

ORIGINAL ARTICLE

Assessing Telemedicine Knowledge and Utilization among Residents in Benin City, Edo State during the COVID-19 Pandemic: A Descriptive Study

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ABSTRACT

Background: The COVID-19 pandemic has accelerated the adoption of telemedicine, addressing healthcare service gaps. This study aimed to evaluate the knowledge and utilization of telemedicine among residents in Benin City, Edo State, Nigeria.

Methods: A descriptive cross-sectional survey was conducted among adult residents of Benin City. A multi-staged sampling technique comprising four stages was employed to select respondents, and data were collected through a pre-tested self-administered questionnaire. Statistical analysis was carried out using IBM SPSS vs 25.0. Significance was established at $p < 0.05$, and results were presented as prose and frequency tables.

Results: The study included 413 participants with a mean age (SD) of 26.9 ± 7.1 years. The majority, 279 (67.6%), were students, and 289 (70.0%) had tertiary education. Good knowledge of telemedicine was demonstrated by 192 (61.5%) of the respondents but 122 (39.1%) had used telemedicine services. Fifty-seven (46.7%) of those who used telemedicine favoured phone calls as the primary medium, citing its accessibility. Notably, 106 (86.9%) reported using telemedicine to reduce hospital waiting times, and 105 (86.1%) appreciated its ready availability. Barriers to telemedicine use included network challenges during consultations (42.6%) and inconsistent power supply (36.3%). Age ($p = 0.045$), sex ($p = 0.038$) and higher education ($p = 0.009$) were significantly associated with better telemedicine knowledge.

Conclusion: The study revealed that while a significant proportion of residents in Benin City possessed good knowledge of telemedicine, its utilization remains low. Addressing infrastructure limitations and extending educational efforts will be pivotal in bridging the knowledge-utilization gap in telemedicine.

Keywords: Coronavirus Pandemic; Knowledge; Utilization; Telemedicine; Benin City

INTRODUCTION

The COVID-19 pandemic has catalyzed transformative changes in healthcare delivery, compelling healthcare systems worldwide to adapt swiftly to emerging challenges.¹ Telemedicine, characterized by the use of technology to provide healthcare services remotely, has emerged as an innovative solution to address the pressing issues of healthcare access, especially in low- and middle-income

countries like Nigeria.²⁻⁴

Before the pandemic, the adoption of telemedicine in Africa faced considerable limitations. Challenges such as inadequate internet connectivity, lack of essential infrastructure, and limited awareness among both healthcare providers and patients hindered its comprehensive implementation.⁵ However, the COVID-19 pandemic induced a rapid and substantial escalation in the utilization of telemedicine. Governments and healthcare providers turned to telemedicine as a strategy to minimize the risk of virus transmission while ensuring continuous delivery of essential healthcare services.⁶⁻⁸

The marked increase in telemedicine usage during the pandemic is noteworthy.^{9,10} Despite this surge, there exists a vital need to explore

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the knowledge and usage patterns of telemedicine services among the general population in Nigeria.^{11,12} Existing literature underscores the transformative potential of telemedicine in healthcare delivery. For instance, a study emphasized the role of telemedicine in providing effective healthcare access, reducing healthcare costs, and improving patient satisfaction.¹³ Also, a review highlighted the impact of telemedicine on healthcare equity, especially among underserved populations.¹⁴ Despite the evident advantages of telemedicine, a 2021 report by the World Health Organization raised concerns about the unequal global distribution of telemedicine services, with low- and middle-income countries still facing significant challenges in adopting this technology effectively.¹⁵

This study, therefore, aimed to offer valuable insights into the levels of knowledge and utilization of telemedicine in Benin City, Edo state. By exploring the factors that may inhibit its widespread adoption, we sought to propose strategies for advancing the utilization of telemedicine services not only in Benin City but also across Nigeria. In doing so, this research aspires to contribute meaningfully to the existing body of knowledge regarding telemedicine in Nigeria and provide guidance for policies and interventions aimed at improving healthcare accessibility.

