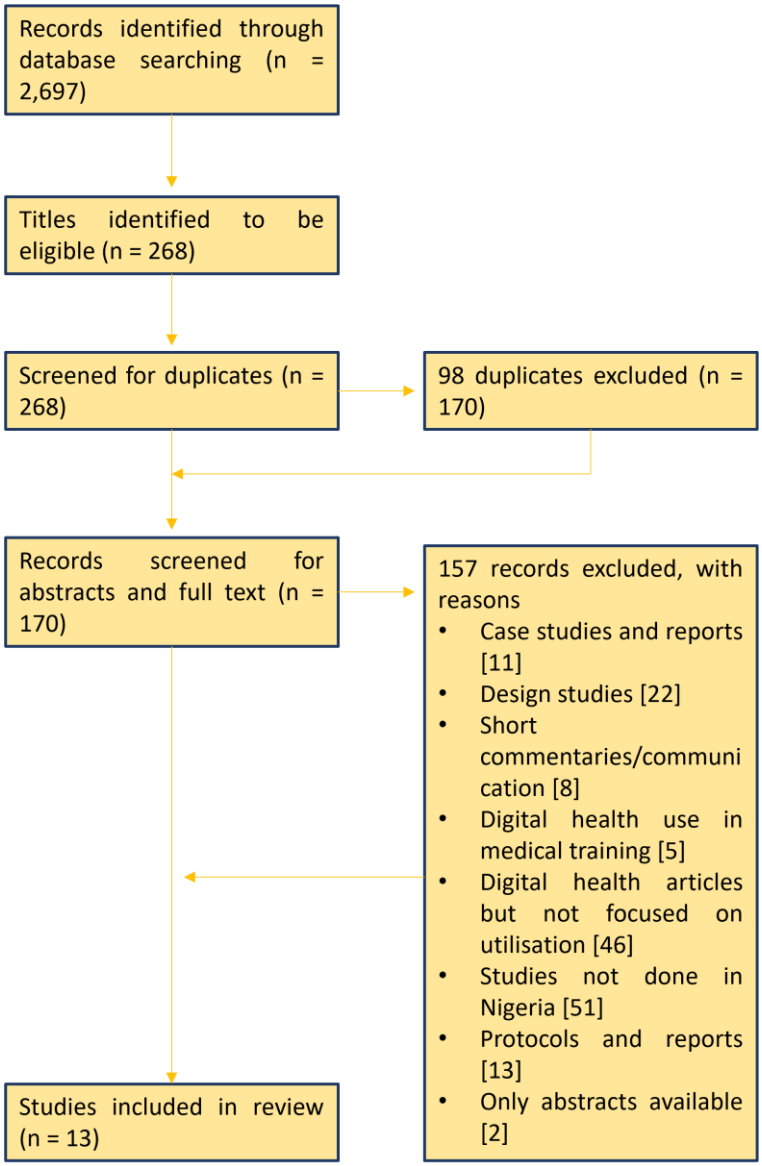

Figure 1. PRISMA-Scr flow chart showing literature search and selection of studies

Results

All the included studies (Odigie et al., 2011; Obasola and Mabawonku, 2018; Onigbogi et al., 2018; Zayyad and Toycan, 2018; Olamoyegun et al., 2020; Eze et al., 2021; Ojo and Adegbile, 2021; Peter et al., 2021; Akwaowo et al., 2022; Ojo et al., 2022; Olajubu, Fajemilehin and Olajubu, 2022; Ayamolowo, Irinoye and Olaniyan, 2023; Itanyi et al., 2023) reported use of digital health by health workers and patients in Nigeria. Themes from the included studies are disposition of patients and healthcare professionals towards the use of digital health, factors encouraging digital health utilisation, and barriers to digital health utilisation.

