THE KNOWLEDGE, ATTITUDE AND PERCEPTION OF TELEPHARMACY AMONG COMMUNITY PHARMACISTS IN BENIN CITY

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A PROJECT SUBMITTED TO THE DEPARTMENT OF CLINICAL PHARMACY AND PHARMACY PRACTICE IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A DOCTOR OF PHARMACY (PHARM. D) DEGREE OF THE UNIVERSITY OF BENIN, NIGERIA.

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CERTIFICATION

This is certified that this work carried out by **EMMANUEL IKPONMWOSA IGBINOMWANHIA** with Matriculation Number PHA1808378 as an undergraduate final year project work, in partial fulfilment of the requirement for the award of the Doctor of Pharmacy (Pharm.D) degree and submitted to the department of clinical pharmacy, Faculty of Pharmacy, University of Benin, Benin City, Nigeria.

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DEDICATION

This project is dedicated to God Almighty for His guidance, mercy, direction, and provision throughout the course of this study. I also dedicate it to my family for their unwavering love, support, and encouragement throughout my academic journey.

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ABSTRACT

Background: Telepharmacy, the provision of pharmaceutical care through telecommunication and digital technologies has emerged as a transformative innovation for improving access to pharmacy services, particularly in regions with limited healthcare infrastructure. In Nigeria, the concept remains relatively new, and community pharmacists play a central role in its successful implementation. Understanding their knowledge, attitudes, and perceptions is therefore essential for advancing digital healthcare integration. This study assessed the knowledge, attitudes, and perceptions of community pharmacists in Benin City, Nigeria, toward telepharmacy and identified potential barriers to its adoption.

Methods: A cross-sectional descriptive study was conducted among community pharmacists practicing in Benin City, Edo State. A total of 188 questionnaires were distributed using a convenience sampling technique during professional meetings and on-site pharmacy visits. Data were collected through a structured, self-administered questionnaire covering four domains: socio-demographic characteristics, knowledge, perception, attitude, and perceived challenges related to telepharmacy. Data were analysed using IBM Statistical Package for the Social Sciences (SPSS) version 27. Descriptive statistics (frequencies and percentages) summarized responses, while Chi-square tests determined associations between variables at a 5% significance level ($p < 0.05$).

Results: Out of 188 distributed questionnaires, 179 were returned and analysed. Most respondents were male (75.3%), aged 31–40 years (51.1%) and held a B.Pharm degree (57.9%). Knowledge of telepharmacy was generally high: 93.3% acknowledged its availability in Nigeria, and 98.3% agreed it played an important role during global health crises. Perception toward telepharmacy was positive. Attitudinal responses were similarly favourable, with 82.6% expressing willingness to adopt telepharmacy in practice and 87.1% believing it would improve pharmaceutical care in Benin City. However, major challenges identified included poor internet connectivity (96.1%), limited patient digital literacy (84.3%), lack of training (76.4%), high installation cost (68.0%), and patients' unwillingness to pay for services (62.4%). Years of experience were significantly associated with knowledge level ($p = 0.026$), while gender influenced perception ($p = 0.018$).

Conclusion: The study revealed high awareness and positive attitudes toward telepharmacy among community pharmacists in Benin City, reflecting readiness to integrate digital technologies into pharmacy practice. Nonetheless, infrastructural and economic barriers particularly unreliable internet services, inadequate training, and low patient acceptance remain critical obstacles. Strengthening ICT infrastructure, developing national telepharmacy guidelines, and providing continuous professional training are necessary steps toward sustainable telepharmacy adoption in Nigeria.

Keywords: Telepharmacy, community pharmacists, knowledge, attitude, perception, digital health, Nigeria.

CHAPTER ONE

1.1 Background of the Study

Historically, traditional pharmacy services have been limited by geographical barriers and accessibility issues, especially in low- and middle-income countries (LMICs) like Nigeria. In Benin City, the capital of Edo State, community pharmacists are often the first point of contact for patients seeking medication and health advice (Pharmacy Council of Nigeria, 2023).

Recent advances in technology have allowed for the integration of telecommunication systems in pharmacy practice, which not only expands the reach of pharmaceutical services but also enhances patient engagement and adherence to medication regimes (Baldoni *et al*., 2019). This shift is particularly crucial in areas where healthcare infrastructure is underdeveloped. Amidst growing trends toward digital transformation in healthcare, the perceptions, attitudes, and knowledge of community pharmacists regarding telepharmacy are vital in determining its success and efficacy in Benin City.

1.2 OVERVIEW OF TELEPHARMACY

Telepharmacy, a branch of telehealth, refers to the provision of pharmaceutical care through telecommunications and digital technologies. It allows pharmacists to offer services such as medication counselling, prescription verification, monitoring, and patient education remotely. Globally, telepharmacy has emerged as a key strategy to bridge geographical barriers in access to pharmaceutical care, particularly in rural or underserved regions (Baldoni *et al.* 2019, Kane and Rincon, 2019; Siddiqua *et al*, 2024). In many developed countries such as the United States, Canada, and parts of Europe, telepharmacy has already been integrated into healthcare systems to enhance medication safety, improve adherence, and ensure continuous pharmacy service delivery (Poudel and Nissen, 2016). It has long been common practice for community pharmacists to give patient care over the phone. However, utilizing Internet

teleservices like messaging apps, smartphone apps, and online shopping has just become commonplace in recent years (Jirjees *et al,* 2022). However, in Nigeria and many African countries, telepharmacy remains in its early stages of implementation, hindered by infrastructural, regulatory, and awareness-related challenges (nwachuya *et al*., 2023).

1.3 TELEPHARMACY IN NIGERIA

In Nigeria, the need for telepharmacy gained significant attention during the COVID-19 pandemic, when physical restrictions and social distancing disrupted routine healthcare delivery. Pharmacists increasingly recognized telepharmacy as a means of maintaining patient engagement and ensuring continued access to medicines (Nduka *et al,* 2023). Nigeria's growing population, coupled with unequal distribution of pharmacists concentrated mainly in urban areas creates an access gap in rural communities. This gap underscores the potential of telepharmacy to extend pharmaceutical services to remote regions where professional pharmaceutical advice is scarce.

