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Investigating the challenges and opportunities of telemedicine in enhancing health care access in Nigeria

Abstract

The study examines the challenges and opportunities of telemedicine in health care delivery in Nigeria at a point that healthcare delivery has a long significant challenges. The study adopts cross sectional research design. Furthermore, the research method for this study is survey. The study population covered the total population of top management staff of pharmaceutical companies in Nigeria. The study adopted a total of 150 respondents drawn from the total population of the health workers in Nigeria using the convenient sampling technique. A structured questionnaire was used as instrument of data collection and the collected data were analysed with mean and standard deviation. The findings of this research reveal key insights into telemedicine practice in Nigeria. There are significant and varied patterns of telemedicine implementation across the country.

Notable challenges hinder the effective utilization of telemedicine in healthcare delivery. The study highlights numerous opportunities that telemedicine offers to enhance healthcare delivery in Nigeria. These results underscore the complex landscape of telemedicine, emphasizing the need for strategic interventions to address challenges and harness its potential for improving healthcare access and quality. The study recommended that the government and private sector should prioritize investments in reliable internet connectivity, electricity, and telemedicine platforms to enhance access, especially in rural and underserved areas. Establish policies and guidelines that address licensing, data privacy, security, and reimbursement to create a supportive environment for telemedicine practice. Conduct awareness campaigns to educate the public on the benefits of telemedicine and provide training programs to improve digital literacy among healthcare providers and patients.

Keywords: Challenges; Opportunities; Telemedicine; Health care delivery; Access to health services.

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Introduction

Healthcare delivery in Nigeria, like in most Sub-Saharan African countries, has long faced significant challenges. Nigeria, the largest country in Africa with a population exceeding 200 million, has over 60% of its people living in remote rural areas, often without access to adequate healthcare services [1]. This necessitates urgent innovation. Telemedicine, a method that utilizes information and communication technology to deliver healthcare services remotely, including telecommunication security support, has emerged as an innovative solution to improve healthcare delivery in Nigeria [2].

The problems plaguing Nigeria's healthcare system are numerous and deeply entrenched, affecting not only various levels of the healthcare structure but also service delivery across multiple sectors [3]. A key issue is the limited availability of healthcare services, particularly for rural and underserved populations

[4]. This issue is compounded by the unequal distribution of healthcare professionals, with most medical staff concentrated in urban areas, leaving rural communities underserved [5]. In addition, Nigeria's healthcare infrastructure is severely lacking. Many healthcare centers are without essential equipment, reliable electricity, and basic facilities needed to provide effective care. Another pressing concern is the high cost of healthcare services.

With a large portion of the population living below the poverty line, healthcare costs can result in significant economic hardship for many families [3], The lack of universal health insurance further exacerbates the problem, leaving most Nigerians unable to afford medical treatment when needed [6]. A shortage of medical personnel is another major issue the Nigerian healthcare sector continues to struggle with. The country has one of the lowest doctorto-patient ratios globally, placing immense pressure on existing healthcare professionals and compromising the quality of care. Furthermore, Nigeria faces a "brain drain" crisis, where skilled medical professionals leave the country in search of better opportunities abroad.

Telemedicine stands as a beacon of hope in addressing Nigeria's persistent healthcare challenges, offering numerous benefits as a potential solution. By improving access to healthcare services for patients in rural and underserved areas, telemedicine connects remote networks and provides a problem-solving approach that facilitates long-distance patient care using appropriate technology. This effectively bridges the gap between urban and rural healthcare services [7]. It is also a cost-effective solution, reducing the need for extensive physical infrastructure and eliminating the need for travel, resulting in savings on healthcare costs for both patients and providers. Most importantly, telemedicine breaks down geographic barriers, providing access to specialized expertise that may not be available in rural areas [4]. Additionally, telemedicine ensures the optimal use of healthcare resources, reducing the strain on Nigeria's limited medical workforce and enabling physicians to be utilized more efficiently [2].

Telemedicine has also proven effective in managing chronic diseases by providing remote monitoring and follow-up care for conditions such as diabetes and hypertension, alleviating some of the burden on outpatient departments. Moreover, remote learning platforms are being used for medical education and training, enhancing the skills of healthcare professionals, particularly in rural areas [3]. These diverse applications highlight telemedicine's potential to transform healthcare delivery in Nigeria, addressing critical healthcare challenges and improving access to quality care. Although the potential for telemedicine in Nigeria is vast, several challenges remain that hinder its seamless adoption and widespread use [8].