The included studies that reported on digital health utilisation among patients recorded its use in the form of mHealth in obtaining access to antenatal services (Itanyi et al., 2023), receiving educational messages about their health (Obasola and Mabawonku, 2018; Olamoyegun et al., 2020; Olajubu, Fajemilehin and Olajubu, 2022), carrying out a clinical examination in the form of a visual acuity assessment (Peter et al., 2021), contacting the hospital to seek advice about their medical care (Odigie et al., 2011), and receiving reminders for routine

vaccination appointments (Eze et al., 2021). Studies that reported on digital health utilisation among healthcare workers recorded its use in the form of electronic health records (Onigbogi et al., 2018; Akwaowo et al., 2022; Ojo et al., 2022; Ayamolowo, Irinoye and Olaniyan, 2023) and e-Health technology (Zayyad and Toycan, 2018).

Disposition of Patients and Healthcare Professionals Towards the Use of Digital Health

Whereas six of the included studies (Onigbogi et al., 2018; Zayyad and Toycan, 2018; Ojo and Adegbile, 2021; Akwaowo et al., 2022; Ojo et al., 2022; Ayamolowo, Irinoye and Olaniyan, 2023) reported on how healthcare professionals felt about the use of digital health, the remaining seven studies (Odigie et al., 2011; Obasola and Mabawonku, 2018; Olamoyegun et al., 2020; Eze et al., 2021; Peter et al., 2021; Olajubu, Fajemilehin and Olajubu, 2022; Itanyi et al., 2023) examined patients' acceptance of digital health.

All seven papers that studied patients (Odigie et al., 2011; Obasola and Mabawonku, 2018; Olamoyegun et al., 2020; Eze et al., 2021; Peter et al., 2021; Olajubu, Fajemilehin and Olajubu, 2022; Itanyi et al., 2023) recorded a favourable disposition of patients in Nigeria towards digital health use. Patients described feelings of elation and acknowledged that the technology made available to them health information that was apt, relevant and useful to them (Olajubu, Fajemilehin and Olajubu, 2022), was easy to use (Peter et al., 2021), made their medical information more easily accessible and reduced their clinic waiting time (Itanyi et al., 2023), and made the process of childbirth less challenging (Olajubu, Fajemilehin and Olajubu, 2022). A remarkable improvement in patients' engagement with their treatment and ability to keep up with follow-up appointments was noted among mHealth users (Odigie et al., 2011), as was a greater use of postnatal services (Olajubu, Fajemilehin and Olajubu, 2022). Patients indicated their interest in continuing to receive health information (Obasola and Mabawonku, 2018; Olamoyegun et al., 2020) and appointment reminders (Olamoyegun et al., 2020; Eze et al., 2021) and were willing to pay for mHealth services if and when they became available (Olamoyegun et al., 2020).

Among the studies that reported on healthcare workers, two studies (Ojo and Adegbile, 2021; Ojo et al., 2022) recorded an unfavourable perception of healthcare workers towards electronic health records integration, despite conceding that the use of electronic health records would improve job performance and make their work easier (Ojo and Adegbile, 2021). In contrast, another study (Onigbogi et al., 2018) reported a favourable disposition by healthcare workers towards the use of electronic medical records. Three studies (Zayyad and Toycan, 2018; Akwaowo et al., 2022; Ayamolowo, Irinoye and Olaniyan, 2023) reported factors affecting the disposition of healthcare workers towards digital health use.

Factors Affecting Digital Health Utilisation Among Healthcare Workers in Nigeria

Several factors were identified as important for digital health utilisation including perceived usefulness of the technology (Zayyad and Toycan, 2018; Akwaowo et al., 2022; Ojo et al., 2022), ease of use of electronic health records systems (Ayamolowo, Irinoye and Olaniyan, 2023) and other digital health tools (Peter et al., 2021), management support and stakeholder engagement (Zayyad and Toycan, 2018; Akwaowo et al., 2022), access to information and knowledge (Akwaowo et al., 2022; Ayamolowo, Irinoye and Olaniyan, 2023), availability of support personnel with the requisite knowledge (Ojo et al., 2022; Ayamolowo, Irinoye and Olaniyan, 2023), computer literacy of the healthcare worker (Zayyad and Toycan, 2018; Akwaowo et al., 2022), awareness of, or previous experience in using digital health applications (Zayyad and Toycan, 2018; Akwaowo et al., 2022; Ayamolowo, Irinoye and Olaniyan, 2023), the incentivisation of digital health use by healthcare workers (Ayamolowo, Irinoye and Olaniyan, 2023), availability of resources and infrastructure for digital health implementation (Zayyad and Toycan, 2018; Akwaowo et al., 2022; Ayamolowo, Irinoye and Olaniyan, 2023), and healthcare worker concerns over user data privacy and safety (Zayyad and Toycan, 2018; Akwaowo et al., 2022).