Empirical evidence from Nigerian studies demonstrates moderate to high awareness but limited implementation of telepharmacy among community pharmacists. For instance, a cross-sectional study among community pharmacists in Lagos found that while 96.5% were aware of telepharmacy, only 63% reported actively practicing it (Oliorah *et al*., 2022). The same study identified poor internet connectivity, high installation costs, and limited access to information and communication technology (ICT) resources as key barriers. Similarly, a study in Anambra State showed that although pharmacists had good knowledge (78.8%) and positive attitudes (74.1%) toward telepharmacy, actual practice levels were significantly lower (52.4%) (Nduka *et al*, 2023). The authors also reported that patients' willingness to pay for telepharmacy services was modest, averaging approximately ₦2,000 ($2.76) per month, suggesting that economic constraints may limit uptake.

Further evidence from Abuja revealed that telepharmacy services are mainly provided through social media platforms such as WhatsApp and Facebook, and via telephone calls for counselling, medication refills, and prescription follow-ups (Ogugua *et al*., 2023). The authors concluded that while telepharmacy has been beneficial in improving communication and access to care, its sustainability in Nigeria will depend on structured guidelines, professional regulation, and improved ICT infrastructure.

1.4 TELEPHARMACY IN AFRICA

Across Africa, telepharmacy is gaining momentum as part of broader digital health initiatives aimed at addressing the continent's healthcare access disparities. A recent scoping review by Nwachuya *et al*. (2023) examined the effectiveness of telepharmacy in rural African communities and found that it has substantial potential to improve medication management, continuity of care, and patient satisfaction. However, challenges such as poor internet connectivity, unreliable electricity, low digital literacy, and lack of regulatory frameworks persist. Most telepharmacy projects in Africa remain pilot studies or donor-funded initiatives without sustainable long-term models (Nwachuya *et al*., 2023).

A similar review published in *Frontiers in Pharmacology* (Al-Shammari *et al*., 2022) emphasized that telepharmacy in sub-Saharan Africa remains underdeveloped compared to high-income countries. The review identified critical infrastructural deficits, limited training in telehealth technologies, and absence of reimbursement policies as major impediments to telepharmacy adoption. In contrast, countries such as the United States, Canada, and Australia have established formal telepharmacy frameworks, including pharmacist credentialing, remote verification systems, and teleconsultation reimbursement schemes (Poudel and Nissen, 2016).

Nevertheless, Africa's growing digital transformation presents new opportunities. Mobile technology penetration has significantly improved, enabling innovative models of pharmacy service delivery through mobile applications and digital platforms. For instance, in Kenya and South Africa, pilot telepharmacy programs have successfully integrated remote medication counselling and chronic disease monitoring into existing healthcare systems (Nwachuya *et al*., 2023). These initiatives demonstrate that with adequate investment and regulation, telepharmacy can be a cost-effective tool to expand pharmaceutical care in resource-limited settings.

1.5 TELEPHARMACY SERVICES OR COMPONENTS

Telepharmacy encompasses a wide range of digital pharmacy services delivered remotely through information and communication technologies (ICT). These services are designed to enhance access to pharmaceutical care, particularly in communities with limited access to physical pharmacy outlets. The major categories of telepharmacy services include:

1.5.1. Virtual Medication Counselling

Virtual medication counselling involves real-time or asynchronous interaction between pharmacists and patients through digital platforms such as video calls, telephone, WhatsApp, or web-based applications. Through this service, pharmacists provide guidance on medication use, potential side effects, drug–drug interactions, and adherence strategies (Poudel and Nissen, 2016). In Nigeria, several community pharmacists have begun using social media and messaging applications to counsel patients, especially during the COVID-19 lockdown (Ogugua *et al*., 2023). This approach ensures continuity of care and allows for flexible communication between pharmacists and patients.

1.5.2. Remote Prescription Verification

Remote prescription verification allows pharmacists to review, authenticate, and approve prescriptions electronically. Using secure telecommunication systems, pharmacists can assess prescription validity, check for medication errors, and ensure compliance with treatment protocols even when physically distant from the dispensing site (Baldoni, Amenta and Ricci, 2019). In developed countries such as the United States and Canada, remote prescription services are integrated into hospital networks, ensuring round-the-clock pharmacist supervision. However, in Nigeria, this service is still emerging due to weak digital infrastructure and limited e-prescription systems (Oliorah *et al*., 2022).

1.5.3. Tele-Medication Therapy Management (Tele-MTM)

Tele-MTM involves systematic monitoring of patients' medication regimens through digital platforms to optimize therapeutic outcomes. It includes medication review, adherence assessment, identification of drug-related problems, and collaborative decision-making with prescribers (Poudel and Nissen, 2016). Tele-MTM has been shown to reduce hospital readmissions and improve chronic disease management outcomes. While such structured programs are limited in Nigeria, pharmacists have expressed willingness to adopt them once enabling infrastructure and regulatory support are established (Nduka *et al,* 2023).

1.5.4. Chronic Disease Monitoring

Chronic disease monitoring via telepharmacy involves remote tracking of conditions such as hypertension, diabetes, and asthma. Pharmacists can assess treatment progress through patient-reported data, electronic health records, and mobile applications (Nwachuya *et al*., 2023). This is particularly beneficial in rural African communities where patients may have difficulty accessing healthcare facilities regularly. For example, in pilot telepharmacy projects across sub-Saharan Africa, pharmacists provided virtual follow-ups for diabetic and hypertensive patients, improving adherence and disease control (Nwachuya *et al*., 2023).

