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**SCHOOL OF PUBLIC HEALTH
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UNIVERSITY OF GHANA**



**FACTORS INFLUENCING THE UTILISATION OF e-PHARMACY SERVICE IN
GHANA**

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DECLARATION

I, Mubarik Sena Saaka, declare that except for other works which have been duly acknowledged, this work is the result of my original research and that as far as I am aware, this dissertation, either in whole or in part, has not been presented elsewhere for another degree.



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DEDICATION

This dissertation is dedicated to the Almighty Allah, whose guidance and mercy have sustained me; to my beloved mother, Adia Sena, and to my unborn children, who inspire my hope for the future.



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LIST OF ABBREVIATIONS

aOR	Adjusted Odds Ratio
CI	Confidence Interval
cOR	Crude Odds Ratio
E-PHARMACY	Electronic Pharmacy
EHEALTH	Electronic Health
NEPP	National Electronic Pharmacy Platform
OTC	Over-The-Counter
TELEMEDICINE	Telecommunication-Based Medicine
TELEPHARMACY	Telecommunication-Based Pharmacy
WHO	World Health Organization



ABSTRACT

BACKGROUND: The integration of digital technologies into healthcare has revolutionized the way health services are delivered, with e-pharmacy services/platforms emerging as an essential component of this transformation. E-pharmacies facilitate remote access to prescription and over-the-counter medications, offering convenience, reduced transaction costs, and improved accessibility, especially for individuals facing geographical or financial barriers. Globally, the adoption of e-pharmacy services has accelerated, particularly during the COVID-19 pandemic, which highlighted the need for contactless and efficient pharmaceutical delivery systems. Although the concept has gained traction in high-income countries, its uptake in low- and middle-income countries, including Ghana, remains limited and uneven. Therefore, this study was conducted to explore the factors influencing the uptake of e-pharmacy services in Ghana, focusing on awareness, accessibility, and perceived benefits.

METHODS: A national cross-sectional study was conducted between September and December 2024, involving 1,236 participants recruited through convenience sampling across all 16 regions of Ghana. Data were collected using a 39-item structured, self-administered online questionnaire. Descriptive statistics were used to summarize participant characteristics. Chi-square tests and logistic regression analyses were performed using STATA (Version BE 18; Stata Corp) to assess the association between socio-demographic factors, awareness, accessibility, perceived benefits, and the utilization of e-pharmacy services. Statistical significance was set at a 5% level ($p < 0.05$).

RESULTS: A total of 1,236 participants, comprising 583 (47.17%) males were involved in the study; 501 (40.53%; 95% CI: 0.38 - 0.43) had utilized e-pharmacy services and 1,173 (94.90%; 95% CI: 0.93 - 0.95) expressed willingness to use e-pharmacy services/platforms in the future. The analysis showed a statistically significant association between e-pharmacy utilization and

participants age, religion, employment status, and region of residence, awareness, accessibility and perceived benefits regarding. Multivariate logistic regression model revealed that awareness (aOR = 2.15; 95% CI: 1.48–3.13; $p = 0.004$), accessibility (aOR = 2.42; 95% CI: 1.73–3.39; $p < 0.001$), and perceived benefits (aOR = 2.88; 95% CI: 2.03–4.09; $p < 0.001$) were statistically significant predictors of e-pharmacy utilization.

CONCLUSION: Many participants demonstrated a fair level of knowledge and a positive perception of e-pharmacy services. Nearly all expressed a willingness to utilize such services in the future. However, to enhance uptake and equitable access, targeted interventions are recommended to improve awareness, particularly among individuals with lower educational attainment, those residing in rural areas, and populations with limited access to digital technology



CHAPTER ONE

INTRODUCTION

1.1 Background of the study

In the 21st century, the rise of the internet has made it possible to purchase, reach wider audiences, compare prices across different vendors and retailers, and deliver various products at any location (Adjie et al., 2023). This digital transformation has facilitated the development of customer-centric services, enhancing accessibility and efficiency of healthcare delivery. Online healthcare services, particularly e-pharmacies, have proven cost-effective and convenient, providing patients with easy access to medications, lower transaction costs, and rapid doorstep delivery (Gani et al., 2022).

Under the expanding field of Digital Health, e-pharmacy businesses have increasingly capitalized on technological advancements, particularly the rapid proliferation and widespread use of mobile devices and their innovative platforms/ applications to improve medication delivery and address healthcare needs across diverse populations. (Srivastava and Raina, 2021). According to Roshini et al. (2020), approximately 30,000 to 50,000 e-pharmacies operate worldwide, facilitating convenient access to medication for the public. This highlights the global adoption and widespread use of e-pharmacy services worldwide.

E-pharmacy refers to a digital, internet-based system that facilitates the connection between users and pharmacies through integrated components such as databases, decision support tools, electronic transaction platforms, and mechanisms for inventory tracking and management. (Srivastava and Raina, 2021). Following the United States introductions of online medication sales in the late 1990s (Orizio et al., 2011), global e-pharmacy market has expanded experienced significant exponential growth. The global market size reached approximately US\$42.32 billion in 2018, and it is projected to soar to US\$107.53 billion by 2025, reflecting a compound annual growth rate of 14.26% from 2019 to 2025 (Zion Market Research, 2019).

This growth underscores the increasing importance of e-Pharmacy in modern healthcare delivery, offering a transformative and complex network of interactions among consumers, healthcare providers, regulatory bodies, and pharmacies. (Gani et al. 2022).

e-Pharmacies provide an opportunity or platform for selling both prescription-only and over-the-counter medicines (OTC) online, delivering them directly to consumers' homes (Bessell et al., 2002; Desai, 2016). The global COVID-19 pandemic has further emphasized the significance and critical role of e-pharmacy services, as the demand for remote pharmaceutical services surged due to social distancing measures and minimizing physical contact (Adjie et al., 2023). While e-pharmacy businesses were initially the preserve of high-income countries, their expansion in low-income and middle-income countries have accelerated significantly in recent years, reshaping access to healthcare globally (Miller et al., 2021, Ernst & Young., 2019). For instance, India's remarkable global market share of US\$9.3 billion and a compound annual growth rate of 18% demonstrate the growth of e-Pharmacy in developing countries. (Dandekar 2020). This highlights the significance of e-pharmacy, not only in the health sector but also in the growth of the entire economy.

E-pharmacies enhance access to medications for patients and individuals who face challenges in traveling to healthcare facilities due to financial constraints or limited physical access (Adjie et al., 2023).

The acceptance of eHealth services in a broader health context is influenced by factors, such as perceived usefulness, ease of use, trust, and external influences. (Venkatesh et al., 2003). User satisfaction with e-pharmacy services significantly impacts willingness to engage in online drug transactions, a trend that has increased during the implementation of the COVID-19 quarantine policies (lockdown) to mitigate the transmission of COVID-19. (Gani et al., 2022).

Despite their benefits, e-pharmacy services/platforms face several challenges, including regulatory and legal, quality control and safety, privacy and data security, logistical challenges, and trust and credibility issues. Approximately 10% of medicines worldwide are estimated to be substandard or falsified (Ahmed et al., 2022). According to the World Health Organization (WHO), over 50% of medicines purchased from online sites without a physical address are counterfeit (WHO, Factsheet No. 275). The Internet is an ideal platform for distributing these substandard or falsified products, which are prevalent in low-income and middle-income countries (WHO, 2017a). Fraudulent and dangerous practices, such as sale counterfeit or substandard medication and drug storage and shipping conditions (Weiss, 2006), may lead to adverse effects, necessitating regulatory oversight and consumer education to combat fraudulent practices and improve e-pharmacy service quality.

The expansion of e-pharmacy services offers significant benefits, including enhanced access to medications and improved healthcare delivery, as well as unique challenges, particularly in low- and middle-income countries. In Ghana, where access to healthcare services is often constrained by financial, geographical, and infrastructural barriers, understanding the specific facilitators of e-pharmacy utilization is essential. Without clear insights into what drives utilization, there is a risk that e-pharmacy services may remain accessible only to a limited segment of the population, further widening existing health disparities

By addressing this gap, this study seeks to identify these enablers that can contribute the development of targeted interventions and policies that promote equitable access to e-pharmacy services for marginalized populations in Ghana. Understanding these dynamics will help inform broader efforts to improve digital health equity and ensure that the benefits of e-pharmacy services are realized across diverse socioeconomic contexts, ultimately improving medication access, reducing geographical barriers, and strengthening the overall health system.

1.2 Problem Statement

Following the technological advancement, health-care scholars have conducted numerous studies on mobile health technologies, specifically targeting various demographic populations, with a particular focus on older adults (Klimova, 2016; Berauk et al., 2018). Evidence shows that while mobile health applications offer potential benefits in terms convenience, they are more widely adopted by younger populations, with older adults expressing significant concerns due to technological challenges (Tu et al., 2021; Lee et al., 2021).

In Ghana, the concept of e-pharmacy has been present for over a decade but with uneven penetration (Danquah et al., 2023). Although some urban pharmacies have adopted services like doorstep deliveries, the overall uptake of e-pharmacy platforms remains inconsistent despite the establishment of the National Electronic Pharmacy Platform (NEPP) by the Ghana Pharmacy Council to streamline and regulate e-pharmacy services. This limited and inconsistent adoption affects the ability of e-pharmacy to reach its full potential in improving healthcare delivery. Also, the escalation of noncommunicable diseases, such as diabetes and hypertension, has generated an unprecedented demand for a continuous supply of critical medicine to patients in Ghana. However, barriers such as age-related challenges, uneven geographical coverage, inadequate provider training, and technological barriers among specific population groups and insufficient public awareness, often prevent individuals engaging with e-pharmacy services. If the uptake of e-pharmacy platforms remains low, patients especially those managing noncommunicable diseases like diabetes and hypertension will continue to face difficulties in accessing essential medicines in a timely and affordable manner. This could result in delayed treatment, disease complications, increased healthcare costs, and widening health inequities between urban and rural populations. Furthermore, without widespread adoption, the transparency, accountability, and efficiency intended through NEPP will not be fully realized.

Despite these initiatives and the potential benefits offered by e-pharmacy in terms of accessibility, convenience, and efficiency, the widespread uptake of digital pharmacy platforms in Ghana remains unexplored. Considering the significance of e-pharmacy activities to patients, health practitioners, facilities, and the entire health service sector in Ghana, research must delve into the intricate factors influencing the uptake of e-pharmacy in the country.

This study seeks to investigate the factors influencing the utilization of e-pharmacy services/platforms in Ghana, focusing on awareness, accessibility, and perceived benefits, and how these collectively influence uptake. The findings will provide evidence to inform policymakers, technology developers, healthcare providers, and e-pharmacy operators, on designing targeted strategies to improve adoption. The ultimate goal is to align e-pharmacy implementation with the diverse needs of consumers and providers, contributing to improved health outcomes and the advancement of digital health in Ghana.

1.3 Justification of the study

The study aims to investigate the factors influencing the utilization of e-Pharmacy services/platforms in Ghana, with particular focus on how the interplay of factors such as awareness, accessibility, perceived benefits influence the utilization of e-Pharmacy services/platforms.

The study investigations will provide a comprehensive understanding of the factors that determine the utilisation of e-pharmacy services/platforms in Ghana. By identifying, understanding and analysing these dynamics, the study will provide valuable information for policymakers, technology developers, e-Pharmacy service providers, healthcare providers, and patients, thereby facilitate the development of targeted systems and strategies aimed at enhancing the effective utilization of e-Pharmacy services and ensure that their benefits are fully realized across diverse socio-economic contexts in Ghana.

The study will help health practitioners enhance the successful utilisation of e-pharmacy services across the country, ensuring its implementation aligns with the diverse needs and expectations of both consumers and healthcare providers to improve health outcomes.

Ultimately, the study seeks to contribute to the existing knowledge and also advance the field of digital health in healthcare delivery system. The findings and recommendations will serve as foundation for future research works, health policy reforms and direction for practitioners interested in leading digital health reforms and advancements in the near future.

1.4 Research Question

1.4.1 Main Research Question

1. What are the factors influencing the utilization of e-Pharmacy services in Ghana?

1.4.2 Specific Research Questions

1. What is the level of utilization of e-Pharmacy services/ platforms in Ghana?
2. What is the association between awareness and the uptake of e-Pharmacy services in Ghana?
3. What is the association between accessibility and the uptake of e-Pharmacy services in Ghana?
4. What is the association between perceived benefits and the uptake of e-Pharmacy services in Ghana?