Barriers to Digital Health Utilisation in Nigeria

Studies targeting healthcare workers identified barriers to digital health use including poor funding of the health system (Zayyad and Toycan, 2018; Ojo et al., 2022), cost implications for the training of members of staff (Ayamolowo, Irinoye and Olaniyan, 2023), the lack of a written policy on use of electronic health records (Zayyad and Toycan, 2018; Ayamolowo, Irinoye and Olaniyan, 2023), infrastructural problems, in particular, the lack of reliable electricity supply and poor internet connectivity (Zayyad and Toycan, 2018; Ojo and Adegbile, 2021), concerns about risk and safety of data (Zayyad and Toycan, 2018; Akwaowo et al., 2022), limited technical and educational support for users (Ojo et al., 2022), workload and inadequate manpower (Ayamolowo, Irinoye and Olaniyan, 2023), difficulty adopting EHR terminologies (Ayamolowo, Irinoye and Olaniyan, 2023), and poor digital literacy (Zayyad and Toycan, 2018; Akwaowo et al., 2022; Ojo et al., 2022).

Onumajuru et al. AJPHN 2024; 1 (X): - http://doi.org/10.62377/1p736r19

Studies on patients identified the following as barriers to digital health utilisation: lack of access to a mobile phone (Olajubu, Fajemilehin and Olajubu, 2022), to internet services (Olamoyegun et al., 2020), and to adequate information on how to use the technology (Itanyi et al., 2023), costs associated with owning a mobile phone and with digital health services (Olamoyegun et al., 2020; Peter et al., 2021; Itanyi et al., 2023), and irregular supply of electricity needed to charge the mobile phones (Olamoyegun et al., 2020).

Sociodemographic Data and Digital Health Utilisation

The evidence on the respective roles of gender and age in influencing digital health utilisation was mixed, with some studies suggesting that they are significant factors in digital health utilisation (Ayamolowo, Irinoye and Olaniyan, 2023), and others suggesting that they are not (Akwaowo et al., 2022). Two studies (Onigbogi et al., 2018; Akwaowo et al., 2022) found no significant association between the age and sex of healthcare workers and their perception about digital health utilisation. However other studies found a significant association between the age (Ojo and Adegbile, 2021; Ayamolowo, Irinoye and Olaniyan, 2023) and gender (Akwaowo et al., 2022; Ayamolowo, Irinoye and Olaniyan, 2023) of healthcare workers and their acceptance of digital health. While some studies found no association between the healthcare workers' level of education (Ojo and Adegbile, 2021; Ojo et al., 2022), cadre/rank (Ojo et al., 2022), years of work experience (Ojo and Adegbile, 2021; Ojo et al., 2022) and their willingness to use digital health tools, other studies recorded a significant association between the healthcare workers' level of education (Ayamolowo, Irinoye and Olaniyan, 2023), years of working experience (Onigbogi et al., 2018) and their perception of EHR integration.