1.5.5. Medication Delivery

Medication delivery complements telepharmacy services by ensuring that prescribed medicines reach patients' homes through courier services or pharmacy-based delivery networks. It bridges the final gap in the telepharmacy care model by combining remote consultation with physical medicine access. In Nigeria, several community pharmacies have adopted medication delivery services through local dispatch riders or third-party logistics providers, especially for chronic medications and elderly patients (Nduka *et al*, 2023). This service enhances patient convenience and adherence while supporting continuity of care

1.6 BENEFIT OF TELEPHARMACY

Telepharmacy provides a wide range of benefits that improve healthcare access, efficiency, and quality, particularly in areas where pharmacists or health facilities are scarce. One of the key benefits of telepharmacy services is that it allows the pharmacist to provide patient care services in a remote area by taking a history, reviewing patients' files, and assessing medications utilized by the patients. This practice also helps the technician to dispense patient prescriptions accurately under the remote supervision of the pharmacist. It provides opportunities for improving health outcomes for patients and the quality of health care systems in general (Muhammad *et al.*, 2022). By using digital platforms, pharmacists can offer essential services such as medication counselling, prescription review, and therapy management remotely. This greatly reduces the need for patients to travel long distances to consult a pharmacist, saving both time and transportation costs. It also ensures that individuals in rural or underserved communities receive the same level of pharmaceutical care as those in urban areas.

For patients, telepharmacy enhances convenience and promotes better medication adherence by enabling regular follow-up and easy communication with pharmacists through video calls, chat, or phone consultations. It supports chronic disease management by allowing

pharmacists to monitor patients' progress, adjust therapies when needed, and provide continuous education about medication use.

For pharmacists and the broader healthcare system, telepharmacy improves workflow efficiency and fosters collaboration among healthcare professionals. It allows pharmacists to reach more patients, extend services to remote clinics, and contribute to public health initiatives such as medication safety and rational drug use. Overall, telepharmacy bridges the gap between patients and pharmacists, enhancing access, continuity of care, and overall health outcomes while maintaining safety and cost-effectiveness.

1.7 KNOWLEDGE, ATTITUDE, AND PERCEPTION (KAP) OF TELEPHARMACY

Telepharmacy is an emerging innovation that enables pharmacists to provide pharmaceutical care remotely through digital and telecommunication technologies. Globally, it has improved access to medication counselling, prescription review, and therapy monitoring, especially in underserved areas.

Knowledge is the familiarity, knowledge, or comprehension of someone or something, including facts, information, descriptions, or abilities, that is gained from education or experience through observation, discovery, or learning (*Knowledge and Its Types*, n.d.). Studies have shown that knowledge and awareness of telepharmacy among pharmacists are generally increasing, particularly after the COVID-19 pandemic, which highlighted the need for remote healthcare delivery. Many community pharmacists are aware of its existence and basic functions, though detailed understanding of its technical, legal, and ethical aspects remains limited in developing countries such as Nigeria.

Perception toward telepharmacy is largely positive. Pharmacists recognize its potential to enhance medication adherence, patient access, and continuity of care while reducing waiting

times. However, concerns persist regarding internet reliability, data security, cost of implementation, and lack of regulatory support.

Overall, pharmacists' KAP toward telepharmacy reflects a growing readiness to adopt digital pharmacy services, provided that adequate training, infrastructure, and clear policies are in place to ensure safe and effective practice.

1.8 FUTURE OF TELEPHARMACY

When compared with developed regions, the gap between policy frameworks and practice in Africa remains wide. In countries like the United States and Canada, telepharmacy operates under well-established legal frameworks that define pharmacist responsibilities, ensure patient data privacy, and standardize service quality. In Nigeria and most of Africa, the absence of specific telepharmacy legislation and infrastructure investment has slowed adoption. Nonetheless, studies emphasize growing interest and willingness among pharmacists to embrace telepharmacy if enabling conditions—such as ICT support, training, and regulatory clarity are provided (Nduka *et al,* 2023; Oliorah *et al*., 2022).

The future of telepharmacy in Nigeria and Africa depends on collaborative efforts between governments, professional bodies, and technology providers. Strengthening digital infrastructure, developing locally relevant telepharmacy models, and integrating telepharmacy training into pharmacy education will be critical. Furthermore, evidence-based policy frameworks are needed to ensure patient safety, data security, and sustainable financing mechanisms. As Africa moves toward digital health integration, telepharmacy stands as a strategic innovation capable of transforming pharmaceutical care accessibility across the continent.

1.9 PROBLEM STATEMENT

Despite a growing body of literature acknowledging the benefits of telepharmacy, limited studies have explored the knowledge, attitudes, and perceptions of community pharmacists in Nigeria, particularly in Edo State. According to Nduka *et al*. (2023), while telepharmacy holds promise for improving healthcare access, community pharmacists' readiness to adopt such innovative services remains uncertain. This lack of knowledge may hinder the effective implementation of telepharmacy in community settings. Furthermore, many pharmacists may have preconceived notions or misconceptions about telepharmacy that could adversely affect their willingness to engage with this new paradigm of service delivery.

1.10 JUSTIFICATION OF THE STUDY

Understanding the knowledge, attitudes, and perceptions of community pharmacists towards telepharmacy is crucial for several reasons. First, pharmacists play a pivotal role in the healthcare delivery system and are key contributors to patient care (Osemene & Erhun, 2018). Their endorsement of telepharmacy can significantly influence its acceptance among the public and other healthcare providers (Ahmed *et al*., 2023). Secondly, insights gained from community pharmacists may help identify barriers to the implementation of telepharmacy services, guiding policymakers and stakeholders in developing strategies to optimize healthcare delivery in underserved regions.

Additionally, the study’s focus on Benin City provides localized data that can potentially serve as a model for similar urban areas in Nigeria and other African countries facing analogous healthcare challenges (Nwachuya *et al*., 2023).

1.11 OBJECTIVES OF THE STUDY

The aim of this study is to assess the knowledge, attitude, and perception of telepharmacy among community pharmacists in Benin City, Edo State, Nigeria. Other objects of the research include to:

1. To assess the level of knowledge of community pharmacists regarding the availability, role, and benefits of telepharmacy.
2. To evaluate the perception of community pharmacists towards telepharmacy in terms of its impact on medication adherence, accessibility, privacy, workload, and cost.
3. To determine the attitude of community pharmacists towards adopting and implementing telepharmacy in their professional practice.
4. To identify the potential challenges affecting the implementation of telepharmacy in community pharmacy practice in Benin city.
5. To explore the relationship between pharmacists' knowledge, perception, and attitude towards telepharmacy.
6. To explore the relationship between knowledge and pharmacist demographics **factors.**

1.10 Scope of the Study

This study focuses on community pharmacists practicing in Benin City, Edo State, Nigeria. The research will encompass various pharmacies, including chain pharmacies and independent community pharmacies. This scope is intentional to ensure that the data reflects a comprehensive perspective of the group of professionals facilitating access to pharmaceutical services.

