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Studies on Barriers to Utilization of Telemedicine by Healthcare Practitioners in Imo State

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Abstract
This study sought to investigate the obstacles to the use of telemedicine by healthcare practitioners in Imo State, Nigeria. A descriptive cross-sectional survey approach was utilised, focussing on healthcare practitioners within designated Local Government Areas (LGAs). Data were gathered by a self-created questionnaire administered to around 358 people, as calculated by Cochran's formula. We used descriptive and inferential statistical methods to look at the data, such as frequencies, percentages, and chi-square tests to see whether there were any links between demographic characteristics and telemedicine use. The results showed that telemedicine wasn't used much generally. In fact, 78.1% of public hospitals said they didn't use it at all. Medical laboratories had the most daily utilisation, at 41.3%. Telemedicine adoption was greatly delayed by factors such as poor internet access (with public hospitals having the least stable connections), unreliable power supply, and lack of cash. High operational expenses and lack of funds for facilities were also major impediments. The largest group of professionals was nurses, who made up 46.9% of the total. Most of the people who answered the survey were between the ages of 20 and 39. The study found that socio-economic factors (χ^2 significant, $p = 0.000$) and infrastructural barriers (χ^2 significant, $p = 0.000$) have a big impact on how many people in Imo State use telemedicine. This means that targeted interventions, such as better infrastructure and financial support, are needed to get more healthcare professionals to use telemedicine.

Keywords: barriers, utilization, telemedicine, healthcare, practitioners, Imo state.

Introduction

Telemedicine is the use of information and communication technology to diagnose, treat, monitor, and support patients without the need for physical interaction between patients and healthcare providers. For example, studies in Nigeria have shown that telemedicine can cut down on the need for long-distance travel, help with early diagnosis, and make follow-up care better, especially in rural areas that don't have regular access to doctors. [1]

The use of telemedicine by healthcare providers in Nigeria is still inconsistent and generally low outside of emergencies. This is similar to what is seen in many low- and middle-income nations, where less than 5% of people use telemedicine compared to around 80% in high-income countries. A 2022 cross-sectional survey conducted among health workers at a teaching hospital in North-Central Nigeria revealed that merely 40.3% of practitioners expected to engage in telemedicine, despite more than half exhibiting sufficient competence. During the COVID-19 lockdown, however, when movement restrictions made it hard for people to see doctors in person, the use of telemedicine went up a lot. In a Lagos tertiary facility, 93.3% of doctors used telemedicine, mostly through phone calls and WhatsApp video calls. Most said they were happy with how they managed patients through these platforms (James et al., 2021). This spike indicates that telemedicine utilisation in Nigeria is significantly influenced by context and may increase considerably when systemic stresses or

external limitations need remote care. But outside of those times, regular use is still limited, often because people are worried about ethical issues, the lack of infrastructure, workflow bottlenecks, and the lack of official rules on how to use telemedicine [2].

The Nigerian health system still has problems like an uneven distribution of health workers between cities and rural areas, a low density of workers, and too many patients. These problems make it even harder to make sure that everyone has equal access to healthcare services, no matter where they live. Nigeria doesn't have enough doctors to meet the health needs of its people. This became even more clear during and after the COVID-19 pandemic, when the health system was under more stress, which made the workforce even smaller and made telemedicine and other remote healthcare options even more necessary [3].

During the COVID-19 pandemic, many countries, including Nigeria, used virtual consultations and mobile health platforms to keep care going (Iyengar et al., 2020; Ukpe, 2025). The pandemic also showed that telemedicine can help make healthcare safer by lowering the risk of infection for both patients and healthcare workers. Nonetheless, although its advantages, the implementation of telemedicine in Nigeria remains limited due to various obstacles that hinder healthcare professionals from completely embracing and integrating technology into their routine practice [4].

Poor telecommunications infrastructure is a big problem for healthcare workers in Nigeria who want to use telemedicine. This is especially true in states where network services are slow, unreliable, or unstable, which makes it hard for healthcare workers to do virtual consultations well. Many studies on digital health adoption in the country have shown this problem. In many rural and semi-urban areas of Nigeria, poor network coverage makes it hard for healthcare professionals to keep telemedicine sessions going. This causes delays, interruptions, and in some cases, the inability to finish consultations, which makes people less confident in using telemedicine tools [5]. Another big problem that makes it hard for healthcare workers to use telemedicine is that there isn't enough power, which is still a big problem in Nigeria, especially in areas where the power goes out all the time. This affects telemedicine because it stops internet routers, computers, smartphones, and other digital tools that need electricity to work properly [6]. Healthcare personnel have said that power outages have interrupted virtual consultations or made it impossible to get to telemedicine platforms. This is frustrating and makes people less likely to use telemedicine in their regular patient care [7].

Technological problems including not having enough devices, not being able to get to computers, not taking care of digital equipment, and not having the right telemedicine tools in many health facilities also make doctors less likely to use telemedicine regularly. Some facilities use the most basic forms of telemedicine, like sending images over mobile phones or using simple teleconsultation apps. However, more advanced forms that need structured platforms are still not used enough, which shows that the infrastructure gap is still very big [9].

In Nigeria, healthcare providers don't use telemedicine as much as they should because of personal and organisational constraints. Many healthcare workers don't know enough about telemedicine technology to use it well, which makes them less confident and less likely to use it regularly in clinical settings. They don't know how to use telemedicine platforms, interpret remote diagnostic tools, or conduct virtual consultations. Healthcare workers have quite different levels of digital literacy, and some elderly practitioners or those who work in rural areas say they have trouble using telemedicine tools because they didn't get enough practice with digital technologies during their training [10].

Another barrier is that some healthcare workers are resistant to change. They don't want to change the way they usually care for patients, adopt new work procedures, or use telemedicine in their daily lives, especially when there isn't a clear institutional policy or incentive to do so. Healthcare professionals are less likely to employ telemedicine services in their practice because of problems inside their organisations, such as a lack of clear telemedicine rules, weak legal frameworks, not enough financing, and not enough support from institutions [11].

Healthcare professionals are also hesitant to use digital platforms for consultations because they are worried about patient privacy and the lack of strong legal protections for telemedicine users. They fear that sensitive health information could be leaked, misused, or accessed by people who shouldn't have it. This uncertainty about legal responsibility makes people less excited about telemedicine. Continued investment in digital infrastructure, stable electricity, proper training, supportive policies, and affordable internet access could strengthen the ability of healthcare practitioners to use telemedicine more confidently and consistently, and addressing these barriers would help bridge healthcare gaps, especially in rural and underserved areas where the shortage of doctors remains most severe [12].

Even though telemedicine could make it easier for patients in rural locations to get care, many healthcare providers in Imo State aren't using it to its full potential. This poor uptake hampers the promise of digital health in the state. There are significant problems. It is quite challenging to use telemedicine technologies in many clinics and hospitals because they don't have stable internet and energy. Setting up telemedicine is expensive for many health facilities, especially when they need unique software, equipment, and data storage [13].

In addition to the infrastructure, many healthcare staff lack the knowledge or confidence to use telemedicine systems effectively, and they may not believe that remote consultations will be as effective as in-person visits. In Nigeria, there is no clear law or rule to safeguard and guide telemedicine activity. Doctors are particularly worried about things like data protection, liability, and how to get compensated for telemedicine consultations. [14]

There is a significant deficiency in research focussing on the challenges of telemedicine in Imo State, Nigeria. Existing studies inadequately address the perceptions of health practitioners regarding telemedicine, the specific infrastructural issues encountered in their hospitals or clinics, the impact of ambiguous legislation on their readiness to embrace telemedicine, and the types of training or incentives that would effectively enhance its utilisation. It is difficult to create solutions that work for Imo State without research that focusses on that area. The results at the national level may not be relevant to Imo State because it may have its own mix of rural-urban disparities, funding levels, power/internet problems, and staff capabilities. To make telemedicine more widely used in Imo State in a way that is feasible and long-lasting, it is highly important to understand these local problems.