Discussion

This scoping review has mapped existing literature on the utilisation of digital health by healthcare workers and patients in Nigeria. Digital health options reviewed are mobile health (mHealth) and electronic health (eHealth). Most of the digital health types used by patients in the included studies are mHealth. In contrast, healthcare workers in the included studies have used eHealth, with electronic health records making up the larger part of this subset. In this section, I discuss how the findings from this review address the research questions:

Digital Health Utilisation by Patients in Nigeria

The findings show that female pregnant patients were favourably disposed to digital health utilisation for aspects of their postnatal care. This agrees with another study done in Singapore, which confirmed the willingness of mothers to utilise mHealth in their postnatal care (Shorey, Yang and Dennis, 2018). Pregnant patients acknowledged that the mHealth-delivered messages helped them decide to access and utilise the hospital's delivery and postnatal care services. Similar findings were noted in a study in Ethiopia conducted by Shiferaw et al., (2016). Findings from our review show that patients recognise the importance of digital health use in the improvement of their outpatient care, their antenatal, postnatal and childcare as well as for healthcare delivery in oncology and in the management of chronic medical conditions like diabetes mellitus. These findings are consistent with findings from another study carried out in Ghana in which the introduction of digital health improved antenatal care attendance, utilisation of postnatal care services and continuum of care (Nuhu et al., 2023). In our review, we found also that patients were willing to pay for mHealth services, if and when they became available. Jemere et al., (2019) made similar findings in Ethiopia.

Digital Health Utilisation by Healthcare Professionals in Nigeria

This review revealed mixed positions among healthcare workers on integration of digital health within the health system. Whereas some studies recorded a positive disposition by healthcare workers towards digital health integration, others recorded a preference by healthcare workers for using paper-based records, therefore maintaining the status quo. A possible reason for this is that some of the studies documented contradictory positions on some of the factors that influence digital health acceptability. For instance, whereas most of the studies reviewed agreed that funding represents an important determinant in the acceptability of electronic health records and therefore digital health systems, the same unanimity was not evident in the responses to whether ease of use of the technology could influence its acceptability. While perceived ease of use was recognised as a significant factor influencing digital health utilisation in a few of the studies included in this review, others found the extent of its influence to be less than significant. This latter finding was corroborated by other studies (Dünnebeil et al., 2012; Hossain, Quaresma and Rahman, 2019).

Onumajuru et al. AJPHN 2024; 1 (X): - http://doi.org/10.62377/1p736r19

Factors Influencing Digital Health Utilisation in Nigeria

Healthcare workers in Nigeria agree that perceived usefulness of technology is an important factor that determines the acceptability of electronic health records to them, according to the evidence we have mapped. This agrees with what Sifat et al., (2022) found in their study in Bangladesh. Health care workers agreed that computer literacy was an important factor influencing acceptability of digital health integration. Sibya et al., (2023) and Mugo and Nzuki (2014) drew similar conclusions in their separate studies. Availability of suitable infrastructure is another factor that was identified from most of the records reviewed as being a factor influencing digital health use by healthcare staff. Infrastructure in this context refers to the availability of electricity supply, the availability and reliability of internet access and connectivity, the volume of bandwidth available, and access to computers. This agrees with the conclusions reached by Ahmadi et al., (2018) and is also in sync with findings by Mugo and Nzuki (2014) in their study of electronic health in developing countries. Incentivisation and support from Management were identified as another positive influence on digital health use by healthcare professionals. This is in keeping with findings recorded by Adenuga, Iahad and Miskon (2017) and Khan et al., (2012). Ease of use of the technology was also noted to be an influencing factor in digital health utilisation, as also attested to in Nwaogu et al., (2021).

Barriers to Digital Health Utilisation in Nigeria

Most of the records reviewed identified the lack of infrastructure – referring to electricity supply, internet connectivity, and bandwidth availability – as significant barriers to digital health utilisation by patients. Although the studies reviewed differed in the extent to which they found this barrier significant, the basic finding agrees with findings from studies elsewhere (Quaglio et al., 2017; Aamir et al., 2018). The results also reveal that access to a mobile phone and the cost of owning such a phone are barriers to the utilisation of digital health by patients in Nigeria. A 15-country study by Lefevre et al., (2020) yielded similar results. Mobile phones are important for accessing many of the features of mHealth but are out of reach of many Nigerians due to their low purchasing power.