CHAPTER TWO

2.0 METHODS

2.1 Study Design

This study employed a cross-sectional descriptive survey design to assess the knowledge, attitude, and perception of telepharmacy among community pharmacists in Benin City, Nigeria. This study will help improve the quality of service provided by pharmacists in Benin city and help create awareness of telepharmacy in Benin considering the high shortage of community pharmacist especially in rural areas hence making proximity a huge challenge. The design was considered appropriate because it enables the researcher to collect and analyze data at a single point in time, providing a snapshot of pharmacists' awareness and readiness towards telepharmacy practice within the study area.

2.2 Study Setting

The study was conducted in Benin City, the capital of Edo State, located in the South-South geopolitical zone of Nigeria. Benin City is a major commercial and healthcare hub housing several registered community pharmacies and practicing pharmacists. The study population comprised actively practicing community pharmacists who attended the scheduled Community Pharmacists' Association general meeting in Benin City and those present within pharmacy premises during the data collection period.

2.3 Study Population and Sampling Technique

The study population consisted of licensed community pharmacists practicing within Benin City. A convenience sampling technique was adopted due to the accessibility of participants during the community pharmacists' meeting and at designated community pharmacy locations.

Eligible participants were community pharmacists who provided consent to participate and were present at the meeting or at their pharmacy premises when approached. Pharmacists who were absent, unwilling to participate, or not actively practicing at the time of data collection were excluded**.**

2.4 Sample Size Determination.

Convenience sampling will be employed for participant selection due to its practical advantages and ease of access. The required sample size was determined using Cochran's formula for an unknown population.

$N = Z^2 * P(1-P) / E^2$

Where:

N0 = sample size

Z = z-score at confidence level of 95% is 1.96

P = population proportion of 50%

E = margin of error of 5%.

Inputting the values into the formula: $N0 = (1.96)^2 * 0.5(1-0.5) / (0.05)^2$ $N0 = 0.9604 / 0.0025$ $N0 = 384.16$

For finite population: $N = n0 / [1 + (n0-1)/N]$

Where:

N = sample size for finite population

N0 = sample size which is 384.16

N = assuming total population which is 300

Inputting values into the formula: $n = 384.16 / [1 + (384.16-1)/300]$ $n = 384.16 / 1+1.28$ $n = 384.16 / 2.28$ $n = 168.5$

10% (17) of the sample size was added to make up for attrition rate making the sample size 187.78, approximately 188.

Attrition rate: 10% of 168.5 = 17 + 168.5

Therefore, a total of 188 questionnaires.

2.5 Data Collection Tool and Procedure

A structured, self-administered questionnaire was used for data collection. The instrument consisted of four sections. Section one contained the Socio-demographic information such as gender, age, qualification and years of experience. Section two contains information that aimed to assess knowledge of telepharmacy among community pharmacist in Benin City a Yes/No responses was used.

Section three assessed the perception of telepharmacy among community pharmacist and a 5-point Likert scale was used which ranged from Strongly Disagree to Strongly Agree, carefully constructed questions were used to for the measurement. The last section evaluated the attitude of community pharmacists towards telepharmacy. Series of questions were constructed and the response were grouped into a 5-point Likert scale.

The questionnaire was administered during the community pharmacists' general meeting. Respondents completed the forms on-site, and the researcher collected them immediately. Additional questionnaires were also distributed and retrieved at pharmacy premises for pharmacists who were not present at the meeting. This approach ensured wider coverage and improved response rate**.**

2.6 Data Analysis

Completed questionnaires were checked for completeness before analysis. Data were entered into IBM SPSS Statistics (Version 27) for processing and analysis. Descriptive statistics such as frequencies, percentages, and tables were used to summarize socio-demographic data and responses on knowledge, perception, and attitude. Responses on Likert scale items were coded numerically to facilitate analysis. Where necessary, inferential statistics such as Chi-square analysis were planned to determine associations between socio-demographic characteristics and outcome variables, with a significance level set at $p < 0.05$**.**

2.7 Ethical Considerations

Ethical approval for the study was obtained from the university of Benin ethics committee. Permission was also secured from the leadership of the Community Pharmacists Association, Benin City Chapter, prior to data collection. Participation was voluntary, and informed consent was obtained from all respondents.

Confidentiality and anonymity were assured by avoiding the use of names or personal identifiers on the questionnaire. All data collected were used solely for academic purposes and securely stored to prevent unauthorized access**.**

3.8 Inclusion Criteria

Registered pharmacists practicing in community pharmacies in Benin City.

Pharmacists willing to participate and provide informed consent for the study.

Exclusion Criteria

Pharmacists not practicing in the community settings.

Pharmacists who will not be willing to participate in the data collection process.

CHAPTER THREE

3.1 Demographic data

Table 3.1 shows the socio-demographic characteristics of the respondents. Out of 179 participants, 134 (75.3%) were males while 44 (24.7%) were females. The majority, 91 (51.1%), were within the age group of 31–40 years, while 53 (29.8%) were between 20–30 years. Most of the respondents, 103 (57.9%), held a B.Pharm degree, and 81 (45.5%) had 5–10 years of work experience. Furthermore, 140 (78.7%) of the respondents were superintendent pharmacists.