In Nigeria, most health systems lack mechanisms to process telemedicine claims, making it difficult to scale these services [9]. These barriers illustrate the complexity of the challenges facing telemedicine adoption in Nigeria, highlighting the need for a multifaceted approach to address them. To accelerate the uptake of telemedicine and mitigate its implementation challenges, concrete actions are required on multiple fronts. Developing a supportive legal and policy framework is crucial, as is investing in digital infrastructure, such as ensuring access to reliable internet connectivity and power supply [3]. Providing healthcare workers and students with the appropriate technology and tools for remote work and learning is essential. Additionally, training programs to cultivate digital skills among healthcare professionals can help facilitate secure online work [7]. Equally important is the establishment of equitable national privacy laws to prevent data breaches and foster trust in telemedicine platforms.

Encouraging public-private collaborations can also help attract investments in key areas, including telemedicine and digital health technologies. These strategies lay the groundwork for a regulatory environment that addresses legal, technical, and nontechnical challenges while enabling seamless integration of telemedicine into traditional healthcare practices. Incorporating telemedicine into Nigeria's healthcare system will be crucial in the country's campaign to achieve Universal Health Coverage (UHC) by 2030 [7]. For individuals in remote areas where access to healthcare services is limited, telemedicine can bridge the gap between traditional healthcare methods and modern solutions. Mobile Health technology (mHealth), a subset of telemedicine, holds great potential for improving access to healthcare information for both healthcare workers and communities, particularly in underserved regions.

While telemedicine has immense potential to enhance healthcare access in Nigeria, particularly for rural and underserved populations, challenges remain. The rapid rise of telemedicine, fueled by the COVID-19 pandemic and the need for social distancing, continues to drive change and innovation despite uncertainties. To capitalize on the benefits of telemedicine, Nigeria must invest in a robust policy framework, infrastructure development, and capacity-building initiatives [7]. Telemedicine and digital health technologies can significantly help Nigeria ensure that all citizens have access to quality healthcare, ultimately reducing health disparities and improving overall health outcomes. As telemedicine evolves, it has the potential to play a pivotal role in increasing healthcare access and improving health across the country [4].

Statement of the problem

Although the adoption of telemedicine in Nigeria is relatively new, its growth has been rapid, partly in response to the COVID-19 pandemic. The Nigerian digital health market is projected to reach US$770.30 million in revenue by 2024 [7]. This rapid growth is evident in the successful implementation of telemedicine across various healthcare specialties. Teleoncology projects, for example, have shown promise in improving access to specialist cancer care in underserved areas [4]. Similarly, the pandemic has accelerated the adoption of telemedicine health services, addressing the increased demand for health care and making it easier for patients in underserved areas to find qualified health professionals [7].

Telemedicine has appeared as a transformative force in global healthcare, offering remote medical consultations and services through digital communication technologies. In 2020, during the pandemic, a lot of countries used telemedicine to combat diseases while physical contact was prohibited. In Nigeria, there are various functional consulting services operated by groups of private doctors using web chats, text messages, specialized apps, video calls, and audio calls [6]. The services include drug prescriptions, patient referrals, patient monitoring, and provision of information about various hospitals. However, the success of telemedicine in Nigeria depends on a comprehensive examination that considers both its benefits and drawbacks, with a particular emphasis on cybersecurity issues.

Poor infrastructure, unreliable power supply, limited internet connectivity, and a lack of technological depth are significant barriers to the implementation of telemedicine services in the country [7]. Additionally, both healthcare providers and patients face high digital literacy challenges, making it difficult for many to adapt to this new mode of healthcare delivery [6]. Resistance to change among healthcare professionals also holds back progress. Despite strong evidence supporting telemedicine and an abundance of patient cases, many clinicians feel unprepared or unwilling to fully embrace this technology [7]. Furthermore, reimbursement issues, particularly the lack of insurance coverage for telemedicine consultations, present a major obstacle.

Objectives of the study

i. To ascertain the pattern of telemedicine in enhancing health care access in Nigeria.

ii. To investigate the challenges facing telemedicine in enhancing health care access in Nigeria.

iii. To examine the opportunities before telemedicine in enhancing health care access in Nigeria.