Records reviewed showed that among healthcare workers, lack of computer literacy as well as lack of experience using electronic health records are barriers to the utilisation of digital health by health professionals in Nigeria. This is consistent with findings made in the respective studies by Ladan, Wharrad and Windle (2019), Sadoughi et al., (2017) and Mugo and Nzuki (2014). This view is indirectly corroborated by existing evidence that shows that in those countries where digital health training has been provided for health professionals, the acceptance and use of digital health is high (Khan et al., 2012).

Some records identified as a barrier the unfamiliarity of terminologies employed in electronic health records software, which made it difficult for nurses to properly document their finding from patients' observations. This discrepancy between the terminologies familiar to the health professionals and the ones available on the technology rendered the technology unfit for purpose and became a barrier to its adoption, similar to findings by Gagnon et al., (2012).

The financial requirements for implementation of digital health and the poor funding of the healthcare sector and specifically for digital health programmes in Nigeria were other significant barriers identified in our review. Other studies have also acknowledged the critical role played by a lack of funding in hampering digital health utilisation. (Mugo and Nzuki, 2014; Akintunde et al., 2021; Sifat et al., 2022).

Concerns about the privacy and security of patients' data constituted a significant barrier to the adoption of electronic health records among healthcare workers in at least one of the studies reviewed. Other studies reviewed did not explore this. However, a study by Archer et al., (2021) found that similar concerns did not significantly affect digital health utilisation by medical professionals. None of the patients' studies reviewed provided evidence on whether patients had concerns about data privacy and security and on how these concerns, if present, shape their utilisation of digital health. However, evidence from studies (Khan et al., 2012) suggests that patients do have concerns about having their personal information shared using digital health technology and to what extent data security would be maintained in such scenarios.

Strengths and limitations

This scoping review is the first study that provides a comprehensive overview of digital health utilisation among patients as well as health care professionals in different settings in rural and urban Nigeria. Patients and health professionals are the main end-users in digital health and this mapping of available evidence of their utilisation of the technology provides invaluable information for future research. Although it highlights some findings about the acceptability of digital health to Nigerian patients, it demonstrates substantial gaps in literature on how they feel about data safety and privacy in digital health and how these feelings affect their utilisation of the technology.

This review also revealed equivocal positions on digital health utilisation among health professionals in Nigeria. This indicates a need for more primary research in that area to better understand the enablers of and barriers to digital health utilisation.

Our search was restricted to peer-reviewed papers only, and this could mean the work is exposed to publication bias. It is possible that research on digital health utilisation in Nigeria exists under terminologies different from the ones used in searching for records utilised for this review and so were missed. In addition, our review was restricted to Nigeria and so its findings may not be generalisable within sub-Saharan Africa or to other populations.

Conclusion

In this scoping review, we have mapped available evidence on the utilisation of digital health, particularly eHealth and mHealth, in Nigeria. The findings from this review indicate that patients are overall favourably disposed to digital health utilisation, whereas the picture for healthcare professionals is mixed. Whereas perceived usefulness of the technology was an important factor in encouraging adoption, lack of funding and of appropriate infrastructure constituted important barriers to utilisation. In addition, very little work has been done to assess the impact of patient data privacy and safety concerns on digital health utilisation.

Majority of the studies involving digital health utilisation among patients had to do with mHealth and therefore relied in some way on the patient's access to a mobile phone. This implies that access to digital health from the locus of the patient is heavily dependent on the patient's access to a mobile phone and ability to use same. Access to a mobile phone, a phone line, internet subscription all come at some financial cost to the patient. Most of the studies involving digital health utilisation among health professionals centred on the use of electronic health records. Although electronic health records increasingly have mobile applications, much of their use by health professionals within the clinical setting requires computer literacy on the part of the health professionals as well as familiarity with terminologies used in the software.

The findings of this review show that there is limited published research about digital health utilisation in Nigeria. There is need for more primary research into the factors affecting digital health utilisation in Nigeria, the motivations inspiring patients and healthcare workers to make use of digital health services and the barriers that hinder them from doing so. There is need to investigate to what extent concerns about patient data privacy and safety may influence digital health utilisation. Further research is also needed to come up with electronic health records software that make use of terminologies that health professionals in Nigeria are familiar with, to encourage them to adopt the technology.

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