Table 3.1: Descriptive analysis on Socio-Demographic Characteristics of Respondents

Variables	Frequency (n = 179)	Percentage (%)
Gender		
Male	134	75.3
Female	44	24.7
Age		
20–30 years	53	29.8
1–40 years	91	51.1
41–50 years	20	11.2
Above 50 years	14	7.9
Highest Educational Qualification		
B.Pharm	103	57.9
M.Pharm	1	.6
Pharm.D	69	38.8
Master's	5	2.8
Years of Experience as a Community Pharmacist		
Less than 5 years	72	40.4
5–10 years	81	45.5
11–20 years	12	6.7
More than 20 years	13	7.3
Position in Community Pharmacy		
Locum Pharmacist	11	6.2
Superintendent Pharmacist	140	78.7
Pharmacy Owner	27	15.2

3.2 Descriptive analysis on Knowledge of Telepharmacy

Table 3.2 presents the knowledge of telepharmacy among community pharmacists. The majority, 166 (93.3%), reported that telepharmacy is available in Nigeria, and 175 (98.3%) agreed that it played a significant role during global health crises. Most respondents, 154 (86.5%), agreed that telepharmacy provides better privacy, and 172 (96.6%) indicated that it reduces patient waiting time. All respondents (100%) agreed that telepharmacy can extend community pharmacy services beyond normal operating hours.

Table 3.2: Knowledge of Telepharmacy

Variables	Frequency (n = 179)	Percentage (%)
Telepharmacy is available in Nigeria.		
No	12	6.7
Yes	166	93.3
Telepharmacy played a significant role during global health crises (e.g., pandemics).		
No	3	1.7
Yes	175	98.3
Telepharmacy provides better counseling in terms of privacy and session duration.		
No	24	13.5
Yes	154	86.5
Telepharmacy reduces waiting time for patients in community pharmacies		
No	6	4.4
Yes	172	96.6
Telepharmacy services can extend community pharmacy services beyond regular operating hours.		
No	0	0
Yes	178	100.0

3.3 Descriptive analysis on Perception of Telepharmacy

Table 3.3 shows the respondents' perception of telepharmacy. More than half, 76 (42.7%), agreed that telepharmacy will improve patients' adherence to medication, while 54 (30.3%) strongly agreed. About 66 (37.1%) agreed that telepharmacy enhances access to medication, especially in rural areas, and 87 (48.9%) agreed that it provides complete privacy during consultations. A smaller proportion, 46 (25.8%), believed that telepharmacy may increase dispensing errors.

Table 3.3: Perception of Telepharmacy

Questions	Strongly disagree	Disagree	Neutral	Agree	strongly Agree	mean
Telepharmacy will improve patients' adherence to medication	8(4.5)	8(4.5)	32(18.0)	76(42.7)	54(30.3)	3.90
Telepharmacy may have a higher error rate for medication dispensing compared to traditional pharmacies	23(12.9)	61(34.3)	42(23.6)	46(25.8)	6(3.4)	2.72
Telepharmacy enhances patients' access to medication, especially in rural areas.	15(8.4)	20(11.2)	30(16.9)	66(37.1)	47(26.4)	3.62
Telepharmacy provides complete privacy during consultations	4(2.3)	10(5.6)	24(13.5)	87(48.9)	53(29.8)	3.98
Telepharmacy increases pharmacists' workload and commitment	16(9)	37(20.8)	45(25.3)	57(32)	23(12.9)	3.19
Telepharmacy helps patients save money and travel time to access healthcare services.	7(3.9)	10(5.6)	27(15.2)	82(46.1)	52(29.2)	3.91
I am willing to share personal information on an online database for telepharmacy services.	12(6.7)	22(12.4)	52(29.2)	72(40.4)	20(11.2)	3.37
Telepharmacy can reduce the cost of establishing a pharmaceutical business compared to traditional pharmacies.	15(8.4)	19(10.7)	38(21.3)	79(44.4)	27(15.2)	3.47
Telepharmacy is costly to maintain.	7(3.9)	47(26.4)	67(37.6)	40(22.5)	17(9.6)	3.07
Telepharmacy can help minimize the scarcity of pharmacists.	7(3.9)	21(11.8)	40(22.5)	75(42.1)	35(19.7)	3.62

3.4 Descriptive analysis on Attitude towards Telepharmacy

Table 3.4 presents the respondents' attitude towards telepharmacy. Most of the pharmacists, 98 (55.1%), agreed and 49 (27.5%) strongly agreed that they are willing to adopt telepharmacy in their practice. Similarly, 103 (57.9%) agreed and 52 (29.2%) strongly agreed that telepharmacy can improve pharmaceutical care in Benin City. In addition, 89 (50%) agreed that they are confident in using technology for telepharmacy services.

Table 3.4: Attitude Towards Telepharmacy

Questions	Strongly disagree	Disagree	Neutral	Agree	strongly Agree	mean
I am willing to adopt telepharmacy in my community pharmacy practice	6(3.4)	3(1.7)	22(12.4)	98(55.1)	49(27.5)	4.02
I believe telepharmacy is a viable solution to improve pharmaceutical care in Benin City	4(2.2)	0(0)	19(10.7)	103(57.9)	52(29.2)	4.12
I am confident in using technology to deliver telepharmacy services.	4(2.2)	4(2.2)	37(20.8)	89(50)	44(27.7)	3.93
I believe telepharmacy will improve the professional image of pharmacists.	6(3.3)	1(0.6)	17(9.6)	88(49.4)	66(37.1)	4.16