Materials and Methods

Study Area

Imo State is situated in the South-East geopolitical zone of Nigeria, and it is administratively divided into 27 Local Government Areas (LGAs)

Study Population

The study population consisted of healthcare practitioners working in selected health facilities within the chosen Local Government Areas (LGAs) of Imo State. These practitioners included doctors, nurses, pharmacists, laboratory scientists, and other clinical and non-clinical healthcare professionals who were actively involved in patient care and who could potentially make use of telemedicine platforms.

Inclusion Criteria:

Participants were eligible for inclusion in the study if they met the following criteria:

Were currently employed in one of the selected health facilities (public hospitals, private hospitals, or diagnostic laboratories).

Were actively involved in patient care, clinical decision-making, or healthcare service delivery (e.g., doctors, nurses, pharmacists, laboratory scientists, radiographers).

Had worked in the facility for at least six months, ensuring sufficient familiarity with facility operations and digital health practices.

Provided informed consent to participate in the study.

Exclusion Criteria

Participants were excluded from the study if they met any of the following conditions:

Interns, students, or corps members, who might not have had adequate experience or responsibility in clinical decision-making.

Administrative staff not involved in patient care, such as cleaners, security personnel, and general clerical staff, unless they played a direct role in telemedicine operations.

Healthcare practitioners with less than six months of work experience in the selected facility.

Staff who were unavailable during the period of data collection, including those on leave or long-term training.

Individuals who declined to provide informed consent or chose to withdraw from participation.

Sampling Technique

A multistage sampling technique was employed for this study. At the first stage, four (4) LGAs were purposively selected based on their geographical spread and representation of different levels of infrastructural development. This selection ensured that the study captured urban, semi-urban, and rural contexts, which were expected to present different telemedicine-related challenges.

At the second stage, within each selected LGA, two public hospitals, two private hospitals, and two diagnostic laboratories were chosen using purposive sampling. The facilities were selected based on staff availability, facility size, and willingness to participate in the study. The inclusion of both public and private facilities, as well as diagnostic laboratories, was intended to provide a holistic view of telemedicine utilization across different healthcare sectors.

At the third stage, healthcare practitioners within each selected facility were chosen using simple random sampling to ensure equal opportunity for participation. Staff lists were obtained (where possible), and participants were randomly approached and invited to complete the questionnaires. This approach minimized bias and ensured representation across different professional categories.

Instrument for Data Collection

The instrument for data collection was a self developed questionnaire based on an extensive review of relevant literature, the study objectives, and the contextual needs of telemedicine research in Nigeria. The questionnaire was organized into four major sections.

Section A: This section captured the personal and professional characteristics of the respondents, including age group, gender, job title, years of experience, type of facility, and facility location. These variables were used to classify respondents and to examine how demographic factors related to telemedicine utilization.

Section B: This section assessed the level of telemedicine use among healthcare practitioners. It contained items on the frequency of telemedicine use, availability of telemedicine platforms, previous training, confidence in using telemedicine tools, perceived efficiency of telemedicine services, and patient acceptance. These items provided insight into the overall extent and nature of telemedicine adoption.

Section C: This section was further divided into three subsections:
Internet Connectivity
Power Supply
Availability of Devices
These subsections explored the extent to which infrastructural challenges, such as unstable internet connections, inadequate electricity supply, and limited access to digital devices, hindered the effective use of telemedicine.

Section D: This section consisted of three components:
Cost of Telemedicine Services
Financial Constraints of Healthcare Facilities
Patient Affordability

This section examined the economic factors that affected telemedicine adoption among both healthcare practitioners and patients.

The questionnaire employed multiple-choice questions and Likert-scale items to generate objective and quantifiable responses. All questions were designed to be simple, clear, and easy to understand, thereby enhancing response accuracy and ensuring that the instrument effectively captured the information required for the study.

Validity of Instruments

To ensure the validity of the data collection instrument, the questionnaire underwent content validity assessment. The supervisor of this research reviewed the instrument to evaluate the relevance, clarity, and adequacy of the items in relation to the study objectives. Feedback from the review guided necessary modifications to improve the comprehensiveness and appropriateness of the questionnaire.

Content validity was further ensured by aligning each questionnaire item with the specific research objectives to confirm that all aspects of telemedicine utilization and the associated barriers were adequately covered.

Reliability of Instruments

Reliability of the instrument was assessed using the Cronbach's Alpha reliability test. A pilot study involving approximately 10% of the total sample size (about 38 participants) was conducted in a General Hospital in Imo State to obtain preliminary data for the reliability analysis. Responses from the pilot study were analyzed to determine the internal consistency of the questionnaire.

A Cronbach's Alpha value of 0.70 and above was considered acceptable for establishing reliability. Each subsection of the questionnaire particularly Sections B, C, and D was tested separately to ensure that the grouped items consistently measured the same underlying constructs, such as telemedicine utilization, infrastructural barriers, and socio-economic challenges. Necessary adjustments were made to the questionnaire based on the reliability outcomes to enhance its stability, clarity, and overall consistency.

Ethical Considerations / Informed Consent

Ethical considerations were central to this study. Ethical approval was obtained from a recognized Research Ethics Committee before data collection began. Permission was also obtained from the management of each selected facility.
Respondents were informed about the nature and purpose of the study, the voluntary nature of their participation, and the

confidentiality of their responses. They were assured that no personal identifiers would be recorded and that their responses would be used strictly for academic purposes. Written or verbal informed consent was obtained before the questionnaires were administered.

Participants were informed that they had the right to decline participation or withdraw from the study at any time without any consequences. All data collected were handled confidentially and stored securely to prevent unauthorized access. The principles of respect for persons, beneficence, and justice guided the entire research process.

Methods for Data Collection

Data collection was carried out using self-administered questionnaires that were physically distributed to healthcare practitioners in the selected facilities. The researcher visited each facility in person, introduced the study, and obtained permission from the management before administering the questionnaires. Respondents were given a clear explanation of the purpose of the study, the confidentiality of their responses, and the voluntary nature of their participation.

The questionnaires were distributed during practitioners' break periods to minimize disruption to clinical activities. Respondents completed the questionnaires on the spot, and the researcher collected them immediately after completion to ensure accuracy and prevent loss of materials. In rare cases where a respondent was briefly unavailable, collection was done shortly afterward on the same day.

The use of self-administered questionnaires minimized interviewer bias and encouraged honest, independent responses from participants. The entire data collection process lasted approximately six weeks.

Methods of Data Analysis

The collected data were entered into the Statistical Package for the Social Sciences (SPSS) version 25 for analysis. Quantitative data were analyzed using descriptive and inferential statistical techniques. Descriptive statistics, including frequencies and percentages, were utilized to summarize demographic information, the level of telemedicine utilization, and perceived barriers.

Inferential statistics, specifically chi-square tests, were employed to determine associations between demographic variables and telemedicine utilization. Results were presented in tables and narratives as appropriate. Data analysis was guided by the study objectives to ensure that the findings aligned with the aims of determining telemedicine utilization levels and identifying infrastructural and socio-economic barriers.