1.5 Research Objectives

1.5.1 General Objective

1. To examine the factors influencing the utilization of e-Pharmacy services in Ghana

1.5.2 Specific Objective

1. To assess the level of utilisation of e-Pharmacy services/platforms in Ghana

2. To investigate the association between awareness and the uptake of e-Pharmacy services in Ghana.
3. To examine the association between accessibility and the uptake of e-Pharmacy services in Ghana.
4. To explore the association between perceived benefits and the uptake of e-Pharmacy services in Ghana.

1.6 Conceptual Framework of Factors influencing the utilisation of e-Pharmacy Services/Platforms

The conceptual framework for this study has been built on the different factors influencing e-pharmacy utilisation. Significant literature has shown that the utilization of e-pharmacy services is influenced by several different factors. Different factors could influence the uptake and utilization of e-pharmacy, awareness of e-pharmacy, accessibility, and the benefits perceived to be associated with e-pharmacy services. From the figure (1.6), Uptake of e-pharmacy services deals with the utilization of electronic platforms and devices to deliver medications to patients. For this, both the pharmacy and clients have the right to interact and access medications either prescribed by a practitioner or self-prescribed. However, the ability of the client to fully utilise these platforms significantly depends on several factors, which include awareness of e-pharmacy, accessibility, and the benefits perceived to be associated with e-pharmacy services, as shown in figure 1.6. The awareness of e-pharmacy services deals with the knowledge about the availability of e-pharmacy platforms, the understanding of the services offered by e-pharmacy, and acquaintance with the benefits and potential risks associated with e-pharmacy. Also, the issue of the accessibility of e-pharmacy Platforms encompasses geographic availability of e-pharmacy services, the user-friendly interface and navigation of e-pharmacy platforms, and the convenience of delivery methods and time

efficiency. Finally, perceived benefits deal with the perceived improvement in accessibility to medications, confidence in the quality and safety of e-pharmacy services, and the recognition of time and cost-saving benefit.

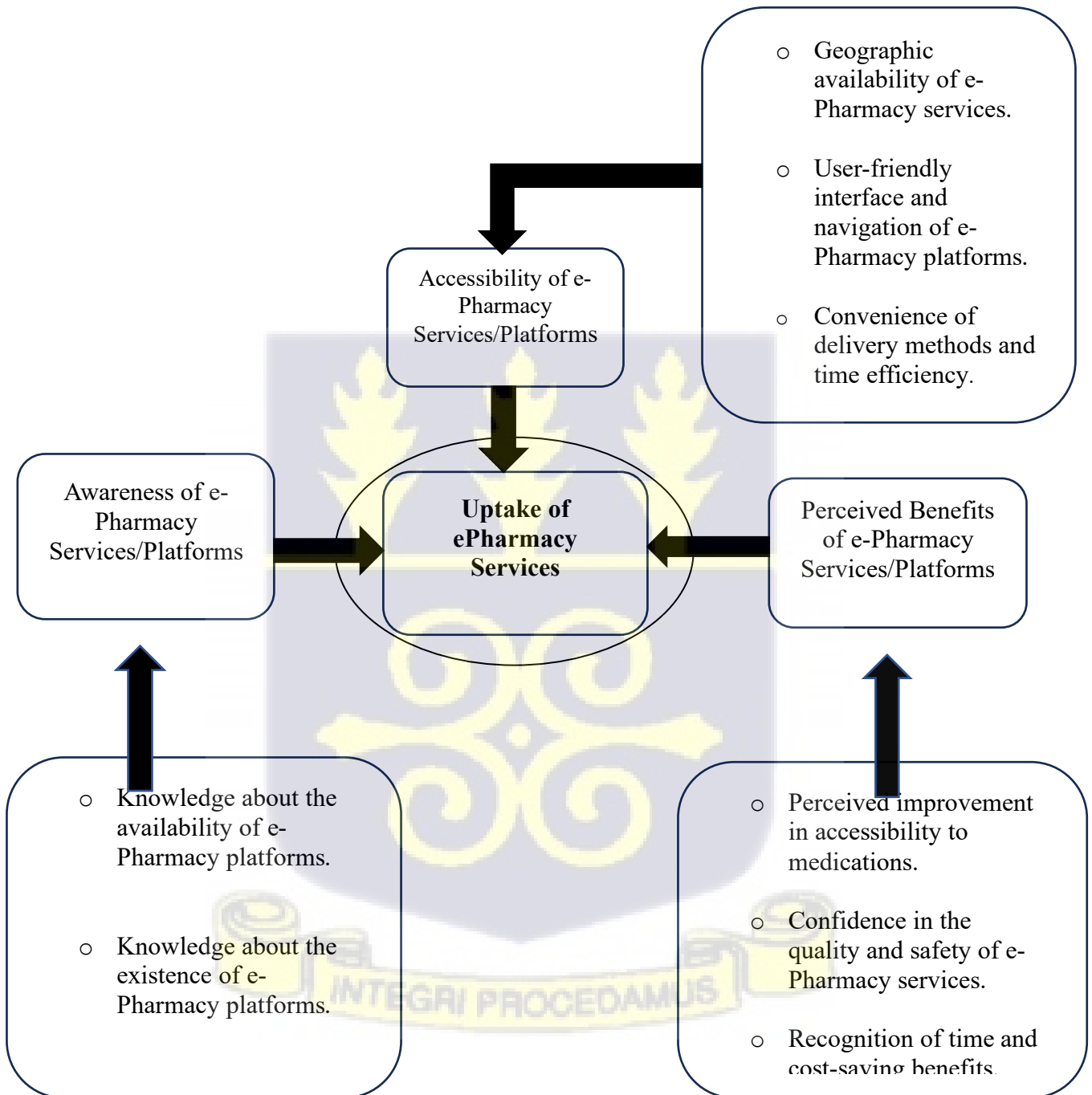


Figure 1.6: A conceptual framework of factors influencing the Utilisation of e-Pharmacy

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview of e-Pharmacy

E-pharmacy refers to a digital, automated, and internet-driven platform that connects users with pharmacies through integrated components such as databases, decision support tools, electronic transaction platforms, and mechanisms for inventory tracking and management (Srivastava and Raina, 2021). According to Yin et al., (2016), the interest in e-pharmacy services has surged rapidly in recent times, reflecting an increase recognition of opportunities for stakeholders to reassess and optimize the delivery of pharmaceutical services. As the adoption of e-pharmacy increases, a significant number of scholars have made various efforts to present evidence on the various factors influencing e-pharmacy adoption across the world. In a study, Ndem et al., (2019) revealed that different customer behaviors, progression in computer technologies, and access networks are the main determinants of the accessibility of essential medical services, including e-pharmacies. According to Savant et al. (2023), there are approximately 30,000 to 50,000 e-pharmacies operating globally, facilitating easier and convenient access to medications for the public. In a study, Sarker et al., (2019) indicated that e-pharmacy businesses plays an essential role in modern healthcare delivery system of the 21st century, improving patient adherence, and alleviating pressure on traditional healthcare infrastructures. The study also revealed that e-pharmacy utilization signifies a transformative phase in pharmaceutical practice, characterized by distinct operational models, emerging opportunities, and inherent challenges. The ability of consumers to access medications online has increased exponentially, changing the foundational structure of how pharmacy/pharmaceutical services are delivered along with policy issues, which necessitates new regulatory frameworks to ensure safety and efficacy. (Fittler A, et al 2013). A legitimate online pharmacy requires the submission of a valid prescription issued by a licensed physician/healthcare provider before dispensing medications,

which must contain accurate contact details for the site, and also offer access to a registered pharmacist. (Bessell et al., 2003)

2.2 Factors influencing the utilization of e-Pharmacy services in Ghana

In the 21st century, e-pharmacy has been recognized for playing a key role in modern healthcare delivery system in most parts of the world. Empirical evidence from previous studies in most parts of the globe highlighted the importance of analyzing the region-specific factors influencing the acquisition, dissemination, and secure provision of pharmaceuticals, medical equipment, and healthcare product is of paramount importance. This analysis is crucial for understanding the complexities and variations in healthcare systems across different geographical areas, ensuring equitable access to essential medical resources, and maintaining high standards of patient safety and care delivery. In their study, Adjie et al. (2023) indicated that the adoption and utilization of e-pharmacy services witnessed a significant increase during the COVID-19 pandemic following the introduction of quarantine policies (lockdowns) in many countries. As further noted, the lockdown policy in most countries across the world , led to a significant number of individuals requiring access to medications without the necessity of visiting a traditional/conventional pharmacy. Sarker et al. (2019) also argued that online pharmacies have created a complex web of interaction among consumers, pharmacies, doctors, and regulatory authorities. This evolving dynamic has prompted regulatory bodies, especially those in the health sector, to implement more rigorous guidelines governing the operations of online pharmacies. All these activities, in one way or another, impact the availability and accessibility of e-pharmacy services across various regions globally.

2.3 Awareness of e-Pharmacy services/platforms

One important factor that has been recognized for influencing the uptake of e-pharmacy services is the awareness of e-pharmacy services among customers (Ababneh et al., 2024; Abu Farha et al., 2017). Generally, awareness has been conceptualized to encompass the knowledge about the existence and availability of e-pharmacy platforms. It also has to do with customers having a full and better understanding of the services offered by e-pharmacy and their acquaintance with the benefits and potential risks associated with e-pharmacy. In highlighting awareness as a determinant of e-pharmacy services, the study by Ababneh et al, (2024) found that during COVID-19, community pharmacists in Malaysia who had elevated awareness of and positive views about drive-through community pharmacy services, improved the utilization of the service system. As revealed by the study, customers' awareness of the presence of drive-thru community pharmacy services at hospital and healthcare facilities in Malaysia encourages their usage. Ahmad, Gnanasan, and Karuppanan (2024) investigated public perceptions and awareness of telepharmacy in Malaysia, particularly in light of the increased reliance on digital health services during the COVID-19 pandemic. Conducted as a cross-sectional survey from November 2022 to May 2023 with 387 participants, the study found that while respondents exhibited high digital readiness, their awareness of telepharmacy remained low. Although many respondents held positive perceptions of telepharmacy's potential, only 48.1% expressed a willingness to use such services. The research suggested that a lack of awareness contributed to the moderate uptake of telepharmacy services. The study recommended targeted education initiatives to bridge the knowledge gap, increase public trust, and promote the greater adoption of e-pharmacy services. The study by Abu Farhan et al., (2017) presented similar findings based on their study among Jordanian pharmacists, as the results revealed that 85.5% of customers being aware of drive-thru pharmacy services enhances the uptake of the system.

Agyemang et al. (2024) examined consumers' adoption of and resistance toward e-pharmacy using the behavioral reasoning Theory. The study aimed to evaluate the reasons influencing the acceptance or rejection of e-pharmacy services. Conducted through in-depth interviews with 28 respondents, the research used thematic analysis to explore the factors shaping consumer decisions. Findings indicated that, accessibility, affordability, prescription management, convenience, pricing, , logistics, and prompt delivery medications encouraged, e-pharmacy services utilization and uptake. Conversely, concerns about trust, security, legal uncertainties, internet access, and privacy deterred consumers. The study recommended enhancing regulatory frameworks and consumer trust initiatives to boost awareness and uptake of e-pharmacy services.

Tegegne et al. (2024) evaluated pharmacy students' perceptions, knowledge, and related factors on telepharmacy in Northwest Ethiopia. The study found that 32.4% of participants had good knowledge of tele-pharmacy, while 48.6% had a positive perception of it. Factors influencing knowledge and perception included age, gender, cumulative GPA, computer training, management support, access to electronic devices, and training on pharmacy information systems. The study highlighted a knowledge gap that could affect the adoption of tele-pharmacy services. It recommended improving access to digital devices and enhancing training on pharmacy information systems to increase awareness and subsequent uptake of e-pharmacy services.

Blebil et al. (2023) explored eHealth literacy and mobile health application utilization among Malaysian pharmacy students. The study sought to assess students' ability to search, evaluate, and apply online health information in clinical decision-making. Conducted through an online survey with 415 respondents, the study found that 34.7% of participants had low eHealth literacy, while 42.4% lacked confidence in making health decisions based on online information. Additionally, 35.2% struggled to differentiate between high- and low-quality

health resources. Despite the growing digital landscape, the study found that a lack of awareness and skill deficits hindered the effective use of mobile health applications. The researchers recommended incorporating eHealth literacy programs into pharmacy education and enhancing university support to increase awareness and adoption of digital health tools, including e-pharmacy.