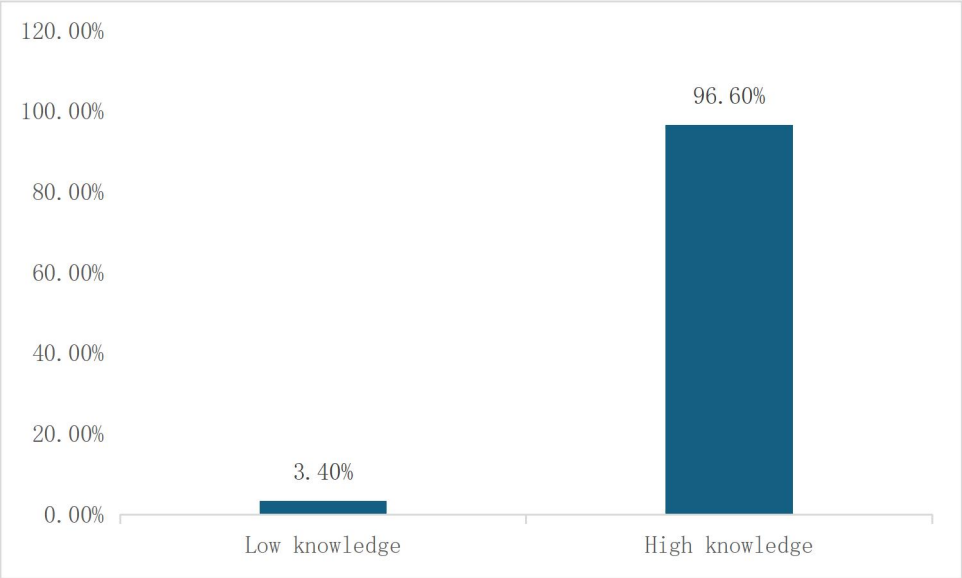
3.5 Descriptive analysis on Potential Challenges in the Adoption of Telepharmacy

Table 3.5 shows the potential challenges to telepharmacy adoption. The majority, 171 (96.1%), identified poor internet connectivity as a major challenge. Other key challenges include limited patient digital literacy (150; 84.3%), lack of training on telepharmacy tools (136; 76.4%), high installation cost (121; 68.0%), and patients' unwillingness to pay for services (113; 62.4%).

Table 3.5: Potential Challenges in the Adoption of Telepharmacy

Variables	Frequency (n = 179)	Percentage (%)
Poor internet connectivity	171	96.1
Limited patient digital literacy and acceptance	150	84.3
Lack of training on telepharmacy tools and software	136	76.4
High cost of installation of telepharmacy tools and software	121	68.0
Privacy or data security concerns	87	48.9
Patients are not willing to pay for telepharmacy services	113	62.4
Regulatory restrictions	61	34.3

3.6 Determination of knowledge score



Mean knowledge score = 4.75 ± 0.51

Fig 1. Knowledge level

3.7 Association between knowledge level and pharmacists' demographics

Table 3.6 shows the association between knowledge level and respondents' demographic characteristics. The result indicates that years of experience as a community pharmacist ($p = 0.026$) was significantly associated with knowledge level, while gender ($p = 0.619$), age ($p = 0.103$), and educational qualification ($p = 0.924$) showed no significant association.

Table 3.7: Association Between Knowledge Level and Demographic Characteristics

variables	Low knowledge	High knowledge	Chi square value	Sig. level
Gender			.248[a]	.619
Male	4	130		
Female	2	42		
Age Group			6.178[a]	.103
20–30 years	1	52		
31–40 years	3	88		
41–50 years	0	20		
Above 50 years	2	12		
Highest Educational Qualification			.478[a]	.924
B.Pharm	3	100		
M.Pharm	0	1		
Pharm.D	3	66		
Master's	0	5		
Years of Experience as a Community Pharmacist			9.302[a]	.026
Less than 5 years	0	72		
5–10 years	4	77		
11–20 years	0	12		
More than 20 years	2	11		
Position in Community Pharmacy			1.848[a]	.397
Locum Pharmacist	0	11		
Superintendent Pharmacist	4	136		
Pharmacy Owner	2	25		

3.9 Association between perception level and pharmacists' demographics

Table 3.7 presents the association between perception level and demographic characteristics of respondents. A significant association was observed between gender and perception level ($p = 0.018$), indicating that perception varied across male and female pharmacists. However, age ($p = 0.988$), educational qualification ($p = 0.195$), and years of experience ($p = 0.474$) showed no significant relationship.

Table 3.9: Association Between Perception Level and Demographic Characteristics

variables	Low perception	High perception	Chi square value	Sig. level
Gender			5.593[a]	.018
Male	49	85		
Female	25	19		
Age Group			.134[a]	.988
20–30 years	23	30		
1–40 years	37	54		
41–50 years	8	12		
Above 50 years	6	8		
Highest Educational Qualification			4.701[a]	.195
B.Pharm	46	57		
M.Pharm	0	1		
Pharm.D	28	41		
Master's	0	5		
Years of Experience as a Community Pharmacist			2.506[a]	.474
Less than 5 years	29	43		
5–10 years	36	45		
11–20 years	6	6		
More than 20 years	3	10		
Position in Community Pharmacy			6.521[a]	.038
Locum Pharmacist	1	10		
Superintendent Pharmacist	64	76		
Pharmacy Owner	9	18		

3.11 Association between attitude level and pharmacists' demographics

Table 3.8 shows the association between attitude level and demographic characteristics. The result revealed no significant association between attitude and gender ($p = 0.637$), age ($p = 0.890$), education ($p = 0.839$), or years of experience ($p = 0.702$). However, position in the pharmacy ($p = 0.051$) showed a near-significant association with attitude level.

Table 3.11: Association Between Attitude Level and Demographic Characteristics.

variables	Low attitude	High attitude	Chi square value	Sig. level
Gender			.222[a]	.637
Male	12	122		
Female	5	39		
Age Group			.626[a]	.890
20–30 years	4	49		
1–40 years	9	82		
41–50 years	2	18		
Above 50 years	2	12		
Highest Educational Qualification			.844[a]	.839
B.Pharm	11	92		
M.Pharm	0	1		
Pharm.D	6	63		
Master's	0	5		
Years of Experience as a Community Pharmacist			1.417[a]	.702
Less than 5 years	6	66		
5–10 years	7	74		
11–20 years	2	10		
More than 20 years	2	11		
Position in Community Pharmacy			5.961[a]	.051
Locum Pharmacist	1	10		
Superintendent Pharmacist	10	130		
Pharmacy Owner	6	21		

3.12 Association between knowledge, perception and attitude

Table 3.9 presents the association between knowledge, perception, and attitude towards telepharmacy. There was a significant association between knowledge and attitude ($p = 0.044$), as well as between perception and attitude ($p = 0.002$). This shows that respondents with higher knowledge and positive perception also demonstrated better attitudes toward telepharmacy.