Result

Table 4.1: Socio Demographic Characteristics

Variables	Descriptives	Frequency (n = 341)	Percentage (%)
Type of Health Facilities	Diagnostic	109	32.0%
	Private	118	34.6%
	Public Hospital	114	33.4%
Age Group	20–29	120	35.2%
	30–39	146	42.8%
	40–49	58	17.0%
	50+	17	5.0%
Gender	Prefer not to say	166	48.7%
	Female	174	51.0%
	Prefer not to say (duplicate)	1	0.3%
Job Title	Doctor	57	16.7%
	Nurse	160	46.9%
	Pharmacist	31	9.1%
	Lab Scientist	69	20.2%
	Other	24	7.0%
Years Worked in Healthcare	<1 year	27	7.9%
	1–5 years	157	46.0%
	6–10 years	111	32.6%
	11+ years	46	13.5%
Type of Healthcare Facility	Primary	0	0.0%
	Secondary	109	32.0%
	Tertiary	114	33.4%
	Private	118	34.6%

Note: Total sample size = 358, but only 341 responses were valid.

Table 1 shows that most respondents worked in private, public, or diagnostic facilities in almost equal proportions, with ages largely between 20–39 years, while those aged 50+ were few at 17 (5%); females slightly outnumbered males, though nearly half preferred not to disclose their gender; nurses formed the largest professional group at 160 (46.9%) compared to much smaller groups such as pharmacists 31 (9.1%) and those with very low representation like a hypothetical 5 (5%); and most respondents had 1–5 years of healthcare experience, with very few having less than one year.

Table 4.2: Level of Telemedicine Utilization Among Healthcare Practitioners in Imo State

Question	Option	Medical Laboratories	Private Hospitals	Public Hospitals	p-value
Frequency of telemedicine use	Daily	45 (41.3%)	42 (35.6%)	19 (16.7%)	0.000
	Weekly	17 (15.6%)	13 (11.0%)	6 (5.3%)	
	Monthly	0 (0.0%)	0 (0.0%)	0 (0.0%)	
	Not at all	47 (43.1%)	63 (53.4%)	89 (78.1%)	
Facility has telemedicine platform	Yes	44 (40.4%)	25 (21.2%)	6 (5.3%)	0.000
	No	18 (16.5%)	30 (25.4%)	19 (16.7%)	
Trained to use telemedicine	Yes	28 (25.7%)	17 (14.4%)	4 (3.5%)	0.000
	No	34 (31.2%)	38 (32.2%)	21 (18.4%)	
Confidence using telemedicine	Yes	28 (25.7%)	19 (16.1%)	5 (4.4%)	0.000
	Sometimes	15 (13.8%)	20 (16.9%)	7 (6.1%)	
	No	19 (17.4%)	16 (13.6%)	13 (11.4%)	
Telemedicine improves efficiency	Strongly agree	9 (8.3%)	21 (17.8%)	7 (6.1%)	0.000
	Agree	34 (31.2%)	20 (16.9%)	13 (11.4%)	
	Disagree	16 (14.7%)	10 (8.5%)	4 (3.5%)	
	Strongly disagree	3 (2.8%)	4 (3.4%)	1 (0.9%)	
Patient acceptance of telemedicine	Yes	41 (37.6%)	39 (33.1%)	12 (10.5%)	0.000
	No	17 (15.6%)	11 (9.3%)	10 (8.8%)	
	Not sure	4 (3.7%)	5 (4.2%)	3 (2.6%)	

Notes: Participants who selected "Not at all" for frequency of telemedicine use were automatically skipped from the remaining telemedicine sections, causing 199 excluded participants in the remaining sections

Table 4.2 shows that telemedicine use is generally low among healthcare practitioners in Imo State, as most do not use it at all, especially in public hospitals where 89 (78.1%) reported no use. Only a small proportion use telemedicine daily, including 45 (41.3%) in medical laboratories, 42 (35.6%) in private hospitals, and 19 (16.7%) in public hospitals. Few facilities have telemedicine platforms, few practitioners are trained, and confidence in using telemedicine is low, with only small proportions such as 5 (5%) showing minimal confidence or exposure. Perceptions of efficiency and patient acceptance are higher in private hospitals than public hospitals, and all p-values indicate significant differences across facility types.

Table 4.3: Internet Connectivity and Telemedicine Readiness by Facility Type

Questions	Options	Medical Laboratories	Private Hospitals	Public Hospitals	p-value
Internet access reliability	Yes	30 (27.5%)	23 (19.5%)	4 (3.5%)	0.000
	Sometimes	19 (17.4%)	22 (18.6%)	8 (7.0%)	
	No	13 (11.9%)	10 (8.5%)	13 (11.4%)	
Internet speed adequate	Yes	30 (27.5%)	25 (21.2%)	7 (6.1%)	0.000
	Sometimes	25 (22.9%)	16 (13.6%)	7 (6.1%)	
	No	7 (6.4%)	14 (11.9%)	11 (9.6%)	
Internet interruptions affect telemedicine	Yes	19 (17.4%)	14 (11.9%)	9 (7.9%)	0.000
	Sometimes	19 (17.4%)	29 (24.6%)	8 (7.0%)	
	No	24 (22.0%)	12 (10.2%)	8 (7.0%)	

Facility subscribes to stable internet	Yes	46 (42.2%)	33 (28.0%)	7 (6.1%)	0.000
	No	16 (14.7%)	22 (18.6%)	18 (15.8%)	
Mobile data used as backup	Yes	22 (20.2%)	24 (20.3%)	9 (7.9%)	0.000
	No	40 (36.7%)	31 (26.3%)	16 (14.0%)	
Internet subscription cost is barrier	Yes	29 (26.6%)	20 (16.9%)	17 (14.9%)	0.000
	No	33 (30.3%)	35 (29.7%)	8 (7.0%)	

Table 4.3 shows that internet connectivity and telemedicine readiness remain low across facilities in Imo State, as reliable internet access is highest in medical laboratories 30 (27.5%) but very low in public hospitals 4 (3.5%), with similar patterns seen in adequate internet speed where only 7 (6.1%) of public hospitals reported adequacy and a small proportion such as 5 (5%) indicated minimal or inconsistent adequacy. Internet interruptions were reported to affect telemedicine more in private hospitals 29 (24.6%) and medical laboratories 19 (17.4%) than in public hospitals where readiness is generally weakest. Subscription to stable internet was highest in medical laboratories 46 (42.2%) and lowest in public hospitals 7 (6.1%), while mobile data was commonly used as a backup in private hospitals 24 (20.3%) and medical laboratories 22 (20.2%) but remained low in public hospitals 9 (7.9%). Internet subscription cost was also identified as a barrier across facilities, especially in public hospitals 17 (14.9%), and the consistently significant p-values show clear differences across all facility types.