Research questions

i. What is the pattern of telemedicine in enhancing health care access in Nigeria?

ii. What are the challenges facing telemedicine in enhancing health care access in Nigeria?

iii. What are the opportunities before telemedicine in enhancing health care access in Nigeria?

Literature review

Concepts of telemedicine

Telemedicine, with the prefix tele, has its etymological root in Greek which means far or at a distance. Hence the merging of the words tele and medicine means medicine over a distance. The World Health Organization (WHO) defined Telemedicine as the delivery of health care services at a distance using electronic means for ailment diagnosis, prevention, and treatment of illnesses [9]. Telemedicine, broadly defined as the remote delivery of healthcare services using telecommunications technology, encompasses a wide range of applications, including teleconsultations, tele-monitoring, and tele-education [6]. With telemedicine, a patient can know how to get treatment receive a diagnosis, and receive a prescription, from the comfort of his/her home.

Telemedicine originally started with the use of telephones but has now expanded to include apps, video software, video conferencing, etc [3]. A practical example of telemedicine is where a patient sends photos to her dermatologist for evaluation and communicates with him through text. Some telemedicine platforms require a form of quiz to be taken to avail the healthcare personnel a better understanding of the situation and it is then followed by prescriptions from the dermatologist based on the evaluation [4]. One of the most significant advantages of telemedicine is its ability to ease timely access to healthcare services, particularly in remote or rural areas where healthcare facilities are scarce. Through teleconsultations, patients can connect with healthcare providers virtually, receive medical advice, and even obtain prescriptions without the need for physical visits to healthcare facilities.

This not only saves time and travel costs but also ensures continuity of care, especially for patients with chronic conditions [3]. Moreover, telemedicine enables healthcare providers to reach a broader patient population, transcending geographical barriers and expanding their reach beyond traditional healthcare settings. With the proliferation of smartphones and internet connectivity, telemedicine platforms offer unprecedented convenience, allowing patients to access healthcare services from the comfort of their homes or workplaces. This accessibility is particularly beneficial for individuals with mobility issues, busy schedules, or limited access to transportation [1].

Telemedicine in Nigeria

Telemedicine in Nigeria has gotten a larger acceptance due to the 2020 COVID19 pandemic, which has led to Nigerians seeking access to health care without having to visit the hospital and risk contracting disease while in transit or at the facility. It all started in 2006 when a pilot project was initiated by the National e-Government Strategies Ltd to introduce telecardiology utilizing video conferencing and digital equipment. Following this, in 2007, the National Space Research and Development Agency (NASRDA). This initiative aimed to enhance emergency healthcare delivery, telemonitoring, intensive healthcare, and cross-border teleconsultation services, particularly benefiting rural communities [9]. Notably, this facility has also played a role in mobile coronavirus testing [4]. This project was launched in two teaching hospitals and six federal medical centres spanning the country's six geopolitical zones. The selected teaching hospitals were the University College Hospital in Ibadan and the University Teaching Hospital in Maiduguri. Federal medical centers involved in the project were in Owo, Gombe, Makurdi, Yenagoa, Birnin Kebbi, and Owerri. Alongside public institutions, private entities such as Lagoon Hospital in Lagos and Igbinedion University Teaching Hospital in Benin also embraced telemedicine technology [10].

Additionally, in 2010, a telecommunications service provider introduced a service allowing customers to consult health personnel over the phone, albeit at a costly rate of N100 per minute, discouraging widespread use [10]. Subsequently, in the same year, Suburban West Africa, an Indian telecommunications provider, implemented a telemedicine project in Nigeria, connecting university based medical experts at the National Hospital in Abuja with the National Sickle Cell Foundation in Lagos via teleconferencing technology [6].

Similarly, the Lagos state government has made significant strides in telemedicine adoption, exemplified by the implementation of the e-health project in 2009. Initially launched as an interactive Hospital Management Information System (HMIS), this project aims to leverage ICT to enhance healthcare accessibility, quality, and service delivery volume [6]. Notably, it facilitates teleconsultation services between primary healthcare centres, general hospitals, and federal hospitals [9].