2.4 Accessibility of e-Pharmacy services/platforms

Accessibility of e-pharmacy Platforms and services is a critical determinant of the service uptake by customers. Accessibility encompasses geographic availability of e-pharmacy services, the ser-friendly interface and navigation of e-pharmacy platforms, and the convenience of delivery methods and time efficiency to the customer. Evidence from the literature has shown that the willingness of users to access or engage in medication transactions through online pharmacy applications is influenced by the ease of accessibility and user satisfaction linked to the platform and services provided. Different customer behaviours, progression in computer technologies, and access to networks are the main factors determining the accessibility of essential medical services, including e-pharmacies (Ndem et al, 2019). Fan & Ezeudoka (2024) investigated the factors affecting the accessibility of electronic pharmacy platforms in South Africa, applying the Technology Acceptance Model (TAM). Data from 480 South African clients was analyzed using partial least squares structural equation modeling. The study found that perceived usefulness, dependability, trust, and expectations for performance, significantly influenced accessibility, as users were more likely to engage with e-pharmacy platforms when they trusted the services and perceived them as efficient. Technological literacy was identified as a key moderator, with individuals possessing higher digital skills demonstrating greater ease in accessing and utilizing e-pharmacy services. The

study recommended targeted digital literacy programs to improve accessibility, ensuring that all user groups could effectively navigate and benefit from e-pharmacy platforms.

Adebo, Aladelusi, and Mohammed (2025) examined the factors influencing the accessibility of e-pharmacy platforms among young users in southwestern Nigeria. Using a quantitative correlational design, data was collected from 306 university students through cluster sampling and using partial least squares structural equation modelling (PLS-SEM). The findings revealed that performance expectancy was the primary determinant of e-pharmacy adoption, indicating that users were more likely to access these platforms if they perceived them as beneficial. Social influence was found to mediate accessibility by shaping users' perceptions and trust in e-pharmacy services. The study recommended that e-pharmacy providers enhance accessibility by leveraging social influence mechanisms, such as peer recommendations and social media engagement, to encourage usage among young consumers.

Al Halbusi et al. (2024) explored accessibility factors influencing e-pharmacy adoption in Qatar using the UTAUT-2 framework. The study surveyed 455 e-pharmacy users and analyzed data using SmartPLS 3.2 software. Results showed that accessibility was strongly influenced by effort expectancy, performance expectancy, social influence, and users' level of awareness. Also, word-of-mouth recommendations played a crucial role in improving accessibility by increasing users' confidence in electronic pharmacy services. The study recommended that e-pharmacy providers focus on awareness campaigns and user education to enhance accessibility, particularly among less tech-savvy populations.

Sonawane et al. (2024) examined demographic factors affecting the accessibility of digital app-based pharmacy delivery services. The study surveyed 175 e-pharmacy users and analyzed data using ANOVA and moderation analysis. Findings revealed that accessibility varied based on demographic characteristics such as educational qualification and age, with younger and more educated individuals demonstrating higher engagement with e-pharmacy services. The study

recommended that e-pharmacy providers tailor their platforms to accommodate diverse user demographics by offering simplified navigation, multilingual support, and user-friendly interfaces to improve accessibility across different age and education groups.

2.5 Perceived benefits associated with e-Pharmacy services/platforms

Like many other electronic or digital systems, e-Pharmacy service delivery has been found to have significant benefits associated with it. The benefits perceived to be associated with e-Pharmacy encompasses the perceived improvement in accessibility to medications, the confidence in the quality and safety of e-Pharmacy services, and the recognition of time and cost-saving benefits. These perceived benefits have over the time being assisted both healthcare practitioners and clients in the delivery and accessibilities of healthcare services (Adjie et al., 2023). In highlighting the benefits of e-Pharmacy, Sarker et al., (2019) in their study revealed that customer and patient focused services offered by e-Pharmacies results in, easy access, lower transaction rates, reduced product costs and faster doorstep delivery. Evidence from previous studies revealed that the acceptance and utilization of e-Pharmacy services is on the rise because e-Pharmacy services has demonstrated their ability to provide complete protection/security to clients when dispensing high-risk medicinal products, similar to how traditional pharmacies work (Jain et al., 2017). Additionally, e-Pharmacies provide the opportunity for patients to purchase medication without needing to visit the healthcare facility to consult doctor or pharmacist. E-Pharmacies expand access to medication for patients who are unable to visit medical facilities because of financial constraints or accessibility concerns by delivering the necessary medications straight to a patient's home. (Argarwal & Parkhi, 2021). Irrespective of the associated benefits, e-Pharmacies have also sparked controversies, particularly regarding the role of cyber doctors on certain e-pharmacy platforms, the importation of regulated medication and the distribution of prescription medication without

required authorization. Even though some e-pharmacies are legitimate and provide benefits to consumers, other e-Pharmacies engage in dubious medical activities and procedures (Letkiewicz, 2009; USTR Report., 2024; Bowman., et al 2020; Hertig., et al 2019).

Assin et al. (2024) explored the role of risk perceptions and perceived usefulness in ePharmacy adoption among Indian consumers. Their findings indicated that perceived usefulness mediates the relationship between risk perceptions and purchase intentions. Consumers who recognized the convenience and accessibility of ePharmacy platforms were more inclined to use them, despite initial concerns over financial, product, and privacy risks. This suggests that perceived benefits, particularly those related to ease of access and service efficiency, enhance adoption even in contexts where risks are acknowledged.

Ahalawat et al. (2024) investigated the adoption behavior of Indian consumers concerning online pharmacies. The study found that while digitalization offers opportunities for healthcare improvements, the readiness of pharmacists to embrace these changes remains a challenge. Community pharmacists in Nigeria exhibited a negative attitude toward ePharmacy services due to organizational factors, such as business size and financial performance. This suggests that perceived benefits of ePharmacy are not universally acknowledged across all stakeholders, and their recognition is necessary to improve adoption rates.

Pihl (2021) focused on Swedish pharmacy students' perspectives on telepharmacy, revealing that while they saw potential benefits in digital pharmacy services, there was skepticism about the ability of ePharmacy to deliver quality pharmaceutical care. The study emphasized the need for enhanced education and training to equip future pharmacists with the skills required to optimize the perceived benefits of ePharmacy services. These findings align with broader evidence that increasing awareness and training can improve the perception of benefits, leading to higher adoption rates.

2.6 Level of Utilisation of e-Pharmacy Services/Platforms

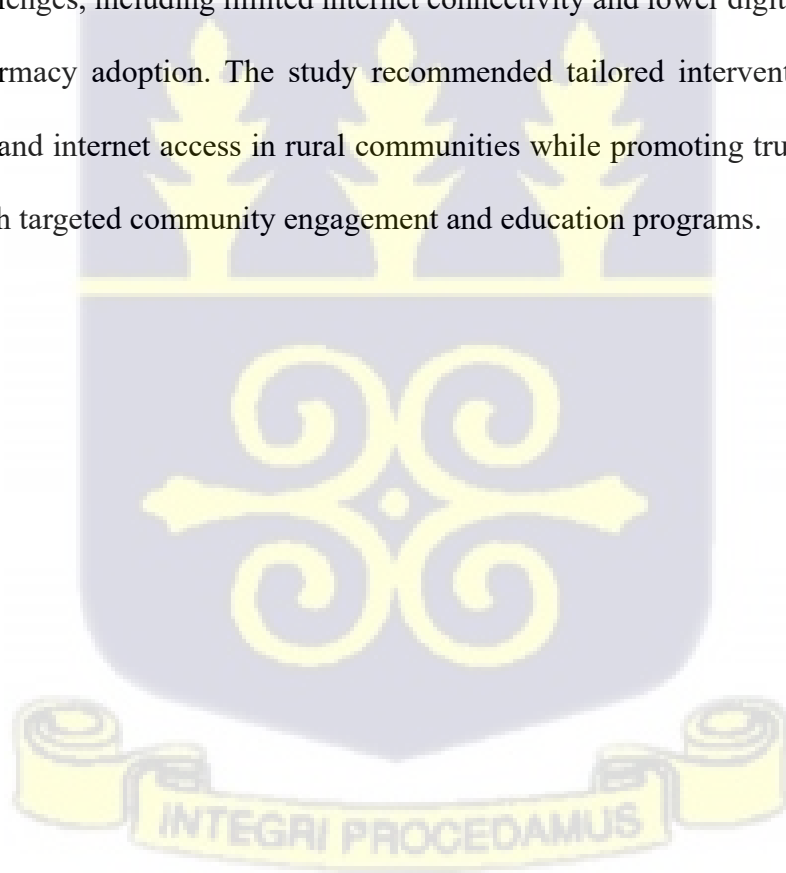
Fan and Ukaegbu (2024) examined the utilization of e-pharmacy services in Nigeria by assessing the role of information literacy in influencing attitudes, perceived control, word of mouth, and trust in e-pharmacy adoption process. Using the Theory of Reasoned Action (TRA) and Trust Theory, the study found that persons with higher information literacy were likely to develop positive attitudes, experience a greater sense of control, and engage in positive word-of-mouth discussions about e-pharmacy services. Trust was identified as a key factor facilitating the relationship between word-of-mouth communication and actual adoption. The study recommended initiatives to improve information literacy, strengthen trust, and leverage word-of-mouth communication to enhance e-pharmacy utilization in Nigeria.

Cen et al. (2022) conducted a systematic review to assess the extent of eHealth adoption in pharmaceutical care across 17 countries, particularly during the COVID-19 pandemic. The review indicated that hospital, community, and specialist pharmacists continued providing essential services such as education, consultation, monitoring, and patient management through various digital platforms, including mobile applications, social media, and electronic medical records. The findings highlighted that eHealth ensured continuity of pharmaceutical care, reduced hospital visits, and improved work efficiency. The study suggested the need for coordinated efforts by governments, healthcare institutions, pharmacists, and patients to strengthen eHealth integration in pharmacy services globally.

Adebo et al. (2025) investigated the adoption of e-pharmacy services in Nigeria, focusing on the mediating role of social influence among young consumers in three public universities in the southwestern region. The study employed the Unified Theory of Adoption and Use of Technology (UTAUT) and found that performance expectancy was the strongest determinant of e-pharmacy adoption. Social influence entirely arbitrates the association between effort

expectancy, enabling conditions, and e-pharmacy adoption, it only partially mediate the relationship between performance expectancy and e-pharmacy use. The study emphasized the importance of enhancing service quality and user experience while leveraging social media campaigns, celebrity endorsements, and peer recommendations to increase e-pharmacy utilization among young people in Nigeria.

Chen and Lee (2024) explored the disparities in e-pharmacy utilization between urban and rural populations in China by analyzing user demographics, preferences, and satisfaction levels. The study found that urban residents had higher adoption rates due to better internet access, greater digital literacy, and increased trust in online platforms. Conversely, rural residents faced significant challenges, including limited internet connectivity and lower digital literacy, which hindered e-pharmacy adoption. The study recommended tailored interventions to improve digital literacy and internet access in rural communities while promoting trust in e-pharmacy services through targeted community engagement and education programs.



CHAPTER THREE

METHODS

3.1 Study Design

The study employed a cross-sectional survey design to explore the influence awareness, accessibility, and perceived benefits on the utilization of e-pharmacy services/platforms in Ghana. The survey was conducted in Ghana.

3.2 Study Area

Republic of Ghana

Ghana is situated on the coast of West Africa, with a population of about 31 million and nearly 60% under the age of 30 years (GPHC., 2021). Its total land area is approximately 238,533 square kilometres.(Ghana Statistical Service, 2021)

In the context of digital health and e-services, Ghana has experienced significant growth in mobile technology penetration. According to the National Communications Authority (2023), mobile phone penetration exceeds 130% (due to multiple SIM ownership), and smartphone adoption is steadily increasing, particularly in rural areas. Internet penetration is estimated at over 68%, with substantial regional disparities in urban regions like Greater Accra and Ashanti have the highest connectivity rates, while rural northern regions have comparatively lower rates. The widespread availability of mobile phones and other internet-enabled devices offers a strong foundation for the expansion of e-services, including e-pharmacy platforms.

Ghana offers a unique setting to understand the interplay between accessibility, awareness, perceived benefits, and their combined influence on the utilization of e-pharmacy services in a developing country context. Ghana's rapid urbanization and economic development present both challenges and opportunities for healthcare delivery, particularly in the pharmaceutical sector. The country's diverse demographic and socio-economic landscape provides a rich field

for examining how these factors influence the public's engagement with e-pharmacy services.