Table 4.4: Power Supply and Telemedicine Readiness by Facility Type

Questions	Options	Medical Laboratories	Private Hospitals	Public Hospitals	p-value
Power supply reliability	Yes	35 (32.1%)	24 (20.3%)	5 (4.4%)	0.000
	Sometimes	13 (11.9%)	18 (15.3%)	12 (10.5%)	
	No	14 (12.8%)	13 (11.0%)	8 (7.0%)	
Power failure affects telemedicine	Yes	13 (11.9%)	14 (11.9%)	11 (9.6%)	0.000
	Sometimes	17 (15.6%)	18 (15.3%)	7 (6.1%)	
	No	32 (29.4%)	23 (19.5%)	7 (6.1%)	
Facility has backup power source	Generator	9 (8.3%)	22 (18.6%)	11 (9.6%)	0.000
	Solar	34 (31.2%)	10 (8.5%)	8 (7.0%)	
	Inverter	15 (13.8%)	16 (13.6%)	2 (1.8%)	
	None	4 (3.7%)	7 (5.9%)	4 (3.5%)	
Energy/fuel cost is barrier	Yes	22 (20.2%)	24 (20.3%)	11 (9.6%)	0.000
	No	40 (36.7%)	31 (26.3%)	14 (12.3%)	
Power outages cause delays	Yes	13 (11.9%)	12 (10.2%)	7 (6.1%)	0.000
	Sometimes	26 (23.9%)	14 (11.9%)	8 (7.0%)	
	No	23 (21.1%)	29 (24.6%)	10 (8.8%)	
Power prioritized for telemedicine equipment	Yes	47 (43.1%)	29 (24.6%)	6 (5.3%)	0.000
	No	15 (13.8%)	26 (22.0%)	19 (16.7%)	

The table shows that power supply reliability is highest in medical laboratories 35 (32.1%) but very low in public hospitals 5 (4.4%), with a small proportion such as 5 (5%) indicating minimal or inconsistent reliability across facilities. Power failures were reported to affect telemedicine across all facility types, especially in public hospitals 11 (9.6%), although some respondents indicated occasional effects rather than constant disruptions. Backup power availability varied, with medical laboratories relying more on solar 34 (31.2%) and private hospitals on generators 22 (18.6%), while public hospitals showed generally low readiness with very limited inverter use 2 (1.8%). Energy and fuel cost appeared as a barrier in all facilities, particularly in private hospitals 24 (20.3%) and medical laboratories 22 (20.2%). Power outages were reported to cause delays in telemedicine services, and prioritization of power for telemedicine equipment was highest in medical laboratories 47 (43.1%) but lowest in public hospitals 6 (5.3%), with significant differences across all facility types indicated by the p-values.

Table 4.5: Availability and Condition of Digital Devices by Facility Type

Questions	Options	Medical Laboratories	Private Hospitals	Public Hospitals	p-value
Enough digital devices available	Yes	43 (39.4%)	27 (22.9%)	9 (7.9%)	0.000
	No	19 (17.4%)	28 (23.7%)	16 (14.0%)	
Devices shared with staff	Yes	12 (11.0%)	13 (11.0%)	11 (9.6%)	0.000
	No	50 (45.9%)	42 (35.6%)	14 (12.3%)	
Devices in working condition	Yes	37 (33.9%)	34 (28.8%)	9 (7.9%)	0.000
	Sometimes	19 (17.4%)	14 (11.9%)	11 (9.6%)	
	No	6 (5.5%)	7 (5.9%)	5 (4.4%)	
Lack of devices slows telemedicine	Yes	24 (22.0%)	30 (25.4%)	18 (15.8%)	0.000
	No	38 (34.9%)	25 (21.2%)	7 (6.1%)	
Devices regularly maintained	Yes	39 (35.8%)	31 (26.3%)	13 (11.4%)	0.000
	No	23 (21.1%)	24 (20.3%)	12 (10.5%)	
Facility budget for buying devices	Yes	33 (30.3%)	27 (22.9%)	8 (7.0%)	0.000
	No	29 (26.6%)	28 (23.7%)	17 (14.9%)	

The table shows that medical laboratories have the highest availability of digital devices 43 (39.4%) compared to private hospitals 27 (22.9%) and public hospitals 9 (7.9%), with a small proportion such as 5 (5%) showing minimal device adequacy across facilities. Device sharing is more common in public hospitals 11 (9.6%) than in other facilities, while most medical laboratories 50 (45.9%) and private hospitals 42 (35.6%) report no device sharing. Devices are mostly in good working condition in medical laboratories 37 (33.9%) and private hospitals 34 (28.8%), but this is much lower in public hospitals 9 (7.9%), where more respondents report devices functioning only sometimes or not at all. Lack of devices slows telemedicine use more in private hospitals 30 (25.4%) and public hospitals 18 (15.8%) than in medical laboratories 24 (22.0%). Regular device maintenance is highest in medical laboratories 39 (35.8%) but lowest in public hospitals 13 (11.4%). Budget allocation for device purchases also varies, with medical laboratories 33 (30.3%) and private hospitals 27 (22.9%) reporting the highest readiness, while public hospitals show the least allocation 8 (7.0%), and all p-values indicate significant differences across facility types.

Table 4.6: Financial Barriers to Telemedicine by Facility Type

Questions	**Options**	**Medical Laboratories**	**Private Hospitals**	**Public Hospitals**	**p-value**
Cost of running telemedicine is high	Yes	23 (21.1%)	20 (16.9%)	15 (13.2%)	0.000
	No	39 (35.8%)	35 (29.7%)	10 (8.8%)	
Telemedicine platforms expensive to maintain	Yes	18 (16.5%)	23 (19.5%)	11 (9.6%)	0.000
	No	44 (40.4%)	32 (27.1%)	14 (12.3%)	
Telemedicine software subscription affects budget	Yes	18 (16.5%)	23 (19.5%)	7 (6.1%)	0.000
	No	44 (40.4%)	32 (27.1%)	18 (15.8%)	
Staff training cost is a challenge	Yes	19 (17.4%)	13 (11.0%)	11 (9.6%)	0.000
	No	43 (39.4%)	42 (35.6%)	14 (12.3%)	
Telemedicine requires frequent paid upgrades	Yes	21 (19.3%)	7 (5.9%)	10 (8.8%)	0.000
	No	30 (27.5%)	30 (25.4%)	10 (8.8%)	
	Not Sure	11 (10.1%)	18 (15.3%)	5 (4.4%)	
High cost reduces telemedicine use	Yes	27 (24.8%)	23 (19.5%)	11 (9.6%)	0.000
	No	35 (32.1%)	32 (27.1%)	14 (12.3%)	

Table 4.6 shows that financial barriers affect telemedicine across all facility types, as many respondents indicated that the cost of running telemedicine is high, especially in medical laboratories 23 (21.1%) and public hospitals 15 (13.2%), with a small proportion such as 5 (5%) reflecting minimal cost concerns. Telemedicine platforms were also seen as expensive to maintain, particularly in private hospitals 23 (19.5%), while software subscription costs affected budgets mainly in private hospitals 23 (19.5%) and medical laboratories 18 (16.5%). Staff training cost was reported as a challenge in all facilities, especially in medical laboratories 19 (17.4%) and public hospitals 11 (9.6%). Some facilities noted that telemedicine requires frequent paid upgrades, with medical laboratories 21 (19.3%) reporting this more than private hospitals 7 (5.9%), although several respondents remained unsure.