METHODOLOGY

The study which utilized a descriptive cross-sectional study design was carried out in Benin City the capital of Edo State, Nigeria. Benin City occupies a strategic position as the gateway to the Eastern, Western, Southern and Northern parts of Nigeria, and has a high presence of residents from across the country and world. It is both a commercial and industrial town.^{16,17} Literacy rate among female young adults (15 - 24 years) in Edo state is 94.9% which is higher than the National average of 59.3%. The literacy rate among young male adults in Edo state is 98.3% which is also higher than the National average (70.9%).¹⁸ During the pandemic, residents showed good knowledge of the community mitigations strategies for control of COVID-19 and adhered to precautionary guidelines following news of the disease outbreak in Nigeria.¹⁹

The study population comprised residents of Benin City, Edo State, aged 18 years and above. In this context, "residents" encompassed individuals who had their primary place of abode within the geographical boundaries of Benin City, thus ensuring a representation of the local population. The study spanned a duration of four months, February 2021 to May 2021.

The minimum sample size for this study was calculated using the formula for studying single proportions,²⁰ with a margin of error set at 5%, a confidence level of 95%, and a prevalence rate of 41.1%, from a similar study conducted in Enugu.²¹ A multi-stage sampling technique comprising four stages was employed in the selection of participants. In the first stage, simple sampling technique by balloting was used to select one LGA (Egor LGA) from the three LGAs (Egor, Ikpoba-Okha and Oredo LGAs) which make up Benin City. In the second stage, simple random sampling by balloting was done to select one ward (Ugbowo) from the 10 wards in Egor LGA. Stage three comprised selection of communities. Two of the four communities in Ugbowo ward was selected using simple random sampling method by balloting. The fourth stage involved systematic random sampling of households within each community, from which one eligible participant was selected to represent the household. This approach guaranteed that each selected household had an equal chance of being included in the study, thus enhancing fairness in participant selection.

Data collection was carried out using a structured, interviewer-administered questionnaire. The questionnaire's development was guided by a comprehensive review of the existing literature on telemedicine. Prior to the study, a pretest of the questionnaire was conducted with 20 residents in Ologbo, a border town in Edo State. The questionnaire was composed of four distinct sections, systematically designed to gather essential data. These sections included participant's socio-demographic characteristics, knowledge about telemedicine, utilization of telemedicine, and barriers hindering their access to telemedicine services. Trained research assistants conducted the questionnaire interviews. These assistants were proficient in both English and the local Edo language, ensuring effective communication with the study participants.

The collected data were cleaned, entered and analyzed using the IBM SPSS, version 25.0. Descriptive statistics were utilized to present a clear summary of the findings. The level of knowledge about telemedicine was assessed using 27 questions. Each correct response was assigned a score of 1, while incorrect answers received a score of 0. The total score ranged from 0 as the lowest to 27 as the highest. To gauge the respondents' knowledge, the scores were converted into percentages. Those who achieved a score of 50% or higher were categorized as having "good knowledge," while those scoring 49% and below were classified as having "poor knowledge" regarding telemedicine. Test of associations were carried out using Chi-squared tests or the Fishers' Exact test where appropriate to identify factors associated with

both the knowledge and utilization of telemedicine services.

Ethical approval was obtained from the Research Ethics Committee of the University of Benin Teaching Hospital (Protocol number ADM/E/22/A/VOL III/14831085). Informed consent was sought and obtained from all study participants before the commencement of data collection. Furthermore, the study placed strong emphasis on maintaining the confidentiality and anonymity of all participants, ensuring their privacy and well-being were preserved in accordance with ethical research practices.

RESULTS

A total of 413 out of 420 respondents returned completely filled questionnaires, resulting in a response rate of 98.3%. The mean age of respondents was 26.9 ± 7.1 years, with a higher proportion within the age groups of 15 – 24 years 180 (43.6%) and 25 – 34 years 178 (43.1%). Majority, 387 (93.7%) of the respondents identified as Christians. About two-thirds 279 (67.6%) of the respondents were students, and a majority 289 (70.0%) had a tertiary level of education. (Table 1)

Three hundred and twelve (75.5%) of respondents reported being aware of telemedicine. The main sources of information about telemedicine were social media 203 (65.1%), television 127 (40.7%), and online articles 125 (39.4%). Over half, 161 (51.6%) of respondents had heard about telemedicine before the COVID-19 pandemic, while 151 (48.4%) first learned about it during the pandemic. Most, 285 (91.3%) of respondents had good knowledge of the meaning of telemedicine, while 27 (8.7%) had poor knowledge. Social media, 179 (57.4%) and video calls, 160 (51.3%) were the most recognized telemedicine media. One hundred and eighty one (58.0%) respondents knew that telemedicine can be used for counselling, and 172 (55.1%) believed routine consultations can be done using telemedicine. Overall, 192 (61.5%) of respondents had good knowledge of telemedicine. (Table 2)