(Figure 3.2)

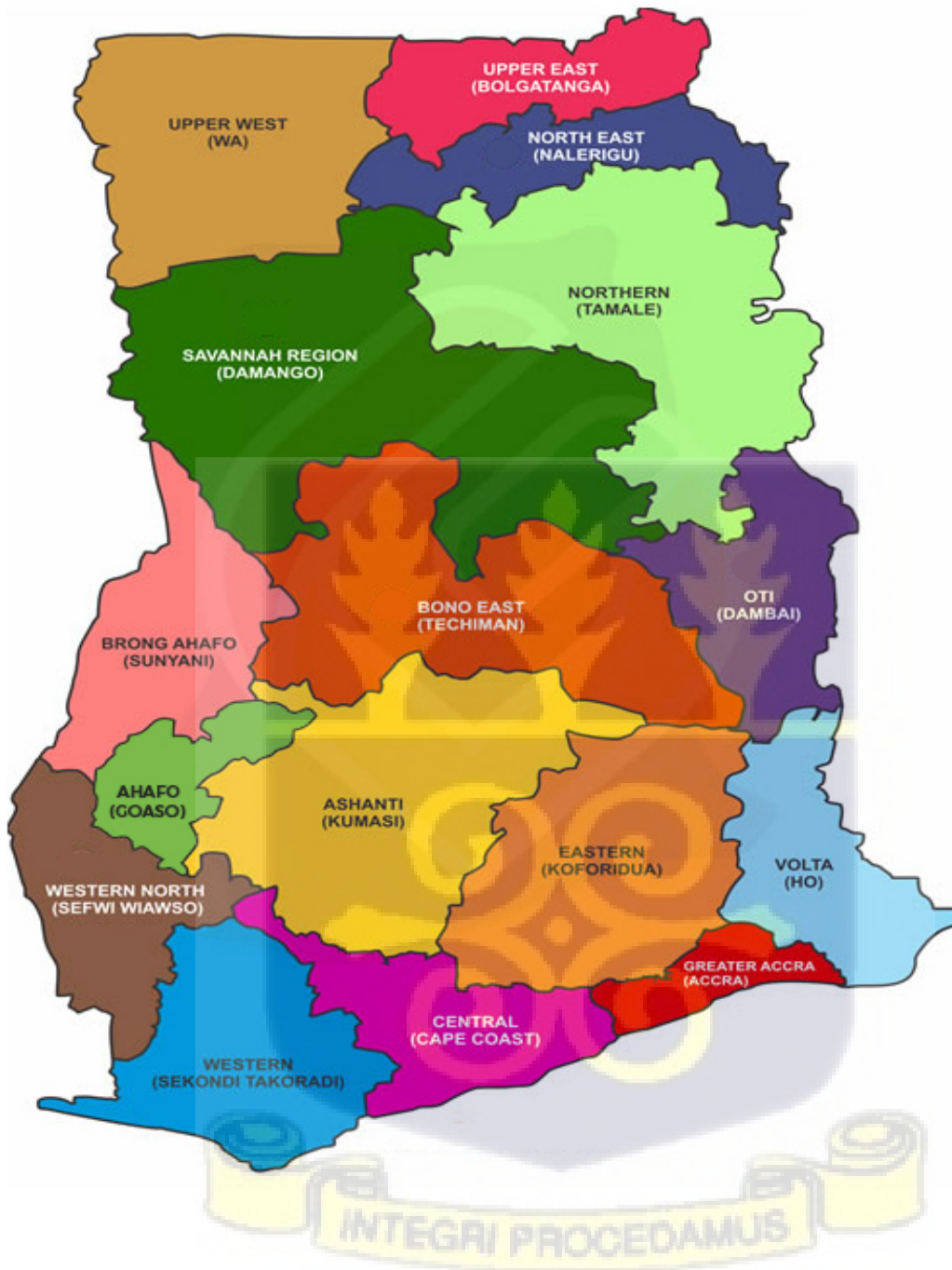


Figure 3.2 Map of Ghana (Google Maps)

3.3 Sampling

3.3.1 Study Population

The study population included Ghanaian residents aged 18 years and older, who are technological adept and most likely to use electronic devices and platforms to access various services including pharmaceutical products and services (e-Pharmacy). By focusing on this broad and diverse demographic, the study aimed to provide comprehensive insights into the factors influencing ePharmacy services adoption and utilization in Ghana.

3.3.2 Inclusion Criteria

Participants who are eligible for the study, met the following inclusion criteria:

- (a) Ghanaian resident aged 18 years or more
- (b) Able to understand questions in english
- (c) Have access to internet connectivity
- (d) Provided informed consent to participate in the study

3.3.3 Exclusion Criteria

The study excluded individuals with the following characteristics:

- (a) Individuals who declined to provide informed consent
- (b) Individuals currently participating in another similar study that could bias responses
- (c) Individuals with cognitive or visual impairments that would hinder their ability to complete an online self-administered questionnaire

3.3.4 Sample Size Determination

The sample size was calculated using the Yamane Taro's, with a margin of error estimated at 3%. Formula stated as;

$$n = \frac{N}{[1+N(e)^2]}$$

Where;

“N” [is the Sample frame] = 30,832,019

“e” [is the Margin of Error] = 3% (0.03)

$$n = \frac{30,832,019}{[1 + 30,832,019(0.03)^2]}$$

$$n = 1,111.07$$

$$n = 1,111$$

$$n = 1,222$$

Based on the final calculation, the required sample size for the study was 1,111 respondents. To ensure that the minimum required sample size was achieved, the calculated sample size was increased by 10% to account for potential nonresponse. (Cochran, 1963; Israel, 1992). By including this margin, the study safeguarded against loss of data due to incomplete responses or participant withdrawal, thereby preserving statistical power and validity.

3.3.5 Sampling Process

The study employed convenience sampling approach (Kretchy et al., 2021) to recruited participants from all sixteen regions of Ghana ensuring nationwide representation. Convenience sampling allowed to engage participants who were easily accessible and willing

to participate, while snowball sampling enabled the recruitment of additional respondents through referrals from initial participants. By applying this strategy, the study ensured broad geographic and demographic coverage, thereby enhancing the representativeness and generalizability of the findings to the national population.

3.4 Data Collection Technique and Tool

3.4.1 Data Collection Tool

The study used a thirty-nine (39) -item structured online questionnaire. **(Appendix III)** The questionnaire was designed based on the research objectives and consisted of closed-ended and Likert-scale items. To ensure the instrument's reliability, Cronbach's alpha was computed. The Cronbach's alpha values ranged from 0.88 to 0.91, indicating good internal consistency for all scales. The questionnaire was created using Google Forms and administered online. The questionnaire consisted of a Participant Information Sheet outlining the objectives of the study, risks and benefits, the voluntary nature of participation, and assurances of confidentiality. The survey tool was structured into four sections;

Section A captured the demographic characteristics of the study participants, which include age, sex, marital status, religion, educational background, employment status, and region of residence, and inquired about their prior use of e-pharmacy services and their interest in using it in the future.

Section B assessed participants' awareness levels of e-pharmacy services. Ten number questions were used to obtain participants' knowledge about the existence and availability of e-pharmacy services/platforms, their understanding of the range of services offered, and their familiarity with the benefits and potential risks associated with e-pharmacy services/platforms. These questions were rated on a 5-point Likert scale, ranging from strongly disagree to strongly agree.

Section C consisted of nine items that evaluated participants' accessibility of e-Pharmacy services/platforms. The questions in this section, focused on ease of access, geographic availability of e-Pharmacy services, the user-friendly interface and navigation of e-Pharmacy platforms, convenience of usage of e-Pharmacy services and delivery methods. Participants responded to these items on a 5-point Likert scale, with options ranging from strongly disagree to strongly agree.

Section D included a total of ten (10) items designed to collect data regarding participants' perceptions of the benefits associated with ePharmacy services/platforms and how these perceived advantages influenced their decision to utilize ePharmacy services. The questions were based on improved access to medications, confidence in the quality and safety of ePharmacy services, as well as the recognition of time and cost-saving benefits and overall convenience. The items were measured on a 5-point Likert scale, with responses ranging from strongly disagree to strongly agree.

3.4.2 Data Collection

The data were collected from participants using an online self-administered questionnaire designed via Google Forms. A survey questionnaire (Google Forms weblink) was circulated through multiple channels, including emails, professional associations and networks, and widely used social media platforms such as WhatsApp, Telegram, LinkedIn, Facebook, Instagram, and Twitter. Participants accessed the survey via the provided link (Google Forms) and completed it at their convenience. This distribution strategy was intended to reach a diverse audience across different regions and demographic groups.

3.5 Study Variables

3.5.1 Dependent Variable

The dependent variable for the study is Uptake e-pharmacy Services. This encompasses the utilization of e-Pharmacy services/platforms to deliver medications. (Almohammed et al., 2023)

1. Have you ever purchased or ordered medicine online? (Online Pharmacy or e-pharmacy services/platform utilisation)

3.5.2 Independent Variables

The independent variables were classified into Socio-demographic and the determinant variable: Awareness of e-pharmacy services, Accessibility to e-pharmacy services, and perceived benefits of e-pharmacy services. **(Table 3.1)** The socio-demographic variable included age, gender, marital status, religion, educational background, employment status, and region of residence. **(Table 3.1)**

Awareness of e-pharmacy services deals with the knowledge about the availability of e-pharmacy platforms, the understanding of the services offered by e-pharmacy, and acquaintance with the benefits and potential risks associated with e-pharmacy. The survey questions was adapted from Ndem et al. (2019) & Chew Beng Ng et al. (2021). Responses were measured on a five-point Likert scale, where 1 represents the lowest level of agreement and 5 represents the highest. An average score of 3.0 or below suggests inadequate awareness of e-pharmacy services/platforms, while a score above 3.0 to 5.0 indicates adequate awareness of e-pharmacy services/ platforms.

The question items are as follows;

1. I am aware of the existence of e-pharmacy services/platforms in Ghana.
2. I am aware of the availability of ePharmacy services/platforms in Ghana

3. I am aware of the range of services offered by e-Pharmacy services/platforms including medication purchase, delivery, refill options and consultation.
4. I am aware that e-pharmacy services/platforms are more cost-effective for purchasing medication compared to traditional pharmacies.
5. I am aware that ePharmacy services/platforms have time-saving benefits for purchasing medication compared to traditional pharmacies.
6. I am aware e-pharmacy services/platforms offer a more convenient alternative for purchasing medications compared to traditional pharmacies
7. I am aware of the potential risks associated using ePharmacy services/platforms such as medication authenticity, data privacy or security concerns.
8. I am aware of the limitations of e-pharmacy services/platforms, such as delayed delivery, limited product availability, or lack of in-person consultation
9. ePharmacy services/platforms provide information about dosage, usage, potential side effects of medications, and consultation.
10. I understand the concept of pharmacy services/platforms and how they operate.

Accessibility of e-Pharmacy Platforms encompasses geographic availability of e-Pharmacy services, the user-friendly interface and navigation of e-Pharmacy platforms, Convenience of usage of e-Pharmacy services, delivery methods, and time efficiency. The question items will be adapted from Norah Abanmy (2017), & Adjie E.A, et al. (2023). The measurement items will be assessed using a five-point Likert scale, with a value of 1 denoting the least agreement and a value of 5 indicating the most agreement. An average mean score of 3.0 or below indicates inadequate accessibility of e-pharmacy services. A mean score above 3.0 to 5.0 indicates adequate accessibility of e-pharmacy services.

The question items are as follows;

1. ePharmacy services/platforms (online pharmacies) are readily available in my Region or location.
2. e-Pharmacy services are available 24/7, 7 days a week.
3. E-pharmacy services/platforms (online pharmacies) are easily accessible in my region or location.
4. e-Pharmacy platforms (online pharmacies) are user-friendly in terms of interface design and website/App navigation.
5. I find it easy to navigate the functionalities and features of e-pharmacy platforms.
6. I consider e-pharmacy services/platforms as a convenient option for purchasing medications
7. I consider the process of ordering medications through e-pharmacy services/platforms very simple and flexible.
8. e-Pharmacy services/platforms (online pharmacies) ensure the timely delivery of medication
9. e-Pharmacy services/platforms offer a range of delivery methods, such as home delivery, pick-up, and express shipping.
10. I am satisfied with the speed and time efficiency of e-pharmacy services in processing orders and delivering medication.