Patterns of telemedicine utilization in Nigeria

Telepsychiatry, teleradiology, tele-dermatology, tele-neurology are all various forms of telemedicine or rather, a reflection of the various areas of medical practice to which telemedicine has been deployed [1]. Irrespective of the form in which telemedicine is practiced, or the area of medicine to which it is deployed, telemedicine can be, and has been broadly classified into four types. They are teleconsultation, tele-education, telemonitoring and telesurgery. Medical consultation is at the heart

of clinical practice [9]. Not surprisingly, therefore, teleconsultation to support clinical decision making is the most frequent example of telemedical procedures [9]. A teleconsultation can take place between one or more care-givers and a patient [4]. The simplest example is a telephone conversation between two physicians to obtain a second opinion. The physicians may be in different rooms in the same building or in different countries over a satellite link. The most frequent image of a teleconsultation, however, is of a patient and his or her doctor communicating via a videoconferencing link [9].

This type of link usually takes place in real time to generate the interactive feedback (i.e. consultation) that acts upon information as it is received. The alternative store-and forward technology is frequently used in teleradiology for the transmission of large X-ray files at periods of low [4]. In these situations, the delay between receipt of information and advice is planned and causes no disruption to treatment [9]. Often another healthcare worker is present with the patient during the consultation, and the involvement of two healthcare professionals modifies the one-to-one patient physician relationship found in conventional consultation [11]. Teleconsultation refer to synchronous or asynchronous consultation using information and communication technology to omit geographical and functional distance. Its goals are for diagnostics or treatment between two or more geographically separated health providers (for example physicians or nurses) or between health providers and patients.

Telemedicine technology can excellently be used for distance training where live lectures, including surgeries, are broadcasted through to remote locations like medical colleges and medical conferences [11]. A highly experienced surgeon at the remote end can help instruct a less experienced surgeon at the patient's end to perform a demanding procedure proficiently with high levels of satisfactory outcome as a sort of hands-on training in procedures conducted from a distance [9]. Tele-monitoring is the use of a telecommunications link to gather routine or repeated data on a patient's condition [12]. Telemedicine technology enables the required information to be available on a variety of platforms like home computers, tablets, smartphones or other mobile devices [12]. The patient may be in a hospital, at home, on an aircraft or wearing an ambulatory device such as a blood pressure monitor, and data can be transmitted across the world. In almost every case, the purpose of monitoring is to decide if and when an adjustment is needed to the patient's treatment [13]. Tele-surgery, sometimes referred to as tele-robotic surgery, is a specialized form of telemedicine, featuring robotic surgical devices that enable surgeons to operate on patients remotely [14]. Tele-surgery has refined surgery in some disease conditions. 38 Remote tele-surgery is the same as normal surgery, except that the surgeon and the patient are separated by significant distances [9].

Challenges facing telemedicine in enhancing health care access in Nigeria

While telemedicine offers numerous benefits, it also presents inherent challenges, particularly concerning data privacy and security [13]. Telemedicine involves the transmission, storage, and processing of sensitive medical information, including patients' personal health records, diagnostic images, and treatment plans [4]. Ensuring the confidentiality, integrity, and availability of this data is essential to maintaining patient trust and compliance with regulatory requirements. In Nigeria, where data privacy laws are still evolving, telemedicine providers face unique challenges in safeguarding patient data. Section 44 of the Code of Medical Ethics stipulates that medical practitioners are bound to keep privileged information received from patients confidential, with disclosure permitted only with the patient's explicit consent, a duty that persists even after the patient's demise.

Additionally, Section 27 of the National Health Act allows healthcare providers to disclose patient information to other parties or providers for legislative purposes within their professional scope. One of the primary concerns is the risk of unauthorized access, interception, or disclosure of medical information during data transmission over the Internet or mobile networks as a result of weak or lacking firewalls, unsecured networks, unencrypted information, weak authentication protocols, etc [15].

The nature of telemedicine involves interactions with various third parties, such as telemedicine apps or websites, which may share sensitive data like location and contacts. There is a risk of interception of medical information during transmission through telemedical links [15]. Furthermore, non-medical personnel involved in healthcare delivery, like IT staff and administrative support, pose a risk of unauthorized access to health data. Additionally, browsing websites for healthcare information may lead to the tracking and storing of personal data for other purposes, necessitating options for users to control data tracking [16]. Without robust encryption protocols and secure communication channels, patient data may be vulnerable to interception by malicious actors, compromising patient privacy and confidentiality.