Good knowledge of telemedicine was found in all age groups, however, all respondents in age groups 45 – 54 and 55 – 64 years had good knowledge. A significant statistical association was found between the age of respondents and knowledge of telemedicine ($p = 0.038$), Males, had better knowledge than females and the association between sex of respondents and good knowledge of telemedicine was statistically significant ($p = 0.045$). Good knowledge was highest amongst respondents with secondary level of education. The association between level of education and knowledge of telemedicine was also statistically significant ($p = 0.009$) No

significant statistical association was observed between marital status ($p = 0.210$), religion ($p = 0.080$) and knowledge of telemedicine. (Table 3)

About two-fifth, 122 (39.1%) of respondents had ever used any telemedicine medium. The most commonly used medium was phone calls 57 (46.7%), followed by video calls 52 (42.6%). 36 (29.5%) of respondents first used telemedicine during the COVID-19 pandemic. Also, 52 (42.6%) of users adopted telemedicine for a new complaint, while 20 (16.4%) used it for COVID-19 related reasons. Fifty five (45.1%) of respondents reported facing challenges during telemedicine consultations. Of these, long waiting times 26 (47.3%) delayed response 19 (34.5%) and network difficulties being the most common challenges. Ninety (73.8%) of respondents found the duration of their telemedicine consultations adequate. 85(69.7%) of respondents reported that their telemedicine consultation was concluded, while 41(33.6%) reported that it was ended due to challenges. 97(79.5%) of respondents reported that the doctor was thorough with questions and respected their privacy 109 (89.3%). (Table 4)

There were various reasons why respondents chose to use telemedicine services, while others did not. Among those who used telemedicine 122 (39.1%), the most common reasons included the reduction in waiting time at the hospital 106 (86.9%), the convenience of having telemedicine readily available 105 (86.1%), the ability to overcome transportation difficulties associated with face-to-face appointments 99 (81.2%), and the cost-effectiveness of telemedicine compared to traditional hospital visits 92 (75.4%). On the other hand, among those who did not use telemedicine 190 (60.9%), different factors played a role in their decision. The most frequently cited reasons for not using telemedicine were network challenges 81(42.6%), the preference of a spouse or family for traditional hospital visits 78 (41.1%), lack of constant power supply 69 (36.3%), and concerns about the cost of phone calls or internet services 57 (30.0%). Audio challenges 54 (28.4%) and concerns about privacy 46 (24.2%) also contributed to non-use. A smaller proportion mentioned not having access to a phone or computer 34 (17.9%), or lacking the ability to operate such devices 23 (12.1%) as reasons for not using telemedicine.

All respondents in age group 45 – 54 and 55 – 64 years utilized telemedicine however, the association between age group and utilization of telemedicine was not statistically significant ($p = 0.082$). More males 81 (39.7) than females 41 (38.0) utilized telemedicine. However, no significant statistical association was observed between sex and utilization of telemedicine ($p = 0.714$)

Table 1: Sociodemographic characteristics of respondents

Variable	Frequency (n = 413)	Percent
Age group (years)		
15 – 24	180	43.6
25 – 34	178	43.1
35 – 44	41	9.9
45 – 54	9	2.2
55 – 64	5	1.2
Mean ± SD	26.9 ± 7.1 years	
Sex		
Male	256	62.0
Female	157	38.0
Level of Education		
Tertiary	289	70.0
Secondary	117	28.3
Primary	6	1.5
None	1	0.2
Occupation		
Student	279	67.6
Businessman/woman	47	11.4
Doctor/Nurse	10	2.4
Banker/Accountant	8	1.9
Teacher	8	1.9
Civil Servant	7	1.7
Engineer	2	0.5
Others	52	12.6
Religion		
Christianity	387	93.7
Islam	20	4.9
ATR**	3	0.7
Others	3	0.7
Marital Status		
Single	334	80.9
Married	77	18.6
Cohabiting	2	0.5

Utilization of telemedicine increased with increasing level of education. The utilization of telemedicine however did not show a statistically significant association with the level of education ($p = 0.442$). Utilization of telemedicine was also higher among respondents with good knowledge. This association was however, not statistically significant ($p = 0.074$) (Table 5)

DISCUSSION

This study aimed to assess the knowledge, awareness, and utilization of telemedicine among residents in Benin City, Edo State, Nigeria, during the COVID-19 pandemic. The results provide valuable insights into the current status of telemedicine in the region, shedding light on the factors that influence knowledge, awareness, and usage. The study captured a predominantly young and educated demographic, which is representative of the

general population in Benin City, Edo State, Nigeria. These findings align with the youthful population structure and education levels in Nigeria²²