Perceived benefits encompass the perceived improvement in accessibility to medications, confidence in the quality of medication and safety of e-pharmacy services, and the recognition of time and cost-saving benefits and Convenience. Participants will be assessed on the perceived benefits/usefulness associated with e-pharmacy services in terms of improving their healthcare experience. A total of 10 question items will be used to assess the perceived benefits/usefulness of e-pharmacy services/platforms. The questions will be drawn from existing studies: Almomani et al. (2023), Davis (1989) & Davis et al. (1989), and Fittler et al.

(2022). However, the questions are tailored to fit the scope of this study. Responses range from a scale: 1=Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree. An average mean score of 3.0 or below indicates insufficient perceived benefit/usefulness. A mean score above 3.0 to 5.0 indicates sufficient perceived benefits/usefulness.

The question items are as follows;

1. e-Pharmacy services/platforms enhance access to medications
2. e-Pharmacy services are available and accessible 24/7, every day of the week.
3. e-Pharmacy services/platforms provide access to a wide range of medications that may not be available in my region/location.
4. e-Pharmacy services/platforms reduce the cost of accessing medication compared to traditional pharmacies
5. Using ePharmacy services/Platforms saves me time compared to visiting the traditional pharmacy.
6. e-Pharmacy services/platforms provide a more convenient alternative to traditional pharmacies for obtaining medications.
7. e-Pharmacy services/Platforms allow for greater privacy and confidentiality compared to traditional pharmacy shops
8. e-Pharmacy services/platforms provide information about dosage, potential side effects, reminders on medication refill and consultation.
9. ePharmacy services/platforms enhance accessibility to medications, especially for individuals with limited mobility
10. I have confidence in the quality and authenticity of medications provided by e-pharmacy services/platforms

Table 3.1: Study Variables

Category	Indicator	Operational Definition	Scale of Measurement
Dependent Variable			
Uptake e-Pharmacy Services	Utilization	The Uptake of e-Pharmacy services/platforms.	Binary (Yes or No)
Independent Variables			
Socio-demographics	Age	Age Category	Ordinal (18-30, 31-40, 41-50, 51-60, 60+)
	Gender	Male or Female	Binary (Male, Female)
	Marital Status	Status of participant's romantic partnership	Nominal (Single, Married, Divorced, Widowed)
	Religion	Religion of participant	Nominal (Christian, Islam, Traditional, Other)
	Education Background	Level of education attained	Ordinal (High School, Diploma, Bachelor's Degree, Master's Degree, PhD)

	Employment Status	Employment status of respondent	Nominal (Employed, Unemployed, Self-employed)
	Region	Region of Residence	Nominal
	Willingness to use e-Pharmacy services	Willingness to purchase medicine online in the future	Binary (Yes or No)
Awareness of e-Pharmacy	Awareness	<p>Knowledge on e-Pharmacy platforms</p> <p>Level of understanding of the services offered by e-Pharmacy</p> <p>Acquaintance with the benefits and potential risks associated with e-Pharmacy</p>	<p>5-point Likert Scale</p> <p>1= Strongly Disagree</p> <p>2= Disagree</p> <p>3= Neutral</p> <p>4= Agree</p> <p>5= Strongly Agree</p>
Accessibility of e-Pharmacy Platforms	Accessibility	<p>Geographic availability of e-Pharmacy services,</p> <p>User-friendly of e-Pharmacy platforms</p> <p>Convenience of usage of e-Pharmacy platforms</p> <p>Delivery methods and time efficiency of e-Pharmacy services</p>	<p>5-point Likert Scale</p> <p>1= Strongly Disagree</p> <p>2= Disagree</p> <p>3= Neutral</p> <p>4= Agree</p> <p>5= Strongly Agree</p>
Perceived Benefits of e-Pharmacy Services	Associated Benefits	<p>Improvement in accessibility to medications.</p> <p>Confidence in the quality and safety of e-Pharmacy services.</p> <p>Recognition of time and cost-saving benefits.</p> <p>Reduced mobility and Convenience.</p>	<p>5-point Likert Scale</p> <p>1= Strongly Disagree</p> <p>2= Disagree</p> <p>3= Neutral</p> <p>4= Agree</p> <p>5= Strongly Agree</p>

3.6 Data Management and Statistical Analysis

3.6.1 Data Management

The data collected were exported from Google Forms into Microsoft Excel for preliminary organisation and validation. This involved cleaning to address any inconsistencies, ensure completeness and verify that all participants met the inclusion criteria. Subsequently, the dataset was imported to STATA statistical software version 18.0 (StataCorp LLC, USA) for detailed statistical analysis.

The level of awareness, accessibility and perceived benefits of the e-Pharmacy were derived from the responses provided to the 10 question items asked for each variable. A total mean score of 3.0 or below means; inadequate awareness, accessibility and perceived benefits while a total mean score above 3.0 to 5.0 indicate adequate awareness, accessibility, and perceived benefits of e-Pharmacy services.

3.6.2 Statistical Analysis

The data was first descriptively analyzed. The demographic characteristics participants (age, gender, marital status, educational background, employment status, and region of residence), willingness to use and the utilisation of e-Pharmacy were presented as frequencies, means, percentages, and proportions, along with a corresponding 95% confidence intervals (CIs), providing a detailed demographic profile of the study population.

A chi-square test of association was performed to determine the association between sociodemographic factors, awareness, accessibility, perceived benefits of e-pharmacy services, and the utilisation of e-pharmacy services. The statistical significance level was set at 5% ($p < 0.05$)

A logistic regression analysis was performed to assess the relationship between independent variables: awareness, accessibility, and perceived benefits of e-pharmacy services and the dependent variable, utilization of e-pharmacy services. The results were presented as odds

ratios (ORs), with 95% confidence intervals and p-values. Variables with statistically significant association ($p < 0.05$) with the utilisation of e-pharmacy services in the chi-square analysis were included in an unadjusted (univariate) and adjusted (multivariate) logistic regression analysis. Adjusted logistic regressions were performed at a 5% level of significance. The adjusted odds ratios (AORs), p-values, and corresponding confidence intervals were presented. The area under the Receiver Operating Curve (ROC) was 0.7967, indicating the model has a good predictive performance. The mean Variance Inflation Factor (VIF) was 2.87, suggesting no substantial multicollinearity among predictors.

3.7 Quality Assurance

The study included respondents who met the predefined inclusion criteria, ensuring that the collected data was representative of the study population. The questionnaire was piloted with a sample of 10 randomly selected individuals in Accra, Ghana, to evaluate its effectiveness in capturing the intended information. Based on the pilot feedback, necessary revisions were made to ensure the questions were comprehensible and coherent and to improve overall instrument reliability and suitability before the commencement of the data collection.

3.8 Ethical Consideration

The research protocol was reviewed and approved by the Institutional Review Board of the Noguchi Memorial Institute at the University of Ghana, with ethics approval number; 004/24-25 (**Appendix I**) before commencement of the study. This approval ensured adherence to ethical guidelines and the study's ethical rigor.

Participants were briefed of the study's purpose, procedures, potential risks, and benefits, privacy and confidentiality policy. Participant were assured of their right to withdraw from the study at any point without facing any negative repercussions.

Participants were informed that there were no foreseeable risks associated with their participation and all collected data were anonymized, excluding names and other personal identifiers, to maintain confidentiality. Access to the data was restricted to the principal investigator and supervisors and it was securely stored to prevent unauthorized access.

Informed consent was obtained electronically from all participants before they proceeded to complete the questionnaire, ensuring voluntary participation.



CHAPTER FOUR

RESULTS

4.1 Sociodemographic Characteristics of Study Participants

The study included a total of 1,236 participants in Ghana, most of them (52.83%) female. The majority of participants (46.44%) were aged 18–30 years. Participants aged 31–40 years made up 36.81%. A substantial proportion of the participants were single (65.45%). The religious composition was predominantly Christian (72.17%). Education level varied among participants; nearly half (47.33%) had a Bachelor’s Degree, and only 0.65 % had a PhD. Most participants (91.27%) were employed. Participants were recruited from all 16 regions of Ghana, with the highest representation from the Greater Accra Region (18.37%), followed by the Ashanti Region (13.67%), and the Oti Region had the lowest representation (3.16%) of the participants. Participants reported having purchased or ordered medications through e-pharmacy services/platforms were 40.53%, while (59.47%) had not. The majority of participants (94.90%) expressed a willingness to utilize e-pharmacy services in the future.

(Table 4.1).

Table 4.1: Sociodemographic Characteristics of Participants, Ghana 2024 (N=1236)

Characteristic	Frequency (N=1236)	Percentage (%)
Sex		
Male	583	47.17
Female	653	52.83
Age (Years)		
18-30	574	46.44
31-40	455	36.81
41-50	145	11.73
51-60	44	3.56
60 and above	18	1.46
Marital status		
Single	809	65.45
Married	326	26.38
Divorced	46	3.72
Widowed	55	4.45

Religion		
Christianity	892	72.17
Islam	306	24.76
Traditional	22	1.78
Other	16	1.29
Education		
High School	195	15.78
Diploma/HND	320	25.89
Ungraduated Degree	585	47.33
Master's Degree	128	10.36
PhD	8	0.65
Employment Status		
Employed	990	80.10
Unemployed	138	11.16
Self employed	108	8.74
Region of Residence		
Ahafo Region	74	5.99
Ashanti Region	169	13.67
Bono East Region	44	3.56
Bono Region	50	4.05
Central Region	89	7.20
Eastern Region	70	5.66
Greater Accra Region	227	18.37
North East Region	46	3.72
Northern Region	64	5.18
Oti Region	39	3.16
Savannah Region	52	4.21
Upper East Region	50	4.05
Upper West Region	54	4.37
Volta region Region	64	5.18
Western North Region	41	3.32
Western Region	103	8.33
Use of e-Pharmacy Services		
Yes	501	40.53
No	735	59.47
Willingness to use e-Pharmacy Services		
Yes	1173	94.90
No	63	5.10

4.2 Level of Awareness of e-pharmacy Services/Platforms

Table 4.2 highlights participants' awareness of e-pharmacy services and platforms. Most respondents (91.02%) were aware of e-pharmacy services in Ghana, with 89.83% acknowledging their availability in their location. However, awareness of the range of services was lower (60.12%). Many participants perceived e-pharmacy services as cost-effective (56.79%), time-saving (86.24%), and convenient (86.09%). Regarding risks, 55.09% recognized potential concerns, while 61.49% were aware of platform limitations. Awareness of dosage information and side effects stood at 52.02%, and 49.43% had a clear understanding of platform operations.

Table 4.2: Level of Awareness of e-pharmacy Services/Platforms

Variable	Strong Disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly Agree n (%)
Aware of existence of e-Pharmacy services/platform in Ghana	20 (1.62)	35 (2.83)	56 (4.53)	731 (59.14)	394 (31.88)
Aware of availability of e-Pharmacy services/platform in my location	20 (1.62)	52 (4.21)	54 (4.37)	815 (65.94)	295 (23.87)
Aware of the range of services offered by e-Pharmacy services/platform	283 (22.90)	111 (8.98)	99 (8.01)	514 (41.59)	229 (18.53)
Cost effectiveness	50 (4.05)	372 (30.10)	112 (9.06)	480 (38.83)	222 (17.96)
Time saving	26 (2.10)	60 (4.85)	84 (6.80)	742 (60.03)	324 (26.21)
Convenience	22 (1.78)	62 (5.02)	78 (6.31)	725 (58.66)	349 (28.24)
Potential risk	98 (7.93)	380 (30.74)	77 (6.23)	488 (39.48)	193 (15.61)
Aware of the limitations of e-Pharmacy services/platforms	174 (14.08)	227 (18.37)	75 (6.07)	554 (44.82)	206 (16.67)
Information about dosage/side effects	181 (14.64)	293 (23.71)	119 (9.63)	476 (38.51)	167 (13.51)
Understanding of how e-Pharmacy platforms operate.	148 (11.97)	372 (30.10)	105 (8.50)	468 (37.86)	143 (11.57)

4.3 Level of Accessibility of e-pharmacy Services/Platforms

Table 4.3 summarizes the accessibility of e-pharmacy services. While 64.81% agreed that these services are readily available in their region, only 47.49% reported 24/7 availability. A majority (77.83%) found e-pharmacy platforms accessible, but only 44.50% considered them user-friendly. Regarding convenience, 83.42% agreed that e-pharmacy services provide an easy way to order medications, though only 46.68% found the ordering process simple and flexible. Timely delivery was acknowledged by 60.11%, and 84.38% recognized multiple delivery options as an advantage. However, satisfaction with processing speed was 53.16%, with 33.50% expressing dissatisfaction.