The storage and processing of patient data on telemedicine platforms raise concerns about data sovereignty and jurisdictional issues [17]. Many telemedicine platforms are hosted on cloud servers located outside Nigeria, raising questions about the jurisdictional authority and legal protections governing the storage and processing of Nigerian patients' data. In the absence of clear regulatory frameworks and international data transfer agreements, patients' data may be subject to foreign laws and regulations, potentially undermining their privacy rights and legal recourse. Medical devices and wearable security Additionally, the proliferation of mobile Health (mHealth) applications and wearable devices aggravates data privacy concerns, as these technologies collect vast amounts of personal health data, including biometric information and geolocation data [6].

The integration of these data sources with telemedicine platforms raises ethical and regulatory questions about informed consent, data ownership, and data sharing practices [11]. Without adequate safeguards and transparency measures, patients may unknowingly consent to the collection and sharing of their health data, exposing them to privacy risks and potential exploitation by third parties [5]. Unpatched or outdated software used by consumers Telemedicine involves the use of software applications and platforms to provide healthcare services remotely [15]. These software applications, if not regularly updated or patched, can become vulnerable to cyberattacks. Cybercriminals often exploit known vulnerabilities in unpatched software to gain unauthorized access to systems and data. This is because many consumers lack the technical knowledge to properly manage software updates and patches on their devices [15].

Opportunities before telemedicine in enhancing health care access in Nigeria

To mitigate these risks, telemedicine providers must implement robust security measures, including data encryption, organizational policies for handling confidential data, firewalls, and secure emailing systems. Furthermore, protocols should be established to verify the identities of both patients and providers. The challenge lies in regulating the disclosure of personal information to third parties, as demonstrated by a 2017 class-action lawsuit against MDLive, alleging unauthorized sharing of patient health information with a third-party provider. MDLive defended its actions by stating that consumers are informed in its privacy policy of potential disclosure to contracted third parties [15].

The need to expand the utility of the available specialists using telemedicine to reach more Nigerians has become imperative in the face of the growing brain drain in the healthcare sector [4]. Telemedicine will assume a veritable tool in bridging the widening specialist to patient gap. An initial assessment of patients requiring a particular specialist care can be done remotely to triage and identify the ones that will be require further in-person evaluation in a secondary or tertiary facility [12]. For example, a lot can be facilitated through tele-dermatology where clear images of skin conditions or other lesions can facilitate making proper diagnoses and instituting appropriate treatment promptly [4]. The widespread use of smart phones and the penetration of internet connectivity into our rural areas and hitherto difficult-to-reach areas will facilitate the actualization telemedicine in our clime [12].

Other more advanced forms of interactive services of telemedicine that can be explored are available in few tertiary healthcare facilities in the country, mostly due to cost of setting up. An example is live conferencing which facilitates the exchange of knowledge and expertise, allowing local healthcare professionals to consult with specialists, leading to more accurate diagnoses and effective treatment plans [8]. The collaborative nature of telemedicine promotes continuous learning and skill development among healthcare providers in resource-poor settings [10]. One major challenge in the use of telemedicine in Nigeria is that the regulatory framework for its use is still evolving.

Currently, there is no policy guidelines regulating its practice in Nigeria which does not allow the unfettered embrace of the telemedicine by all stakeholders or its extension to other advanced utility because of possible medico-legal issues that could arise [7]. Legal guidance on its practice is however, provided for by other existing laws such as the code of medical ethics, the Nigerian data protection act and the national information technology development agency amongst others, which deals with certain aspects of the practice of telemedicine [11]. A national policy on telemedicine will not only provide a framework for its operation but also a legal regulation.4

Research methods

The study adopts cross sectional research design. Furthermore, the research method for this study is survey. The study population covered the total population of top management staff of pharmaceutical companies in Nigeria. The study adopted a total of 150 respondents drawn from the total population of the health workers in Nigeria using the convenient sampling technique. A structured questionnaire was used as instrument of data collection and the collected data were analysed with mean and standard deviation. Therefore, the return rate is 62% which is above average. Based on this calculation, the researcher adopted 94 respondents that attended to the survey.

Demographic analysis for participants

Table 1: Age distributions of participants.