Table 3.12: Association Between Knowledge, Perception, and Attitude

variables	Low attitude	High attitude	Chi square value	Sig. level
Knowledge level			4.066[a]	.044
Low knowledge	2	4		
High knowledge	15	157		
Perception Level			9.423[a]	.002
Low perception	13	61		
High perception	4	100		

3.13 Association between perception and knowledge

Table 3.10 shows the association between perception and knowledge levels among respondents. The result indicates no significant association between the two variables ($p = 0.205$), suggesting that level of knowledge did not necessarily correspond with perception of telepharmacy.

Table 3.13: Association Between Perception and Knowledge

Knowledge level	Low perception	High perception	Chi square value	Sig. level
Low knowledge	4	2	1.610[a]	.205
High knowledge	70	102		

3.14 Top five Potential Challenges in the Adoption of Telepharmacy

Table 3.11 highlights the top five challenges to telepharmacy adoption. Poor internet connectivity ranked highest (96.1%), followed by limited patient digital literacy (84.3%), lack of training on telepharmacy tools (76.4%), high installation cost (68.0%), and patients' unwillingness to pay (62.4%).

Table 3.14: Top Five Potential Challenges in the Adoption of Telepharmacy

Challenges	**Percentage (%)**	**Frequency (N)**	**position**
Poor internet connectivity	**96.0**	**169**	**First**
Limited patient digital literacy and acceptance	**84.0**	**148**	**Second**
Lack of training on telepharmacy tools and software	**76.7**	**135**	**Third**
High cost of installation of telepharmacy tools and software	**68.2**	**120**	**Fourth**
Patients are not willing to pay for telepharmacy services	**62.5**	**110**	**Fifth**

CHAPTER FOUR

DISCUSSION

The present study included 179 community pharmacists, the majority of whom were male (75.3%). This gender trend is similar to findings from previous Nigerian pharmacy workforce surveys, which reported male predominance in community pharmacy practice(Osemene & Erhun, 2018), this finding contrasts with some data that show a growing trend of more female pharmacists worldwide (Bates *et al*., 2016). Most respondents (51.1%) were aged 31–40 years, indicating that a relatively young and active pharmacist population is practicing in Benin City. This aligns with observations by Jolaosho, S. G (2022) that Nigeria's pharmacy workforce is dominated by early- to mid-career practitioners (Jolaosho, S. G 2022, Ekpenyong *et al*., 2018).

Furthermore, over half of the respondents (57.9%) held a B.Pharm qualification, with 38.8% possessing a Pharm.D degree. This reflects a growing adoption of advanced pharmacy training in Nigeria, consistent with the pharmacy education reforms reported by NAFDAC and PCN (Pharmacy Council of Nigeria, 2024). Most respondents also had 5–10 years of practice experience, suggesting a well-experienced workforce capable of adapting to new digital healthcare models such as telepharmacy.

Overall knowledge of telepharmacy was high, with 93.3% acknowledging its availability in Nigeria and 98.3% recognizing its importance during public health crises such as the COVID-19 pandemic. This is consistent with global studies reporting increased awareness and adoption of telepharmacy during the pandemic (Poudel & Nissen, 2016; Ogboghodo *et al*., 2024, Ilma *et al*., 2023). Excellent knowledge of telepharmacy was also reported by Almalki *et al* (2023) among community pharmacists who participated in study carried in Saudi Arabia (Almalki *et al*., 2023).

Respondents also agreed that telepharmacy enhances privacy (86.5%), reduces waiting times (96.6%), and extends services beyond regular hours (100%). These findings align with international evidence suggesting that telepharmacy improves accessibility, workflow efficiency, and patient confidentiality (Baldoni *et al*., 2019).

The mean knowledge score (4.75 ± 0.51) further reflects strong awareness, possibly due to increased exposure to digital health initiatives post-COVID-19. Years of experience was the only demographic factor significantly associated with knowledge ($p = 0.026$), which may indicate that more experienced pharmacists are exposed to varied practice models and continuing education platforms.

Perception towards telepharmacy was generally positive. Most respondents agreed that telepharmacy will improve medication adherence and enhance patient access, especially in rural areas, an important finding given Nigeria's urban–rural healthcare disparity. This agrees with prior research showing that telepharmacy bridges geographical barriers and improves care for underserved populations ((Tegegne *et al,* 2023, Ghozali, 2024). This finding is supported by the Technology Acceptance Model (TAM), which explains how the perceived ease of use and perceived usefulness predicts the acceptance of the information technology (Ma, Q. and Liu, L, 2005).

However, 25.8% believed telepharmacy could increase medication dispensing errors, suggesting lingering concerns about remote verification processes. Similar caution was noted by Al-Jumaili *et al*. (2021), who emphasized the need for robust digital safety systems in telepharmacy. Gender was significantly associated with perception ($p = 0.018$), suggesting that male and female pharmacists may differ in attitudes towards digital health adoption. No association was found with education, age, or years of practice.

Attitude was overwhelmingly positive, 82.6% were willing to adopt telepharmacy and 87.1% believed it would improve pharmaceutical care in Benin City. It is influenced by a person's beliefs (perceptions) in usefulness of the technology and the ease to use the technology (Ogugua, J. O *et al* 2023). This mirrors the supportive stance reported among pharmacists in studies from the United States, Jordan, and India (Abu-Farha *et al*., 2023). The high positive attitude can be attributed to the age distribution which is made up of relatively young pharmacy and the current high trend in digital health awareness, this supported by finding from Ogugua, J. O *et al* (2023) which identified respondents within the age bracket of 18 to 40 years were most willing to adopt and use Telepharmacy (Ogugua, J. O *et al* 2023). It has been noted that many healthcare practitioners use telepharmacy services to increase patient access to pharmaceutical care services such as medication counselling, especially during the COVID-19 time (Ahmed *et al*., 2023)

Confidence in using technology was also high (77.7% agreement), indicating readiness to transition into digital pharmacy services. No socio-demographic variables significantly influenced attitude ($p > 0.05$), although pharmacy position approached significance ($p = 0.051$) this aligns with other studies (Ghozali, 2024). This may imply that managerial pharmacists are more likely to drive telepharmacy adoption.