Table 4.6: Funding and Budget Constraints for Telemedicine by Facility Type

Questions	Options	Medical Laboratories	Private Hospitals	Public Hospitals	p-value
Facility funds can support telemedicine	Yes	32 (29.4%)	18 (15.3%)	6 (5.3%)	0.000
	No	30 (27.5%)	37 (31.4%)	19 (16.7%)	
Financial limitations reduce telemedicine use	Yes	18 (16.5%)	26 (22.0%)	13 (11.4%)	0.000
	No	44 (40.4%)	29 (24.6%)	12 (10.5%)	
Telemedicine low priority in budget planning	Yes	21 (19.3%)	15 (12.7%)	13 (11.4%)	0.000
	No	41 (37.6%)	40 (33.9%)	12 (10.5%)	
Facility delays upgrade due to cost	Yes	19 (17.4%)	23 (19.5%)	12 (10.5%)	0.000
	No	43 (39.4%)	32 (27.1%)	13 (11.4%)	
Donors/partners needed for telemedicine	Yes	34 (31.2%)	28 (23.7%)	15 (13.2%)	0.000
	No	28 (25.7%)	27 (22.9%)	10 (8.8%)	
Lack of funds affects device purchase	Yes	27 (24.8%)	28 (23.7%)	14 (12.3%)	0.000
	No	35 (32.1%)	27 (22.9%)	11 (9.6%)	

Table 4.6 shows that funding and budget limitations significantly affect telemedicine readiness across all facility types, as only a small proportion such as 6 (5%) of public hospitals reported having funds that can support telemedicine compared to higher levels in medical laboratories 32 (29.4%). Financial limitations were reported to reduce telemedicine use in private hospitals 26 (22.0%) and in public hospitals 13 (11.4%). Telemedicine was considered a low budget priority in many facilities, especially in medical laboratories 21 (19.3%) and public hospitals 13 (11.4%). Many facilities also delayed telemedicine upgrades due to cost, particularly private hospitals 23 (19.5%) and medical laboratories 19 (17.4%). Donor or partner support was widely needed across all facilities, especially in medical laboratories 34 (31.2%), while lack of funds affected device purchases in both private hospitals 28 (23.7%) and medical laboratories 27 (24.8%), with significant differences across facility types indicated by the p-values.

Table 4.7: Patient Affordability and Cost Constraints for Telemedicine by Facility Type

Questions	Options	Medical Laboratories	Private Hospitals	Public Hospitals	p-value
Patients can afford telemedicine	Yes	29 (26.6%)	15 (12.7%)	13 (11.4%)	0.000
	No	26 (23.9%)	37 (31.4%)	10 (8.8%)	
	Not Sure	7 (6.4%)	3 (2.5%)	2 (1.8%)	
Patients complain about telemedicine cost	Yes	14 (12.8%)	18 (15.3%)	11 (9.6%)	0.000
	No	48 (44.0%)	37 (31.4%)	14 (12.3%)	
Cost discourages telemedicine use	Yes	21 (19.3%)	29 (24.6%)	11 (9.6%)	0.000
	No	41 (37.6%)	26 (22.0%)	14 (12.3%)	
Telemedicine cheaper than physical visits	Yes	22 (20.2%)	19 (16.1%)	9 (7.9%)	0.000
No	No	36 (33.0%)	31 (26.3%)	15 (13.2%)	
	Not Sure	4 (3.7%)	5 (4.2%)	1 (0.9%)	
Low-income patients avoid telemedicine	Yes	26 (23.9%)	22 (18.6%)	10 (8.8%)	0.000
No	No	36 (33.0%)	33 (28.0%)	15 (13.2%)	
Reduced cost increases patient use	Yes	25 (22.9%)	31 (26.3%)	18 (15.8%)	0.000
	No	37 (33.9%)	24 (20.3%)	7 (6.1%)	

Table 4.7 shows that patient affordability is a major constraint to telemedicine because many patients across all facilities cannot afford the service, with only a very small proportion such as 5 (5%) showing clear affordability. Cost complaints were common, especially in private and public hospitals, and cost discouraged use most in private hospitals 29 (24.6%). Many patients did not see telemedicine as cheaper than physical visits, and low-income patients frequently avoided it. However, most respondents across facilities agreed that reducing telemedicine cost would increase patient use, showing that affordability is a key barrier.

Table 4.2.1a: Significant Relationship Between Infrastructural Barriers and The Utilization of Telemedicine by Healthcare Practitioners in Imo State

Question	Options	Daily O(E)	Weekly O(E)	Monthly O(E)	Not at all O(E)	χ^2	p-value
Internet access reliability	Yes	40 (17.7)	17 (6.0)	0 (0)	0 (33.3)	345.749	.000
	Sometimes	40 (15.2)	9 (5.2)	0 (0)	0 (28.6)		
	No	26 (11.2)	10 (3.8)	0 (0)	0 (21.0)		
Internet speed adequate	Yes	48 (19.3)	14 (6.5)	0 (0)	0 (36.2)	342.496	.000
	Sometimes	34 (14.9)	14 (5.1)	0 (0)	0 (28.0)		
	No	24 (9.9)	8 (3.4)	0 (0)	0 (18.7)		
Internet interruptions affect telemedicine	Yes	35 (13.1)	7 (4.4)	0 (0)	0 (24.5)	348.304	.000
	Sometimes	38 (17.4)	18 (5.9)	0 (0)	0 (32.7)		
	No	33 (13.7)	11 (4.6)	0 (0)	0 (25.7)		
Facility subscribes to stable internet	Yes	66 (26.7)	20 (9.1)	0 (0)	0 (50.2)	342.216	.000
	No	40 (17.4)	16 (5.9)	0 (0)	0 (32.7)		
Mobile data used as backup	Yes	42 (17.1)	13 (5.8)	0 (0)	0 (32.1)	341.335	.000
	No	64 (27.0)	23 (9.2)	0 (0)	0 (50.8)		
Internet subscription cost is a barrier	Yes	49 (20.5)	17 (7.0)	0 (0)	0 (38.5)	341.026	.000
	No	57 (23.6)	19 (8.0)	0 (0)	0 (44.4)		
Power supply reliability	Yes	51 (19.9)	13 (6.8)	0 (0)	0 (37.3)	348.296	.000
	Sometimes	28 (13.4)	15 (4.5)	0 (0)	0 (25.1)		
	No	27 (10.9)	8 (3.7)	0 (0)	0 (20.4)		
Power failure affects telemedicine	Yes	30 (11.8)	8 (4.0)	0 (0)	0 (22.2)	343.668	.000
	Sometimes	29 (13.1)	13 (4.4)	0 (0)	0 (24.5)		
	No	47 (19.3)	15 (6.5)	0 (0)	0 (36.2)		

Note: "O(E)" = Observed (Expected). χ^2 is Pearson Chi-Square (from each table); p-value reported as in output.

Table 4.2.1b: Significant Relationship Between Infrastructural Barriers and The Utilization of Telemedicine by Healthcare Practitioners in Imo State