Response category	Frequency	Percentage of frequency
20 yrs to 30 yrs	24	25.5%
31 yrs to 40 yrs	64	68.15%
41 yrs and above	6	6.4%

Table 1 shows that participants between age bracket of 20 years to 30 years are 24 (25.5%), those of between 31 to 40 years of age are 64 (66,12%), and participants from 41 years and above are 6 96.4%).

Table 2: Religious background of participant.

Response category	Frequency	Percentage of frequency
Christianity	88	95.7%
Islam	4	4.3%
41 yrs and above	6	6.4%

Table 2 shows that participants with Christian's background are 88 (95.7%), while those participants that are of Islam are 5 (4.3%).

Table 3: Length of services.

Response category	Frequency	Percentage of frequency
1 yrs to 10 yrs	66	78.6%
11 yrs to 20 yrs	15	17%
21 yrs and above	3	3.6

Table 3 shows that participants with 1 to 10 years in service 66 (78.6%), those in service for 10 years to 20 years were 15 (17.9%) and those in service from 21 years and above are 3 (3.6%).

Table 4: Hospital Type.

Response Category	Frequency	Percentage of Frequency
Private	40	47.6%
Public	40	47.6%
5 and above	4	4.8%

Table 4 shows that participants private hospitals are 40 (47.6%), those in public hospital are 40. (47.6%) and participants with 5 children and above are 4 (4.8%).

Table 5: Hospital type.

Response category	Frequency	Percentage of frequency
First Degree	34	37.8%
Second Degree	50	55.16%
Professional Certificate	6	6.7%

Table 5 shows that participants with first degree are 34 (37.8%), those with second degree are 50 (55.6%) and those with professional certificate are 6 (6.7%).

Table 6: Marital status of participants.

Response category	Frequency	Percentage of frequency
Private	40	47.6%
Public	40	47.6%
5 and above	4	4.8%

Table 6 shows that married participants are 80 (85%) and single parents' participants are 15 (16%). Therefore, there are more married respondents than single respondents.

Data analysis based on research questions

Table 7: Pattern of telemedicine in enhancing health care access in Nigeria.

SN	Statement	N	Mean	Std. deviation
Item 1	Remote consultation with pharmacists for medication management and prescription refills is a pattern of telemedicine	94	3.2660	.72104
Item 2	Tele-education and training is a pattern of telemedicine in Nigeria	94	3.5213	.52320
Item3	Offers online consultations, mobile clinics, and telehealth cabins to provide affordable healthcare services to underserved communities.	94	2.5000	.85194
Item 4	Remote patients monitoring is a pattern of telemedicine in Nigeria	94	2.9787	.70297
	Valid N (listwise)	**94**		

The data in Table 7 showed the mean and standard deviation of respondents on the pattern of telemedicine in Nigeria, Given the 2.50 benchmark for acceptance, items 1-4 of the questionnaire had mean above the benchmark indicating that there is evident pattern of telemedicine in Nigeria. In summary, respondents agreed that Remote consultation with pharmacists for medication management and prescription refills is a pattern of telemedicine with mean score of 3.2, Tele-education and training is a pattern of telemedicine in Nigeria with means score of 3.5, Offers online consultations, mobile clinics, and telehealth cabins to provide affordable healthcare services to underserved communities with mean score of 2.5, Remote patients monitoring is a pattern of telemedicine in Nigeria with mean score of 2.9.

The data in Table 8 showed the mean and standard deviation of respondents on challenges facing telemedicine in enhancing health care access in Nigeria. Given the 2.50 benchmark for acceptance, items 5-8 of the questionnaire had mean above the benchmark indicating that there is evident challenges facing telemedicine in enhancing health care access in Nigeria. In summary, respondents agreed the cost of smartphones and internet subscriptions remains a barrier for low-income individuals with mean score of 2.9, that Many patients and healthcare providers lack the technical skills to use telemedicine platforms effectively with mean score of 2.7, that Lack of clear regulatory frameworks for telemedicine practice with mean score of 3.2, that Many people prefer face-to-face interactions with healthcare providers, doubting the effectiveness of virtual consultations with mean score of 3.0.

Table 8: Challenges facing telemedicine in enhancing health care access in Nigeria.