Table 4.3: Level of Accessibility of e-pharmacy Services/Platforms

Accessibility	Strong Disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly Agree n (%)
e-Pharmacy services are readily available in my region	64 (5.18)	159 (12.86)	140 (11.33)	718 (58.09)	155 (6.72)
e-Pharmacy services/platforms are available 24/7 in my location	83 (6.72)	468 (37.86)	98 (7.93)	416 (33.66)	171 (13.83)
e-Pharmacy services/platforms are accessible in my location	52 (4.21)	132 (10.68)	90 (7.28)	800 (64.72)	162 (13.11)
e-Pharmacy platforms are user-friendly in terms of interface design	44 (3.56)	516 (41.75)	126 (10.19)	418 (33.82)	132 (10.68)
I find it easy to navigate the features and functionalities and of e-Pharmacy platforms	137 (11.08)	264 (21.36)	125 (10.11)	568 (45.95)	142 (11.49)
I consider e-Pharmacy services a convenient access for ordering medications	13 (1.05)	101 (8.17)	91 (7.36)	792 (64.08)	239 (19.34)
Simplicity and flexibility of the medication ordering process.	233 (18.85)	314 (25.40)	112 (9.06)	441 (35.68)	136 (11.00)
Timely delivery of medications	130 (10.52)	230 (18.61)	133 (10.76)	590 (47.73)	153 (12.38)
Availability of multiple delivery options	14 (1.13)	87 (7.04)	92 (7.44)	821 (66.42)	222 (17.96)
Satisfaction with the speed in processing orders	132 (10.68)	282 (22.82)	165 (13.35)	563 (45.55)	94 (7.61)

4.4 Level of Perceived Benefits of e-pharmacy Services/Platforms

Table 4.4 highlights the perceived benefits of e-pharmacy services. Most respondents (77.42%) agreed that e-pharmacy platforms improve medication accessibility, while 84.71% recognized their role in providing a wider range of medications. Additionally, 82.77% viewed them as time-saving, 77.83% as convenient, and 79.21% as cost-effective. Privacy was a noted advantage, with 58.17% believing e-pharmacy services offer greater confidentiality. However, opinions on dosage information and side effects were mixed, with 54.21% agreeing and 32.85% disagreeing. Accessibility for individuals with limited mobility was widely acknowledged (84.87%), while 52.91% believed in the quality of medications provided.

Table 4.4: Level of Perceived Benefits of e-pharmacy Services/Platform

Perceived Benefits	Strong	Disagree	Neutral	Agree	Strongly
	Disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Agree n (%)
e-Pharmacy services/platforms improve accessibility to medications	9 (0.73)	161 (13.03)	109 (8.82)	753 (60.92)	204 (16.50)
e-Pharmacy services/platforms are available and accessible 24/7	312 (25.24)	240 (19.42)	109 (8.82)	389 (31.47)	186 (15.05)
e-Pharmacy services/platforms access to a wider range of medications	10 (0.81)	83 (6.72)	96 (7.77)	819 (66.26)	228 (18.45)
e-Pharmacy services/platforms reduce cost of accessing medications	15 (1.21)	124 (10.03)	118 (9.55)	784 (63.43)	195 (15.78)
Time saving compared to visiting traditional Pharmacies	13 (1.05)	101 (8.17)	99 (8.01)	803 (64.97)	220 (17.80)
e-Pharmacy services/platforms provide a convenient alternative for obtaining medications	40 (3.24)	139 (11.25)	95 (7.69)	760 (61.49)	202 (16.34)
e-Pharmacy services/platforms provide greater privacy and confidentiality compared to traditional pharmacies	210 (16.99)	227 (18.37)	80 (6.47)	505 (40.86)	214 (17.31)
e-Pharmacy services/platforms provide information on dosage, medication reminders, potential side effects,	108 (8.74)	298 (24.11)	160 (12.94)	509 (41.18)	161 (13.03)
e-Pharmacy services/platforms enhance medication accessibility for individuals with limited mobility	5 (0.40)	78 (6.31)	104 (8.41)	808 (65.37)	241 (19.50)
e-Pharmacy services/platforms provide quality and authentic medications	152 (12.30)	294 (23.79)	136 (11.00)	507 (41.02)	147 (11.89)

4.5 Participant's Level of Awareness, Accessibility and Perceived Benefits of e-Pharmacy Services/Platforms

The majority of the participants, (67.80%) demonstrated adequate awareness of e-Pharmacy services (Figure 4.5).

In terms of accessibility, (65.86%) of participants reported having adequate access to e-Pharmacy services. (Figure 4.5).

Regarding perceived benefits, (67.07%) of participants believed that e-Pharmacy services provided adequate benefits. (Figure 4.5)

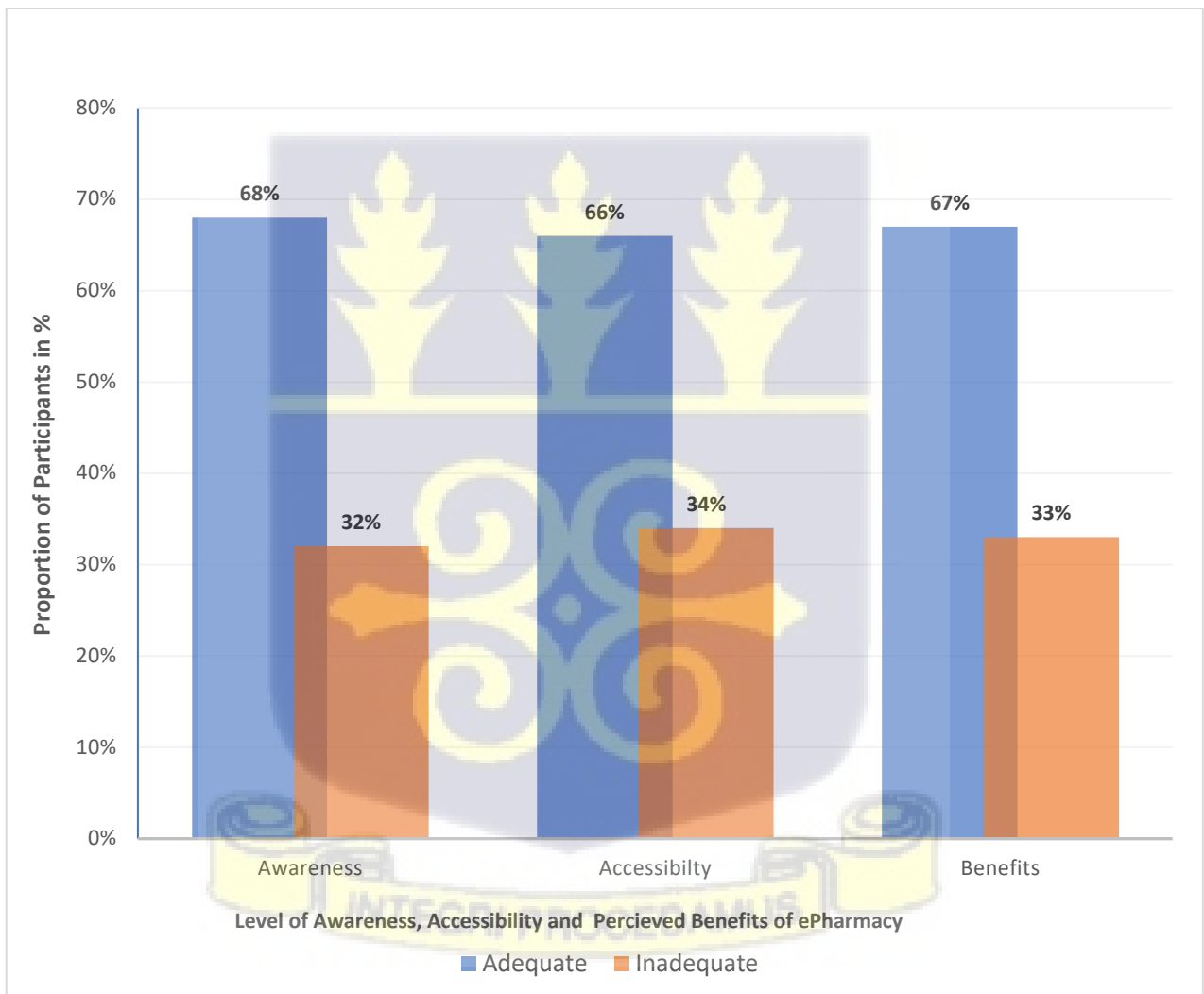


Figure 4.5 Level of Awareness, Accessibility and Perceived Benefits of e-Pharmacy Services Service/Platforms, Ghana 2024

4.6 Level of Utilisation of e-pharmacy Services/Platforms

Of the 1,236 participants 40.53% had used e-Pharmacy services. (**Figure 4.6**). The vast majority of the participants (94.90%) expressed their willingness to use e-Pharmacy services in the future with only a small proportion (5.10%) showing reluctance to use e-Pharmacy services. (**Figure 4.6.1**)