A significant association was found between knowledge and attitude ($p = 0.044$) and between perception and attitude ($p = 0.002$). This indicates that increased understanding and positive perception translate to greater willingness to adopt telepharmacy. These findings are consistent with behavioural theories such as the Technology Acceptance Model, which states that perceived usefulness and knowledge influence adoption behaviour (eBusiness@Newcastle, n.d.).However, knowledge and perception did not show a significant association ($p = 0.205$), suggesting that high knowledge does not automatically equate to

positive perception. Similar findings have been reported in other digital healthcare adoption research (Oliorah, P. I *et al* 2022).

The most notable barriers identified were poor internet connectivity (96.1%), limited digital literacy (84.3%), lack of training (76.4%), high setup cost (68%), and patients' unwillingness to pay (62.4%). These barriers are widely reported in low- and middle-income countries' telehealth literature (Nduka *et al*., 2023; Nwachuya *et al*., 2023).

Nigeria's infrastructural limitations and digital divide may hinder widespread telepharmacy deployment, highlighting the need for government and private sector investment in digital connectivity and pharmacist training.

CHAPTER 5

CONLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

This study assessed the knowledge, perception, and attitude of community pharmacists in Benin City toward telepharmacy. Findings revealed a high level of knowledge and positive attitude, showing that pharmacists are generally aware of and open to adopting telepharmacy. Years of experience significantly influenced knowledge, while gender affected perception, indicating demographic factors play a role in digital health adoption.

Although respondents acknowledged telepharmacy's potential to improve access, privacy, and efficiency in pharmaceutical care, barriers such as poor internet connectivity, high setup costs, limited training, and low patient digital literacy were identified.

In summary, telepharmacy holds great promise for expanding pharmaceutical services in Nigeria. With adequate infrastructure, training, and regulatory support, it can enhance healthcare delivery and patient outcomes.

5.2 RECOMMENDATIONS

Continuous professional development programs should be organized by the Pharmacy Council of Nigeria (PCN) and relevant associations to train community pharmacists on telepharmacy tools, data security, and digital patient management. The PCN and the Federal Ministry of Health should also develop clear telepharmacy guidelines and policies that define practice standards, patient data protection, and ethical considerations to ensure safe service delivery.

Government and private stakeholders should invest in improving broadband internet access and stable power supply, especially in underserved areas, to enhance the reliability of telepharmacy services. Pharmacists should also engage in public sensitization campaigns to

improve patients' digital literacy and willingness to use telepharmacy services. This will foster trust and acceptance among patients.

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APPENDIX

SECTION 1: Socio-demographic characteristics

Gender:

[ ] Male

[ ] Female

Age Group:

[ ] 20–30 years

[ ] 31–40 years

[ ] 41–50 years

[ ] Above 50 years

Years of Experience as a Community Pharmacist:

[ ] Less than 5 years

[ ] 5–10 years

[ ] 11–20 years

[ ] More than 20 years

Highest Educational Qualification:

[ ] B.Pharm

[ ] M.Pharm

[ ] Pharm.D

Section 2: Knowledge of Telepharmacy

Please indicate whether you agree with the following statements by selecting Yes or No.

Telepharmacy is available in Nigeria.

[ ] Yes

[ ] No

Telepharmacy played a significant role during global health crises (e.g., pandemics).

[ ] Yes

[ ] No

Telepharmacy provides better counseling in terms of privacy and session duration.

[ ] Yes

[ ] No

Telepharmacy reduces waiting time for patients in community pharmacies.

[ ] Yes

[ ] No

Telepharmacy services can extend community pharmacy services beyond regular operating hours.

[ ] Yes

[ ] No

Patients in rural areas can access more medication and information via telepharmacy.

[ ] Yes

[ ] No

Section 3: Perception of Telepharmacy

Please indicate your level of agreement with the following statements using the scale: Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A), Strongly Agree (SA).

Telepharmacy will improve patients' adherence to medication.

[ ] SD

[ ] D

[ ] N

[ ] A

[ ] SA

Telepharmacy may have a higher error rate for medication dispensing compared to traditional pharmacies.

[ ] SD

[ ] D

[ ] N

[ ] A

[ ] SA

Telepharmacy enhances patients' access to medication, especially in rural areas.

[ ] SD

[ ] D

[ ] N

[ ] A

[ ] SA

Telepharmacy provides complete privacy during consultations.

[ ] SD

[ ] D

[ ] N

[ ] A

[ ] SA

Telepharmacy increases pharmacists' workload and commitment.

[ ] SD

[ ] D

[ ] N

[ ] A

[ ] SA

Telepharmacy helps patients save money and travel time to access healthcare services.

[ ] SD

[ ] D

[ ] N

[ ] A

[ ] SA

I am willing to share personal information on an online database for telepharmacy services.

[ ] SD

[ ] D

[ ] N

[ ] A

[ ] SA

Telepharmacy can reduce the cost of establishing a pharmaceutical business compared to traditional pharmacies.

[ ] SD

[ ] D

[ ] N

[ ] A

[ ] SA

Telepharmacy is costly to maintain.

[ ] SD

[ ] D

[ ] N

[ ] A

[ ] SA

Telepharmacy can help minimize the scarcity of pharmacists.

[ ] SD

[ ] D

[ ] N

[ ] A

[ ] SA

Section 4: Attitude towards Telepharmacy

Please indicate your level of agreement with the following statements using the scale: Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A), Strongly Agree (SA).

I am willing to adopt telepharmacy in my community pharmacy practice.

[ ] SD

[ ] D

[ ] N

[ ] A

[ ] SA

I believe telepharmacy is a viable solution to improve pharmaceutical care in Benin City.

[ ] SD

[ ] D

[ ] N

[ ] A

[ ] SA

I am confident in using technology to deliver telepharmacy services.

[ ] SD

[ ] D

[ ] N

[ ] A

[ ] SA

I believe telepharmacy will improve the professional image of pharmacists.

[ ] SD

[ ] D

[ ] N

[ ] A

[ ] SA