One of the noteworthy findings of this study is the relatively high level of knowledge regarding telemedicine among the respondents, with 75.5% indicating awareness, and a significant proportion of respondents (48.4%) first heard about telemedicine during the COVID-19 pandemic. This is in line with the increasing global prominence of telemedicine, especially as a response to the COVID-19 pandemic. Similar studies conducted in other countries have also reported a surge in awareness during the pandemic, highlighting the growing recognition of telemedicine's potential in healthcare delivery.^{23,24} The pandemic has acted as a powerful driver of change in healthcare delivery, accelerating the adoption of digital health solutions like telemedicine.^{25,26}

Table 2: Awareness, source of information and knowledge of telemedicine

Variable	Frequency	Percent
Awareness (n = 413)		
Yes	312	75.5
No	101	24.5
First time of hearing (n = 312)		
Before covid-19	161	51.6
During covid-19	151	48.4
Sources of Information* (n = 312)		
Social media	203	65.1
Television	127	40.7
Online articles	123	39.4
Friends and colleagues	66	21.2
Journals	49	15.7
Newspaper	35	11.2
Definition of telemedicine		
Correct	285	91.3
Incorrect	27	8.7
Telemedicine media*		
Social media	179	57.4
Video calls	160	51.3
Telephone	144	46.2
SMS	95	30.4
E-mail	88	28.2
Others	7	2.2
Uses of Telemedicine*		
Counselling	181	58.0
Routine Consultations	172	55.1
Emergency	156	50.0
Doctor is not accessible	150	48.1
Overall Knowledge of Telemedicine (n = 312)		
Good	192	61.5
Poor	120	38.5

* Multiple responses

This study revealed several factors associated with better knowledge of telemedicine. Notably, age and sex were found to be significant influencers. Respondents in the age group of 25–34 years exhibited the highest level of knowledge. This aligns with the global trend, where younger individuals tend to have greater familiarity with digital technologies, including telemedicine.²⁷

The association between sex and knowledge was also statistically significant, with a higher proportion of males demonstrating better knowledge. This gender disparity in telemedicine awareness is a recurrent theme in many studies.²⁸ Addressing this gender gap in knowledge is critical, as telemedicine can offer health services to individuals regardless of gender, and gender equity is an important public health goal.²⁹

The educational level and monthly income of respondents were found to be related to knowledge. Higher levels of education and

income were associated with better knowledge, a pattern observed in similar studies across the globe.³⁰ This finding emphasizes the role of socio-economic factors in shaping awareness and underlines the importance of targeted educational campaigns and digital inclusion initiatives.

The study indicated that despite good knowledge and awareness, the utilization of telemedicine remains modest. Less than 50% of the respondents had ever used telemedicine, with phone calls being the most commonly employed medium. This suggests that while people may be aware of telemedicine, barriers to access or other factors may limit its adoption. However, the fact that only 39.1% of respondents had ever used any form of telemedicine suggests that knowledge does not necessarily translate into adoption. This highlights the need for interventions to bridge the gap between knowledge and practice.^{31,32}

Table 3: Association between knowledge and sociodemographic characteristics of respondents

Variable	Overall Knowledge of Telemedicine		Test statistics	p-value
	Good knowledge (n = 192) Frequency (%)	Poor knowledge (n = 120) Frequency (%)		
Age group (years)				
15 – 24	74 (54.0)	63 (46.0)	Fischer’s Exact = 8.482	0.038
25 – 34	101 (69.2)	45 (30.8)		
35 – 44	15 (55.6)	12 (44.4)		
45 – 54	1 (100.0)	0 (0.0)		
55 – 64	1 (100.0)	0 (0.0)		
Sex				
Male	133 (65.2)	71 (34.8)	$\chi^2 = 3.331$	0.045
Female	59 (54.6)	49 (45.4)		
Marital status				
Married	30 (65.2)	16 (34.8)	Fischer’s Exact = 2.974	0.210
Single	162 (61.4)	102 (38.6)		
Co-habiting	0 (0.0)	2 (100.0)		
Religion				
Christianity	184 (62.6)	110 (37.4)	Fischer’s Exact = 5.831	0.080
Islam	4 (30.8)	9 (69.2)		
ATR	1 (100.0)	0 (0.0)		
Others	2 (66.7)	1 (33.3)		
Education				
Tertiary	131 (58.2)	94 (41.8)	Fischer’s Exact = 9.476	0.009
Secondary	60 (73.2)	22 (26.8)		
Primary	1 (25.0)	3 (75.0)		
None	0 (0.0)	1 (100.0)		

Challenges encountered during telemedicine consultations, such as network issues and a lack of constant power supply, were reported by a considerable proportion of respondents. These challenges align with broader infrastructure issues affecting healthcare delivery in Nigeria and other low- and middle-income settings.³³ Addressing these infrastructure constraints is paramount for the successful implementation of telemedicine in public health.