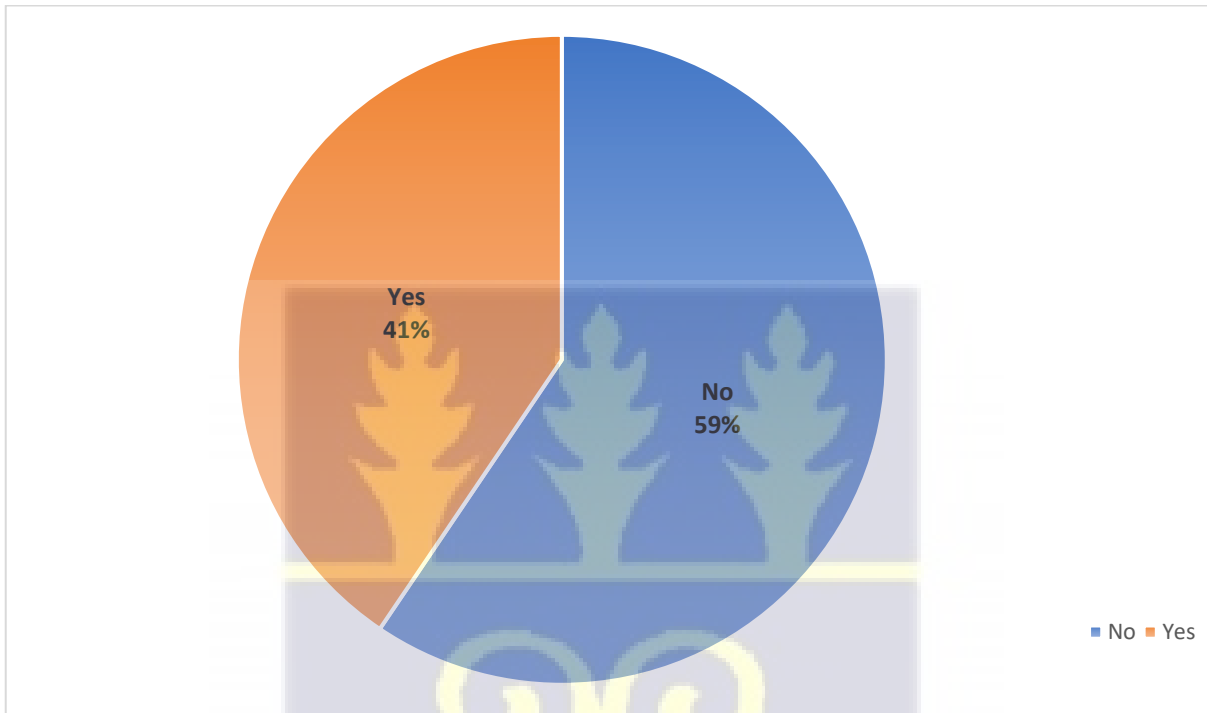


Figure 4.6 Utilisation of e-Pharmacy services/platforms, Ghana 2024



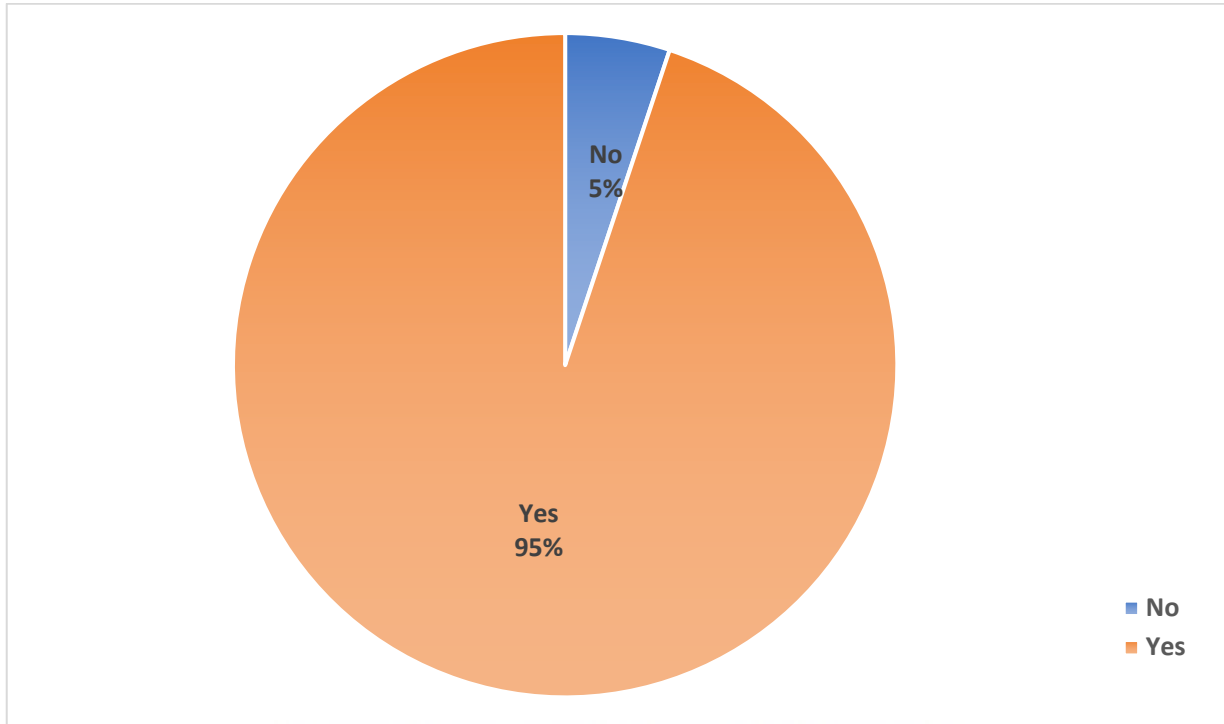


Figure 4.6.1 Willingness to use e-Pharmacy services/platforms, Ghana 2024

4.7 Utilization of e-Pharmacy Service/Platforms

Of the 1236 participants studied, 40.53 (501/1236) used e-pharmacy service and more than half, 53.69% (269/501), of those who reported utilizing e-pharmacy services were females. Among the non-users, females made up a higher proportion, 52.24% (384/735).

The majority of e-pharmacy users, 51.7% (75/145), were aged 41-50 years, followed by age group 60 or more years 44.4% (8/18), with only 36.4% (16/44) above 60 years. The age group 18-30 years accounted for 39.8% (232/583) of users.

Regarding marital status, most users 47.8% (22/46) were divorced, while married participants comprised 44.5% (145/326). Single and widowed participants made up 38.4% (311/809) and 41.8% (23/55) of users, respectively. Non-users were predominantly single 61.6% (498/809), followed by widowed individuals 58.2% (32/55), with married and widowed participants constituting 55.5% (181/326) and 52.2% (32/55), respectively.

Other was the lowest religious affiliation among users 41.6% (371/892) and non-users 58.4% (521/892). Islamic participants accounted for 34.6% (106/306) of users and 65.4% (200/306) of non-users. Traditional religion practitioners represented 59.1% (13/22) of users and 40.9% (9/22) of non-users, while participants of other religions constituted the majority of users 68.8% (11/16) and 31.2% (5/16) non-users, respectively.

Concerning education, most e-pharmacy users held an PhD (75.0%; 6/8), while 46.2% (90/195) were High school. Diploma/HND holders graduates accounted for 42.2% (135/320), and participants with a master's degree and PhD comprised 39.8% (51/128) and 37.4% (219/585), respectively. In terms of employment status, the majority of users were employed, accounting for 82.4% (473/1128) and 17.6% (28/108) unemployed.

Participants from the Ashanti Region had the highest utilization of e-pharmacy services, representing 62.7% (106/169) of users. This was followed by participants from the Western Region, Greater Accra Region and Central Region (59.2%; 61/103), (53.3%; 121/227), and (47.2%; 42/89) respectively. The lowest utilization rates were recorded in the Upper East Region (18.0%; 9/50), Bono Region (20.0%; 10/50), Oti Region (20.5%; 8/39).

Table 4.7: Characteristics of Participants by the Uptake of e-Pharmacy Services/Platforms, Ghana 2024 (N=1236)

Characteristics	Utilisation of e-Pharmacy	
	(n=501) (40.53%) Yes (%)	(n=735) (59.47%) No (%)
Sex		
Male	232 (39.8)	351 (60.2)
Female	269 (41.2)	384 (58.8)
Age (Years)		
18-30	217 (37.8)	357 (62.2)
31-40	185 (40.7)	270 (59.3)
41-50	75 (51.7)	70 (48.3)
51-60	16 (36.4)	28 (63.6)
60 and above	8 (44.4)	10 (55.6)

Marital status

Single	311 (38.4)	498 (61.6)
Married	145 (44.5)	181 (55.5)
Divorced	22 (47.8)	24 (52.2)
Widowed	23 (41.8)	32 (58.2)

Religion

Christianity	371 (41.6)	521 (58.4)
Islam	106 (34.6)	200 (65.4)
Traditional	13 (59.1)	9 (40.9)
Other	11 (68.8)	5 (31.2)

Education

High School	90 (46.2)	105 (53.8)
Diploma/HND	135 (42.2)	185 (57.8)
Ungraduate Degree	219 (37.4)	366 (62.6)
Master's Degree	51 (39.8)	77 (60.2)
PhD	6 (75.0)	2 (25.0)

Employment Status

Employed	411 (41.5)	579 (58.5)
Unemployed	28 (25.9)	80 (74.1)
Self employed	62 (44.9)	76 (55.1)

Region of Residence

Ahafo Region	21 (28.4)	53 (71.6)
Ashanti Region	106 (62.7)	63 (37.3)
Bono East Region	13 (29.5)	31 (70.5)
Bono Region	10 (20.0)	40 (80.0)
Central Region	42 (47.2)	47 (52.8)
Eastern Region	24 (34.3)	46 (65.7)
Greater Accra Region	121 (53.3)	106 (46.7)
North East Region	12 (26.1)	34 (73.9)
Northern Region	16 (25.0)	48 (75.0)
Otis Region	8 (20.5)	31 (79.5)
Savannah Region	17 (32.7)	35 (67.3)
Upper East Region	9 (18.0)	41 (82.0)
Upper West Region	12 (22.2)	42 (77.8)
Volta Region Region	18 (28.1)	46 (71.9)
Western North Region	11 (26.8)	30 (73.2)
Western Region	61 (59.2)	42 (40.8)

4.8 Bivariate Analysis of the Sociodemographic Factors and Utilisation of e-Pharmacy Services/Platforms, Ghana 2024

From the chi-square analysis conducted between the utilisation of e-Pharmacy services and socio-demographic factor, age ($\chi^2= 9.7410$; $p=0.045$), religion ($\chi^2= 13.2513$; $p=0.004$), employment status ($\chi^2= 11.0619$; $p=0.004$), region of residence ($\chi^2= 126.5879$; $p=0.001$), were the found to be significantly associated with the uptake of e-Pharmacy services/Platform. **(Table 4.8)**

However, sex, marital status, and educational level of the participants, were not significantly associated with the use of e-Pharmacy services/platforms ($P>0.05$) **(Table 4.8)**.

Table 4.8: Chi Square test of association between sociodemographic factors and uptake of e-Pharmacy services/platforms, Ghana 2024

Characteristics	Use of e-Pharmacy Services		χ^2	P-Value
	(n=501) Yes (%)	(n=735) No (%)		
Sex			0.25	0.617
Male	232 (39.8)	351 (60.2)		
Female	269 (41.2)	384 (58.8)		
Age (Years)			9.74	0.045
18-31	217 (37.8)	357 (62.2)		
31-40	185 (40.7)	270 (59.3)		
41-50	75 (51.7)	70 (48.3)		
51-60	16 (36.4)	28 (63.6)		
60 and above	8 (44.4)	10 (55.6)		
Marital status			4.62	0.201
Single	311 (38.4)	498 (61.6)		
Married	145 (44.5)	181 (55.5)		
Divorced	22 (47.8)	24 (52.2)		
Widowed	23 (41.8)	32 (58.2)		
Religion			13.25	0.004

Christianity	371 (41.6)	521 (58.4)		
Islam	106 (34.6)	200 (65.4)		
Traditional	13 (59.1)	9 (40.9)		
Other	11 (68.8)	5 (31.2)		
Education			9.22	0.056
High School	90 (46.2)	105 (53.8)		
Diploma/HND	135 (42.2)	185 (57.8)		
Ungraduated Degree	219 (37.4)	366 (62.6)		
Master's Degree	51 (39.8)	77 (60.2)		
PhD	6 (75.0)	2 (25.0)		
Employment Status			11.06	0.004
Employed	411 (41.5)	579 (58.5)		
Unemployed	28 (25.9)	80 (74.1)		
Self employed	62 (44.9)	76 (55.1)		
Region of Residence			126.59	<0.001
Ahafo Region	21 (28.4)	53 (71.6)		
Ashanti Region	106 (62.7)	63 (37.3)		
Bono East Region	13 (29.5)	31 (70.5)		
Bono Region	10 (20.0)	40 (80.0)		
Central Region	42 (47.2)	47 (52.8)		
Eastern Region	24 (34.3)	46 (65.7)		
Greater Accra Region	121 (53.3)	106 (46.7)		
North East Region	12 (26.1)	34 (73.9)		
Northern Region	16 (25.0)	48 (75.0)		
Oti Region	8 (20.5)	31 (79.5)		
Savannah Region	17 (32.7)	35 (67.3)		
Upper East Region	9 (18.0)	41 (82.0)		
Upper West Region	12 (22.2)	42 (77.8)		
Volta region Region	18 (28.1)	46 (71.9)		
Western North Region	11 (26.8)	30 (73.2)		
Western Region	61 (59.2)	42 (40.8)		

4.9 Bivariate analysis of Participants' Awareness, Accessibility and Perceived benefits of e-Pharmacy services/platforms and uptake of e-Pharmacy services/Platforms

From the chi-square analysis conducted, awareness ($\chi^2= 89.57$; $p<0.001$), accessibility ($\chi^2= 95.67$; $p<0.001$), and perceived benefits ($\chi^2= 92.40$; $p<0.001$) of e-Pharmacy services were significantly associated with the uptake of e-Pharmacy services. **(Table 4.9)**

Table 4.9: Chi Square test of association between Awareness, Accessibility and Perceived benefits of e-Pharmacy services/platforms and uptake of e-Pharmacy services/Platforms

Variable	Use of e-Pharmacy Services		χ^2	P-Value
	(n=501) Yes (%)	(n=735) No (%)		
Level of Awareness			89.57	<0.001
Adequate	416 (49.6)	422 (50.4)		
Inadequate	85 (21.4)	313 (78.6)		
Level of Accessibility			95.67	<0.001
Adequate	410 (50.4)	404 (49.6)		
Inadequate	91 (21.6)	331 (78.4)		
Level of Perceived Benefits			92.40	<0.001
Adequate	414 (49.9)	415 (50.1)		
Inadequate	87 (21.4)	320 (78.6)		

4.10 Univariate and Multivariate logistic regression analysis of the association between factors influencing the utilisation of e-Pharmacy and the use of e-Pharmacy services.

Age

In the crude analysis the odds of e-Pharmacy uptake among to individuals aged 41-50 years was 1.76 times higher compared to those in younger age groups 18-30 years (cOR = 1.76; 95% CI: 1.22 - 2.54, p=0.002). In the adjusted model respondents aged 41-50 years had 1.15 times higher odds of the use of e-Pharmacy services compared to those in younger age groups 18-30 years, but this was not significant (cOR = 1.15; 95% CI: 0.73 - 1.81, p=0.535) (Table 4.10)

Religion

In both the crude and adjusted model, Islam was significantly associated with lower odds of using e-pharmacy services (cOR = 0.24, 95% CI: 1.22 - 2.54, p=0.010) compared to Others.