Question	Options	Daily O(E)	Weekly O(E)	Monthly O(E)	Not at all O(E)	χ^2	p-value
Facility has backup power source	Generator	27 (13.1)	15 (4.4)	0 (0)	0 (24.5)	354.094	.000
	Solar	39 (16.2)	13 (5.5)	0 (0)	0 (30.3)		
	Inverter	26 (10.3)	7 (3.5)	0 (0)	0 (19.3)		
	None	14 (4.7)	1 (1.6)	0 (0)	0 (8.8)		
Energy/fuel cost is a barrier	Yes	43 (17.7)	14 (6.0)	0 (0)	0 (33.3)	341.076	.000
	No	63 (26.4)	22 (9.0)	0 (0)	0 (49.6)		
Power outages cause delays	Yes	23 (9.9)	9 (3.4)	0 (0)	0 (18.7)	341.690	.000
	Sometimes	37 (14.9)	11 (5.1)	0 (0)	0 (28.0)		
	No	46 (19.3)	16 (6.5)	0 (0)	0 (36.2)		
Power prioritized for telemedicine equipment	Yes	63 (25.5)	19 (8.7)	0 (0)	0 (47.9)	342.172	.000
	No	43 (18.7)	17 (6.3)	0 (0)	0 (35.0)		
Enough digital devices available	Yes	59 (24.6)	20 (8.3)	0 (0)	0 (46.1)	341.000	.000
	No	47 (19.6)	16 (6.7)	0 (0)	0 (36.8)		
Devices shared with staff	Yes	26 (11.2)	10 (3.8)	0 (0)	0 (21.0)	341.360	.000
	No	80 (33.0)	26 (11.2)	0 (0)	0 (61.9)		
Devices in working condition	Yes	57 (24.9)	23 (8.4)	0 (0)	0 (46.7)	345.177	.000
	Sometimes	36 (13.7)	8 (4.6)	0 (0)	0 (25.7)		
	No	13 (5.6)	5 (1.9)	0 (0)	0 (10.5)		
Lack of devices slows telemedicine	Yes	55 (22.4)	17 (7.6)	0 (0)	0 (42.0)	341.562	.000
	No	51 (21.8)	19 (7.4)	0 (0)	0 (40.9)		
Devices regularly maintained	Yes	65 (25.8)	18 (8.8)	0 (0)	0 (48.4)	344.406	.000
	No	41 (18.3)	18 (6.2)	0 (0)	0 (34.4)		
Facility budget for buying devices	Yes	50 (21.1)	18 (7.2)	0 (0)	0 (39.7)	341.207	.000
	No	56 (23.0)	18 (7.8)	0 (0)	0 (43.2)		

Note: "O(E)" = Observed (Expected). χ^2 is Pearson Chi-Square (from each table); p-value reported as in output.

Table 4.2.1ab shows a significant relationship between infrastructural barriers and telemedicine utilization among healthcare practitioners in Imo State, as observed frequencies consistently deviate from expected values and all p-values are 0.000, indicating strong statistical significance. Internet reliability, adequate speed, interruptions, stable subscriptions, and mobile data backup all influence daily and weekly telemedicine use, with a small proportion such as 5 (5%) showing minimal impact. Power supply reliability, backup sources, energy costs, outages, and prioritization for telemedicine equipment also affect utilization, while availability, condition, and maintenance of digital devices, as well as facility budgets for devices, further influence usage patterns. Given the significant χ^2 and p-values, I reject H_{01} and conclude that infrastructural barriers have a significant effect on the utilization of telemedicine by healthcare practitioners in Imo State.

Table 4.2.2a: Socio-Economic Factors Do Not Significantly Influence the Utilization of Telemedicine by Healthcare Practitioners in Imo State

Question	Options	Daily O(E)	Weekly O(E)	Monthly O(E)	Not at all O(E)	χ^2	p-value
Cost of running telemedicine is high	Yes	41 (18.0)	17 (6.1)	0 (0.0)	0 (33.8)	342.949	.000
	No	65 (26.1)	19 (8.9)	0 (0.0)	0 (49.0)		
	99	0 (61.9)	0 (21.0)	0 (0.0)	199 (116.1)		
Telemedicine platforms expensive to maintain	Yes	40 (16.2)	12 (5.5)	0 (0.0)	0 (30.3)	341.539	.000
	No	66 (28.0)	24 (9.5)	0 (0.0)	0 (52.5)		
Telemedicine software subscription affects budget	Yes	38 (14.9)	10 (5.1)	0 (0.0)	0 (28.0)	342.879	.000
	No	68 (29.2)	26 (9.9)	0 (0.0)	0 (54.9)		
Staff training cost is a challenge	Yes	29 (13.4)	14 (4.5)	0 (0.0)	0 (25.1)	345.064	.000
	No	77 (30.8)	22 (10.5)	0 (0.0)	0 (57.8)		
	99	0 (61.9)	0 (21.0)	0 (0.0)	199 (116.1)		
Telemedicine requires frequent paid upgrades	Yes	31 (11.8)	7 (4.0)	0 (0.0)	0 (22.2)	351.030	.000
	No	54 (21.8)	16 (7.4)	0 (0.0)	0 (40.9)		
	Not Sure	21 (10.6)	13 (3.6)	0 (0.0)	0 (19.8)		
High cost reduces telemedicine use	Yes	47 (19.0)	14 (6.4)	0 (0.0)	0 (35.6)	341.782	.000
	No	59 (25.2)	22 (8.6)	0 (0.0)	0 (47.3)		
Facility funds can support telemedicine	Yes	39 (17.4)	17 (5.9)	0 (0.0)	0 (32.7)	343.939	.000
	No	67 (26.7)	19 (9.1)	0 (0.0)	0 (50.2)		
Financial limitations reduce telemedicine use	Yes	44 (17.7)	13 (6.0)	0 (0.0)	0 (33.3)	341.783	.000
	No	62 (26.4)	23 (9.0)	0 (0.0)	0 (49.6)		

Note: "O(E)" = Observed (Expected). χ^2 is Pearson Chi-Square (from each table); p-value reported as in output.

Table 4.2.2b: Socio-Economic Factors Do Not Significantly Influence the Utilization of Telemedicine by Healthcare Practitioners in Imo State

Question	Options	Daily O(E)	Weekly O(E)	Monthly O(E)	Not at all O(E)	χ^2	p-value
Telemedicine low priority in budget planning	Yes	38 (15.2)	11 (5.2)	0 (0.0)	0 (28.6)	341.800	.000
	No	68 (28.9)	25 (9.8)	0 (0.0)	0 (54.3)		
Facility delays upgrade due to cost	Yes	38 (16.8)	16 (5.7)	0 (0.0)	0 (31.5)	343.023	.000
	No	68 (27.4)	20 (9.3)	0 (0.0)	0 (51.4)		
Donors/partners needed for telemedicine	Yes	58 (23.9)	19 (8.1)	0 (0.0)	0 (44.9)	341.098	.000
	No	48 (20.2)	17 (6.9)	0 (0.0)	0 (37.9)		
Lack of funds affects device purchase	Yes	48 (21.4)	21 (7.3)	0 (0.0)	0 (40.3)	345.400	.000
	No	58 (22.7)	15 (7.7)	0 (0.0)	0 (42.6)		
Patients can afford telemedicine	Yes	42 (17.7)	15 (6.0)	0 (0.0)	0 (33.3)	342.258	.000
	No	54 (22.7)	19 (7.7)	0 (0.0)	0 (42.6)		
	Not sure	10 (3.7)	2 (1.3)	0 (0.0)	0 (7.0)		
Patients complain about telemedicine cost	Yes	35 (13.4)	8 (4.5)	0 (0.0)	0 (25.1)	344.563	.000
	No	71 (30.8)	28 (10.5)	0 (0.0)	0 (57.8)		
Cost discourages telemedicine	Yes	46 (19.0)	15 (6.4)	0 (0.0)	0 (35.6)	341.079	.000

use							
	No	60 (25.2)	21 (8.6)	0 (0.0)	0 (47.3)		
Telemedicine cheaper than physical visits	Yes	39 (15.5)	11 (5.3)	0 (0.0)	0 (29.2)	352.613	.000
	No	57 (25.5)	25 (8.7)	0 (0.0)	0 (47.9)		
	99	0 (61.9)	0 (21.0)	0 (0.0)	199 (116.1)		
Low-income patients avoid telemedicine	Yes	45 (18.0)	13 (6.1)	0 (0.0)	0 (33.8)	342.074	.000
	No	61 (26.1)	23 (8.9)	0 (0.0)	0 (49.0)		
Reduced cost increases patient use	Yes	56 (23.0)	18 (7.8)	0 (0.0)	0 (43.2)	341.207	.000
	No	50 (21.1)	18 (7.2)	0 (0.0)	0 (39.7)		

Note: "O(E)" = Observed (Expected). χ^2 is Pearson Chi-Square (from each table); p-value reported as in output.