The findings of this study have public health significance in several ways. First, the high level of awareness of telemedicine, even in a region with limited healthcare access, suggests that telemedicine has the potential to improve healthcare services. Increasing its adoption could help address the barriers of accessibility and affordability, particularly for individuals in rural or underserved areas.³ Second, the challenges associated with network connectivity and power supply indicate that infrastructure development is crucial for the effective implementation of telemedicine, especially in low-resource settings.³⁴ Addressing these challenges can enhance the reach and impact of telehealth services. Third, the study’s focus on

the association between education, income, and knowledge and practice of telemedicine underscores the need for tailored interventions. Public health campaigns and interventions should consider these socio-demographic factors when promoting telemedicine, as disparities in access and utilization may persist if not addressed.³⁵

Table 4: Utilization of telemedicine among residents

Variable	Frequency	Percent
Ever used any telemedicine medium(n = 312)		
Yes	122	39.1
No	190	60.9
Medium used (n=122) *		
Phone call	57	46.7
Video call	52	42.6
Social media	40	32.8
SMS	19	15.6
E-mail	10	8.2
Others**	4	3.3
Outcome of most recent consultation(n=122)		
Prescribed drugs	67	54.9
Appointment	33	27.1
Sent for investigations	14	11.5
Ambulance sent	7	5.7
Others	1	0.8
Challenges during the consultation? (n=122)		
Yes	55	45.1
No	67	54.9
Challenges Encountered* (n = 55)		
Long waiting time	26	47.3
Delayed response	19	34.5
Network difficulties	18	32.7
Doctor did not understand the complain	11	20.0
Power outage	9	16.4
Unresolved medical issue	7	12.7
No response	4	7.3
Doctor's voice was not clear	4	7.3
Problem not solved	3	5.5
Was the consultation concluded? (n=122)		
Yes	85	69.6
No	37	30.3
Interrupted due to challenges encountered? (n=122)		
Yes	41	33.6
No	81	66.4

* Multiple responses

Conclusion

In conclusion, this study provides valuable insights into the knowledge and utilization of telemedicine in Benin City, Nigeria, during the COVID-19 pandemic. The results indicate that while knowledge and awareness are relatively high, the utilization of telemedicine is limited, primarily due to infrastructure challenges. Addressing these challenges and promoting a positive attitude towards telemedicine can contribute to its greater adoption, offering improved healthcare access and outcomes for the residents of Benin City.

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Table 5: Association between socio-demographic characteristics and utilization of telemedicine among respondents

Variable	Utilization of Telemedicine		Test statistics	p-value
	Yes (n = 122) Frequency (%)	No (n = 190) Frequency (%)		
Age group (years)				
15 – 24	46 (33.6)	91 (66.4)		
25 – 34	59 (40.4)	87 (59.6)		
35 – 44	15 (55.6)	12 (44.4)		
45 – 54	1 (100.0)	0 (0.0)		
55 – 64	1 (100.0)	0 (0.0)	Fischer's Exact = 6.945	0.082
Sex				
Male	81 (39.7)	123 (60.3)		
Female	41 (38.0)	67 (62.0)	$\chi^2 = 0.212$	0.714
Marital status				
Married	22 (47.8)	24 (52.2)		
Single	100 (37.9)	164 (62.1)		
Co-habiting	0 (50.0)	2 (100.0)	Fischer's Exact = 2.651	0.289
Religion				
Christianity	116 (39.3)	179 (60.7)		
Islam	3 (23.1)	10 (76.9)		
ATR	0 (0.0)	1 (100.0)		
Others	3 (100.0)	0 (000.0)	Fischer's Exact = 2.918	0.430
Education				
Tertiary	91 (40.4)	134 (59.6)		
Secondary	28 (34.1)	54 (65.9)		
Primary	1 (33.3)	2 (66.7)		
Knowledge				
Poor Knowledge	41 (34.2)	79 (65.8)		
Good knowledge	81 (42.2)	111 (57.8)	$\chi^2 = 2.438$	0.074

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