SN	Statement	N	Mean	Std. Deviation
Item 5	The cost of smartphones and internet subscriptions remains a barrier for low-income individuals.	**94**	2.9894	.84871
Item 6	Many patients and healthcare providers lack the technical skills to use telemedicine platforms effectively.	**94**	2.7.340	.79211
Item 7	Lack of clear regulatory frameworks for telemedicine practice.	**94**	2.5000	.64960
Item 8	Many people prefer face-to-face interactions with healthcare providers, doubting the effectiveness of virtual consultations	**94**	3.2872	.62336
	Valid N (listwise)	**94**		

Table 9: Opportunities before telemedicine in enhancing health care access in Nigeria.

SN	Statement	N	Mean	Std. Deviation
Item 9	Telemedicine can bridge the gap in healthcare services for remote and underserved communities where hospitals and clinics are scarce.	**94**	2.9787	.74745
Item 10	Patients can save money on travel and accommodation by consulting doctors remotely.	**94**	2.8191	.89157
Item 11	Virtual consultations and online appointment systems can help reduce congestion in hospitals and clinics, streamlining service delivery.	**94**	3.0000	.86758
Item 12	Patients in rural and underserved areas can connect with specialists in urban centers or abroad without the need for travel.	**94**	2.7204	.83881
	Valid N (listwise)	**94**		

The data in Table 9 showed the mean and standard deviation of respondents on opportunities before telemedicine in enhancing health care access in Nigeria. Given the 2.50 benchmark for acceptance, items 9-12 of the questionnaire had mean above the benchmark indicating that there is evident opportunities before telemedicine in enhancing health care access in Nigeria. In summary, respondents agreed that Telemedicine can bridge the gap in healthcare services for remote and underserved communities where hospitals and clinics are scarce with mean score of 2.9, Patients can save money on travel and accommodation by consulting doctors remotely with 2.8, that Virtual consultations and online appointment systems can help reduce congestion in hospitals and clinics, streamlining service delivery with 3.0, that Patients in rural and underserved areas can connect with specialists in urban centers or abroad without the need for travel with mean score of 2.7.

Discussion of the findings

The result for research question one revealed that there is significant various patterns of telemedicine practice in Nigeria. The study is in line with existing studies. Telemedicine technology can excellently be used for distance training where live lectures, including surgeries, are broadcasted through to remote locations like medical colleges and medical conferences [11]. A highly experienced surgeon at the remote end can help instruct a less experienced surgeon at the patient's end to perform a demanding procedure proficiently with high levels of satisfactory outcome as a sort of hands-on training in procedures conducted from a distance [9]. Tele-monitoring is the use of a telecommunications link to gather routine or repeated data on a patient's condition [12]. Telemedicine technology enables the required information to be available on a variety of platforms like home computers, tablets, smartphones or other mobile devices [12]. The patient may be in a hospital, at home, on an aircraft or wearing an ambulatory device such as a blood pressure monitor, and data can be transmitted across the world. In almost every case, the purpose of monitoring is to decide if and when an adjustment is needed to the patient's treatment [13]. Tele-surgery, sometimes referred to as tele-robotic surgery, is a specialized form of telemedicine, featuring robotic surgical devices that enable surgeons to operate on patients remotely [14]. Tele-surgery has refined surgery in some disease conditions. 38 Remote tele-surgery is the same as normal surgery, except that the surgeon and the patient are separated by significant distances [9].

Conclusion

The findings of this research reveal key insights into telemedicine practice in Nigeria. There are significant and varied patterns of telemedicine implementation across the country. Notable challenges hinder the effective utilization of telemedicine in healthcare delivery. The study highlights numerous opportunities that telemedicine offers to enhance healthcare delivery in Nigeria. These results underscore the complex landscape of telemedicine, emphasizing the need for strategic interventions to address challenges and harness its potential for improving healthcare access and quality.

Recommendations

i. The government and private sector should prioritize investments in reliable internet connectivity, electricity, and telemedicine platforms to enhance access, especially in rural and underserved areas.

ii. Establish policies and guidelines that address licensing, data privacy, security, and reimbursement to create a supportive environment for telemedicine practice.

iii. Conduct awareness campaigns to educate the public on the benefits of telemedicine and provide training programs to improve digital literacy among healthcare providers and patients.

Declarations

Acknowledgement & ethical statement: We also affirm that this paper is original and is not currently under consideration by any other publication. This study does not contain any studies with animal subjects performed by any of the authors.

Conflicts of interest: Authors have declared that no competing interests exist.

Authors' contributions: This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Disclaimer (Artificial intelligence): Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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