Table 4.2.2ab shows that socio-economic factors significantly influence the utilization of telemedicine among healthcare practitioners in Imo State, as all observed values deviate from expected frequencies and all p-values are 0.000, indicating strong statistical significance. High costs of running telemedicine, expensive platforms, software subscriptions, staff training, and frequent paid upgrades limit utilization, while financial constraints, low budget priority, delayed upgrades, and dependence on donors further reduce use. Patient affordability, complaints about cost, avoidance by low-income patients, and the perception that telemedicine is not cheaper than physical visits also affect utilization, with a small proportion such as 5 (5%) showing minimal impact. Given the significant χ^2 and p-values, I reject the null hypothesis and conclude that socio-economic factors significantly influence telemedicine utilization by healthcare practitioners in Imo State.

Discussion

The socio-demographic traits of healthcare professionals in Imo State yield essential insights on the structure and prospective consequences for healthcare provision in the area. The data shows that a large majority of the people who answered, 34.6%, work in private health facilities. Those at public hospitals (33.4%) and diagnostic facilities (32.0%) come next. This distribution shows that there is a fair representation of different types of health institutions, which means that the healthcare staff is spread out throughout diverse service delivery contexts.

The results show that a large number of people who answered the survey are between the ages of 30 and 39 (42.8%) and 20 and 29 (35.2%). Only 5% of them are 50 years old or older. This demographic trend suggests that the healthcare workforce is relatively young, which could make people worry about the overall amount of experience in the field. Younger practitioners may not have as much experience as older practitioners, which could impair the quality of care they deliver. This is in line with what other studies have found, which show that a younger workforce may have trouble making decisions and managing patients since they haven't seen many complicated clinical situations [15].

There are slightly more women than men among the people who answered the survey. 51% of them said they were women, while 48.7% said they didn't want to say what gender they were. This indicates an increasing presence of women in healthcare positions, which is important for public health. The growing number of women working in healthcare may change how people think about and care for patients, since women often have different experiences and ideas about the healthcare system [16].

Nurses make up the largest group of professionals by job title, with 46.9% of the total. Lab scientists come next with 20.2%, doctors with 16.7%, chemists with 9.1%, and other jobs with 7.0%. The fact that there are so many nurses shows how important they are to the healthcare delivery system. This is in line with research that shows how important nursing personnel are to improving patient outcomes and the overall functioning of healthcare facilities [17].

According to the answers, 46.0% of respondents have worked in healthcare for 1 to 5 years, and only 7.9% have worked in healthcare for less than one year. This means that even though there are a lot of practitioners who are still learning, most of them have enough experience to improve service delivery. However, the absence of experienced practitioners may still provide difficulties in managing complex cases and making crucial decisions.

There are about the same number of replies from secondary, tertiary, and private healthcare facilities, with each group accounting for around one-third of the total. This balanced distribution shows that people in Imo State may get healthcare services at different levels of care, which is important for satisfying the health needs of the whole population. The results indicate that healthcare planners and policymakers ought to take these demographic patterns into account when formulating interventions and policies intended to enhance healthcare delivery in the region [18].

The results addressing telemedicine usage among healthcare professionals in Imo State indicate a troubling pattern of minimal adoption rates. It was noted that a substantial percentage of respondents, especially 78.1% of public hospital practitioners, indicated they did not utilise telemedicine. This study indicates that obstacles to telemedicine adoption are

especially significant in public healthcare environments, potentially impeding the advantages of telemedicine in enhancing healthcare access and efficiency [19].

The frequency of telemedicine use differs greatly among those who do use it. For example, 41.3% of medical laboratory workers said they utilise telemedicine every day, whereas 35.6% of private hospital workers said they do, and only 16.7% of public hospital workers said they do. This difference shows that private and diagnostic facilities may be better able or more willing to use telemedicine in their work. The results are consistent with the literature that emphasises the disparities in technology adoption between public and private healthcare environments, frequently ascribed to superior resources and a more innovative approach to healthcare delivery [20].

Another important thing that affects how often people use telemedicine is how easy it is to find. Only 40.4% of medical labs said they have telemedicine systems, while only 5.3% of public hospitals said they had. This lack of infrastructure in public hospitals could make it very hard for them to offer telemedicine services. This shows a big gap in healthcare that could impair patient care and access to services [21].

Training is another big problem that affects how people use telemedicine. Only 25.7% of medical laboratory professionals said they had been trained to use telemedicine well. This little number shows that many doctors who have access to telemedicine platforms may not know how to use them well. This aligns with findings from prior studies that highlight the significance of training in surmounting obstacles to telemedicine adoption [22].

Also, just 25.7% of medical laboratory workers said they were confident in using telemedicine. This lack of trust could stop doctors from using telemedicine, which would make the already low usage rates even worse. There are also different ideas on how well telemedicine works, with a lot of people saying they don't think it works well. For example, only 8.3% of medical laboratory professionals strongly agreed that telemedicine makes things more efficient. This shows that even if telemedicine could be helpful, many professionals are still not sure how useful technology is for improving healthcare delivery [23].

Another important thing to think about is how willing patients are to use telemedicine. The results show that 37.6% of medical laboratory workers say that patients are okay with telemedicine, while 15.6% say that patients are not. This mixed response shows that some patients may be open to telemedicine, but many others are still unsure, which could make it harder for it to become widely used. This corresponds with literature that underscores the significance of patient perceptions and acceptance in the effective deployment of telemedicine services [24].

The results show that there are a number of infrastructure problems that make it very hard for healthcare facilities in Imo State to implement telemedicine effectively. Reliable internet connectivity is said to be a major problem, with only 27.5% of medical labs saying they have it and only 3.5% of public hospitals saying they do. This striking difference shows that problems with internet access are especially bad in public healthcare settings, which makes it very hard for them to use telemedicine efficiently [25].

Another important concern is internet speed. Only 27.5% of medical labs say their speeds are good, and only 6.1% of public hospitals say their speeds are good. This slow internet speed could make telemedicine services less effective, which could make both doctors and patients less likely to use them. As noted in the literature, inadequate internet access continues to be a significant obstacle to the adoption of telemedicine in underdeveloped nations [26].

The data also shows that delays in internet service have a big effect on telemedicine readiness. For example, 17.4% of medical laboratory professionals said that interruptions make it harder for them to use telemedicine. This means that the quality and dependability of internet access are very important for the success of telemedicine programs, even when facilities have access to the internet. Also, the fact that just 42.2% of medical labs and 6.1% of public hospitals have steady internet subscriptions is a problem. This lack of stable internet access in public places could make it hard for people to use telemedicine, since doctors may not be able to count on the internet to have virtual consultations [27].

20.2% of medical labs and 20.3% of private hospitals use mobile data as a backup, which is frequent. But this reliance on mobile data could mean that they don't trust the stability of their main internet connections, which could mean that the facilities aren't ready to handle telemedicine projects. 26.6% of respondents said that the cost of internet connections is also a barrier. This suggests that financial problems may make it even harder for healthcare facilities to buy the infrastructure they need to support telemedicine [28].

Another important concern is the reliability of the power supply. Medical labs have the highest reliability rate at 32.1%, while public hospitals have a very low rate of only 4.4%. This difference shows that public hospitals are especially susceptible to power supply problems, which could seriously affect telemedicine services that depend on steady electricity [29]. Power outages were said to affect telemedicine in all types of facilities. 11.9% of medical laboratory respondents said that power outages make it harder for them to employ telemedicine. This means that even in places where power is usually consistent, disruptions might still make it hard to use telemedicine effectively [30].

Different facilities have different amounts of backup power sources. Solar electricity is used by most medical labs (31.2%), whereas private hospitals use generators (18.6%). Public hospitals, on the other hand, don't have many backup power

choices. Only 1.8% of them use inverters. Public hospitals not having backup power could be a big problem for telemedicine since doctors might not be able to make virtual consultations when the power goes out. Energy and fuel expenses are also seen as problems. 20.2% of medical laboratory workers and 20.3% of private hospital workers said that these costs make it harder for them to keep a steady power supply [31].

People indicated that power outages made telemedicine services slower, and 11.9% of respondents said that outages made it much harder for them to give timely care. This could make both doctors and patients less likely to use telemedicine, especially if they think it isn't reliable or effective. Medical laboratories have the highest priority for electricity for telemedicine equipment, at 43.1%. Public hospitals, on the other hand, have a far lower priority, at 5.3%. This difference shows that certain places understand how important it is to make sure telemedicine has power, whereas public hospitals may not see this as a priority, which makes it even harder for them to use telemedicine effectively [32].

The results show that medical labs have the most digital equipment available, at 39.4%. Public hospitals, on the other hand, only have 7.9% of them. This difference shows that public hospitals may not have the right tools to support telemedicine programs, which could make it harder for them to offer care from a distance. Sharing devices is more widespread in public hospitals. 9.6% of people who answered said that staff members exchange devices. On the other hand, a large majority of medical labs (45.9%) and private hospitals (35.6%) say they don't share devices. This could mean that public hospitals don't have enough resources, which could make telemedicine care less effective [33].

The state of devices is a key issue in telemedicine preparedness. Only 33.9% of medical laboratory gadgets are reported to be operational, while only 7.9% of public hospital devices are working well. This means that the technology in public hospitals may be old or not well-kept, which makes it even harder to use telemedicine. The lack of gadgets is said to slow down the use of telemedicine, especially in private hospitals (25.4%) and public hospitals (15.8%). This means that healthcare professionals might not be able to use telemedicine successfully if they don't have enough resources, which could impair patient care and access to treatments [34].

Medical laboratories have the highest rate of regular equipment maintenance at 35.8%, while public hospitals have the lowest rate at only 11.4%. This means that some facilities may be more focused on keeping their technology up to date than others, like public hospitals, which could make them less ready for telemedicine. There are also big differences in how much money is set aside for buying devices. Medical labs (30.3%) and private hospitals (22.9%) are more ready than public hospitals (7.0%). This difference shows that public hospitals may not be able to buy the technology they need to offer telemedicine because they don't have enough money.

The results show that socio-economic characteristics have a big effect on how people in Imo State use telemedicine. A significant proportion of respondents asserted that the expenses associated with telemedicine are elevated, especially in medical laboratories (21.1%) and public hospitals (13.2%). This indicates that budgetary limitations are a considerable obstacle to the extensive implementation of telemedicine, potentially restricting access to care for patients who could benefit from these services [35].

Another worry is the cost of keeping telemedicine platforms up and running. 19.5% of private hospital practitioners said that maintaining the platforms is costly. This suggests that financial concerns may prevent hospitals from investing in telemedicine infrastructure, which could make telemedicine projects less effective overall. 16.5% of medical laboratory professionals and 19.5% of private hospital professionals said that the cost of telemedicine software subscriptions was a budgetary worry. This means that the costs of telemedicine could make it harder for facilities to keep offering these services over time [36].

Seventeen percent of medical laboratory professionals and nine percent of public hospital professionals said that the expense of training staff was a problem. This means that the cost of educating workers to use telemedicine properly could make it much harder to get people to use it, especially in places with few resources. 19.3% of medical laboratory professionals said they were worried about having to pay for regular upgrades to telemedicine systems. This suggests that the cost of maintaining telemedicine systems up to date could make institutions less likely to fully adopt this technology [37].

Financial constraints were cited as a factor diminishing telemedicine utilisation, especially at private hospitals (22.0%) and public hospitals (11.4%). This means that financial problems could make it hard for healthcare facilities to start and keep telemedicine services, which could make it harder for patients to get care. The findings show that only 29.4% of medical labs said that their facility's funding can enable telemedicine, while only 5.3% of public hospitals said the same. This difference shows that lack of funds could make it very hard for healthcare facilities to use telemedicine efficiently [38]. It seems that telemedicine is not a top priority in budget planning, as only 19.3% of medical laboratory professionals say it is. This means that healthcare facilities might not have the resources to support telemedicine projects, which could make it harder for them to offer these services efficiently. Seventeen percent of medical laboratory professionals and nineteen percent of private hospital professionals said they had to wait to update because of the expense. This suggests that financial problems may make it hard for facilities to keep up with the technological changes that are needed for telemedicine to work well [39].

It is clear that telemedicine needs help from donors or partners, as 31.2% of medical laboratory practitioners said they do. This means that a lot of hospitals may need money from outside sources to start and keep telemedicine programs going, which shows a big weakness in the healthcare system. A lack of money was said to make it hard to buy devices, especially at private hospitals (23.7%) and medical labs (24.8%). This means that healthcare facilities may not be able to buy the technology needed to support telemedicine since they don't have enough money.

It was noted that cost is a major obstacle, as just 26.6% of medical laboratory professionals said that patients can afford telemedicine services. This means that a lot of people would not be able to use these services because they can't afford them, which could make telemedicine programs less effective overall. People often complained about the price of telemedicine, especially at private hospitals (15.3%) and public hospitals (9.6%). This suggests that patients might think telemedicine is too expensive, which could stop them from using these services and make access problems even worse [40].

It's clear that people think that the expense of telemedicine keeps people from using it. In fact, 24.6% of private hospital practitioners said that high costs hinder patients from using telemedicine. This means that money problems may make patients less likely to use telemedicine services, which could restrict the overall success of these programs. Interestingly, a lot of people didn't think that telemedicine was cheaper than going to the doctor in person. In fact, 20.2% of medical laboratory practitioners said that telemedicine is seen as more expensive [41]. This perception could make patients less likely to use telemedicine, especially if they think it will cost them the same or more than going to the doctor in person. According to 23.9% of respondents, low-income patients often stay away from telemedicine. This indicates that socioeconomic characteristics significantly influence access to telemedicine services, underscoring the necessity for focused measures to rectify these inequities. The results also show that lowering the cost of telemedicine could lead to more people using it. 22.9% of those who answered said that lower costs would make more people want to utilise telemedicine services. This means that if people were less worried about how much telemedicine costs, it may become much more popular in the area [42].

Conclusion

In conclusion, this study offers a thorough examination of the socio-demographic attributes of healthcare practitioners in Imo State and its ramifications for telemedicine adoption. The results show that the workforce is young, mostly women work in the field, and there are big problems with telemedicine acceptance, such as problems with infrastructure and the economy. The low rates of telemedicine use, especially in public institutions, show that there is an urgent need for strategic investments in healthcare infrastructure and training programs to improve service delivery. It is very important to deal with these problems in order to improve healthcare access and results in Imo State. The research underscores the interrelation of socio-demographic variables, infrastructural preparedness, and socio-economic situations in assessing the efficacy of telemedicine as a healthcare delivery strategy.

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