After adjusting for other factors, this association was remained statistically significant (aOR = 0.18, 95% CI 0.05 - 0.65, p=0.009). **(Table 4.10)**

Employment

In the crude analysis, participants employed had significantly higher odds of utilizing e-pharmacy services in both the crude (cOR = 2.02, 95% CI: 1.30-3.18, p=0.002) and adjusted models (aOR = 2.84, 95% CI: 1.65-4.89, p<0.001) compared to unemployed participants. Similarly, self-employed individuals had higher odds of e-pharmacy utilization (aOR = 2.27, 95% CI: 1.19-4.35, p=0.013) compared to their unemployed counterparts. **(Table 4.10)**

Region

In the adjusted model, individuals from the Ashanti Region were significantly more likely to utilize e-pharmacy services compared to those from the Ahafo Region (aOR = 4.81, 95% CI: 2.53-9.18, p<0.001). Participants from the and Western Region and Central Region also had significantly higher odds of utilization Region (aOR = 4.36, 95% CI: 2.17 - 8.73, p<0.001) and (aOR = 3.48, 95% CI: 1.68-7.03, p=0.001) respectively, as did those from the Greater Accra Region (aOR = 1.78, 95% CI: 1.03-3.08, p=0.040). **(Table 4.10)**

Awareness

In the unadjusted model, participants with adequate awareness were 3.63 times more likely to utilize e-Pharmacy services compared to those with inadequate awareness (cOR = 3.63; 95% CI: 2.76 - 4.78; p < 0.001). After adjusting for potential confounders, the association remained statistically significant, with participants having adequate awareness showing 2.15 times higher odds of utilizing e-Pharmacy services (aOR = 2.15; 95% CI: 1.48 - 3.13; p = 0.004). **(Table 4.10)**

Accessibility

Adequate accessibility was strongly associated with higher odds of utilizing e-Pharmacy services. In the unadjusted model, participants with adequate accessibility were 3.69 times

more likely to utilize these services compared to those with inadequate accessibility (cOR = 3.69; 95% CI: 2.82 - 4.83; $p < 0.001$). This association remained statistically significant in the adjusted logistic regression model, where participants with adequate accessibility had 2.42 times higher odds of e-Pharmacy service utilization (aOR = 2.42; 95% CI: 1.73 - 3.39; $p < 0.001$). (Table 4.10)

Perceived benefits

Participants who perceived e-Pharmacy services as beneficial were significantly more likely to utilize them. In the unadjusted model, participants with adequate perceived benefits were 3.67 times more likely to utilize e-Pharmacy services compared to those with inadequate perceived benefits (cOR = 3.67; 95% CI: 2.79 - 4.82; $p < 0.001$). This association persisted in the adjusted model, where participants with adequate perceived benefits demonstrated 2.88 times higher odds of utilizing e-Pharmacy services (aOR = 2.88; 95% CI: 2.03 - 4.09; $p < 0.001$). (Table 4.10)

Table 4.10: Univariate and Multivariate logistic regression analysis of the association between factors influencing the utilisation of e-Pharmacy and use the of e-Pharmacy services.

Variable	Unadjusted Model		Adjusted Model	
	cOR (95% CI)	P-value	aOR (95% CI)	P-value
Age (Years)				
18-30	Ref		Ref	
31-40	1.13 (.88 - 1.45)	0.351	0.81 (0.60 - 1.10)	0.181
41-50	1.76 (1.22 - 2.54)	0.002	1.15 (0.73 - 1.81)	0.535
51-60	0.96 (0.50 - 1.77)	0.849	0.69 (0.33 - 1.45)	0.330
60 or more	1.32 (0.51 - 3.39)	0.569	0.76 (0.25 - 2.32)	0.638
Religion				
Others	Ref		Ref	
Christianity	0.32 (0.11 - 0.94)	0.038	0.33 (0.10 - 1.14)	0.080
Islam	0.24 (0.08 - 0.71)	0.010	0.18 (0.05 - 0.65)	0.009
Traditional	0.66 (0.17 - 2.55)	0.543	0.29 (0.06 - 1.33)	0.110

Employment Status

Unemployed	Ref		Ref	
Employed	2.02 (1.30 - 3.18)	0.002	2.84 (1.65 - 4.89)	<0.001
Self employed	2.33 (1.35 - 4.02)	0.002	2.27 (1.19 - 4.35)	0.013

Region of Residence

Ahafo Region	Ref		Ref	
Ashanti Region	4.25 (2.34 - 7.69)	<0.001	4.81 (2.53 - 9.18)	<0.001
Bono East Region	1.06 (0.47 - 2.46)	0.892	1.56 (0.63 - 3.87)	0.334
Bono Region	0.63 (0.27 - 1.49)	0.293	0.57 (0.23 - 1.42)	0.229
Central Region	2.26 (1.17 - 4.34)	0.015	3.43 (1.68 - 7.03)	0.001
Eastern Region	1.32 (0.65 - 2.67)	0.445	1.78 (0.83 - 3.85)	0.141
Greater Accra Region	2.88 (1.63 - 5.09)	<0.001	2.60 (1.41 - 4.80)	0.002
North East Region	0.89 (0.39 - 2.04)	0.785	1.16 (0.48 - 2.83)	0.739
Northern Region	0.84 (0.39 - 1.80)	0.655	1.62 (0.70 - 3.75)	0.259
Oti Region	0.65 (0.26 - 1.65)	0.365	0.65 (0.24 - 1.75)	0.394
Savannah Region	1.23 (0.57 - 2.64)	0.365	1.09 (0.48 - 2.47)	0.833
Upper East Region	0.55 (0.23 - 1.34)	0.189	1.03 (0.40 - 2.68)	0.946
Upper West Region	0.72 (0.32 - 1.63)	0.433	1.12 (0.45 - 2.76)	0.807
Volta region Region	0.99 (0.47 - 2.076)	0.974	1.28 (0.57 - 2.86)	0.545
Western North Region	0.93 (0.39 - 2.18)	0.859	0.69 (0.28 - 1.70)	0.416
Western Region	3.67 (1.93 - 6.95)	<0.001	4.36 (2.17 - 8.73)	<0.001

Awareness

Inadequate	Ref		Ref	
Adequate	3.63 (2.76 - 4.78)	<0.001	2.15 (1.48 - 3.13)	<0.001

Accessibility

Inadequate	Ref		Ref	
Adequate	3.69 (2.82 - 4.83)	<0.001	2.42 (1.73 - 3.39)	<0.001

Perceived Benefits

Inadequate	Ref		Ref	
Adequate	3.67 (2.79 - 4.82)	<0.001	2.88 (2.03 - 4.09)	<0.001

cOR (Crude odds ratio), aOR(Adjusted odds ratio) 95%CI (95% Confidence interval).

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This chapter discusses the results of the data collected from 1,236 participants in Ghana. The study examined factors influencing the utilization of e-pharmacy services in Ghana, focusing on awareness, accessibility, and perceived benefits of e-pharmacy services. The main objectives of the study were to assess the level of utilization of e-pharmacy services/platforms in Ghana and to determine the association between awareness, accessibility, and perceived benefits and the uptake of e-pharmacy services/platforms in Ghana. The discussion is structured around the level of utilization of e-pharmacy services/platforms, the association between awareness and uptake, the impact of accessibility on adoption, and the influence of perceived benefits on e-pharmacy service usage. The findings indicate that although e-pharmacy services are gaining traction, utilization remains low. However, awareness, accessibility, and perceived benefits were significantly associated with e-pharmacy uptake. This study could be the first of its kind in Ghana.

5.2 Sociodemographic factors

Identifying sociodemographic predictors of e-pharmacy service utilization has important implications for its successful implementation in Ghana. This study examined seven sociodemographic factors, and the findings from multivariate logistic regression analysis revealed that religion, employment status, and geographic location significantly influenced e-pharmacy utilization. Specifically, participants who belong to Islam were less likely to use e-pharmacy services/platforms compared to Christians. Employed individuals were significantly more likely to utilize e-pharmacy services/platforms, compared to their unemployed counterparts. Additionally, participants residing in the southern regions of Ghana demonstrated

a significantly higher likelihood of using e-pharmacy services than those in the northern regions.

5.3 Level of Utilisation of e-Pharmacy Services/Platforms in Ghana

The study's first objective was to assess the level of e-pharmacy service utilization in Ghana. To achieve this, a descriptive analysis was conducted to examine participants' usage patterns and willingness to engage with e-pharmacy platforms. The findings revealed that a majority (59.47%) of respondents had not used e-pharmacy services, whereas 40.53% had. Despite the relatively low current utilization rate, an overwhelming 94.90% of participants expressed a willingness to use e-pharmacy services in the future, highlighting significant growth potential for the sector.

The findings on the level of e-pharmacy utilization in Ghana, as indicated above, align with the broader trends observed in other studies on e-pharmacy adoption. The descriptive analysis revealed that while only 40.53% of respondents had used e-pharmacy services, a significant majority (94.90%) expressed a willingness to engage with such platforms in the future. This suggests that although uptake remains relatively low, there is strong potential for growth, which could drive their expansion and improve healthcare accessibility. This is particularly relevant in underserved or remote areas where access to physical pharmacies is limited. The study by Fan & Ukaegbu (2024) in Nigeria similarly highlighted that information literacy plays a crucial role in shaping attitudes, perceived control, and word-of-mouth communication regarding e-pharmacy adoption. The low utilization rate in Ghana may partly be attributed to limited awareness or trust in digital pharmacy services, reinforcing the need for targeted strategies to enhance information literacy and build trust.

Cen et al. (2022) conducted a systematic review that examined the global adoption of eHealth in pharmaceutical care, with a particular focus on its progression during the COVID-19

pandemic. Their findings highlighted the focal role of digital pharmacy services in maintaining continuity of care, reducing hospital visits, and enhancing efficiency. However, the relatively low utilization rate of e-pharmacy services in Ghana suggests that structural barriers such as limited digital literacy, regulatory challenges, and accessibility constraints may be impeding the use of e-pharmacy services. Nevertheless, the high willingness to adopt these services in the future presents a significant opportunity that could be leveraged through strategic policy actions/interventions, including collaborative efforts between the government and private sector to strengthen digital health infrastructure.

Adebo et al. (2025) found that in Nigeria, social influence plays a key role in influencing young consumers' uptake of e-pharmacy services. The study revealed that performance expectancy is the strongest driver of utilization, with social factors such as peer influence and celebrity endorsements further mediating adoption. The high willingness to use e-pharmacy services/platforms in Ghana suggests that similar social dynamics could be leveraged to drive usage, particularly among younger populations. Digital marketing strategies, including influencer endorsements and social media campaigns, may be effective in accelerating e-pharmacy adoption.

Chen & Lee (2024) investigated the disparities in e-pharmacy adoption between urban and rural populations in China, emphasizing the influence of factors such as internet access and digital literacy on usage patterns. Similarly, Ghana's low utilization rate may be attributed to challenges in digital infrastructure, particularly in rural areas where internet penetration and digital literacy levels are comparatively lower. However, the high willingness to adopt e-pharmacy services suggests that, as observed in China, targeted interventions such as digital literacy programs and infrastructure development could help bridge the adoption gap. Furthermore, the study by Fan & Ukaegbu (2024) underscores the role of improving

accessibility and fostering trust in digital platforms, both of which are essential for promoting the widespread utilization of e-pharmacy services.

In summary, while current e-pharmacy utilization remains low in Ghana, the strong willingness to adopt these services presents a promising opportunity for growth. The empirical literature suggests that enhancing information literacy, strengthening trust, leveraging social influence, and improving digital infrastructure are critical steps toward increasing e-pharmacy utilization and adoption in Ghana, aligning with the findings observed in Nigeria and China.

5.4 Association between Awareness and the Uptake of e-Pharmacy Services

The second objective was to examine the association between awareness and the uptake of e-pharmacy Services. From the chi-square analysis, awareness was significantly associated with the uptake of e-pharmacy services/platforms in Ghana ($\chi^2= 89.57$; $p<0.001$). The results show that 83.03% of participants with adequate awareness reported using e-pharmacy services, compared to only 16.97% of those with inadequate awareness. This significant association suggests that individuals who are well-informed about e-pharmacy services are more likely to utilize them. This finding is consistent with previous research, indicating that knowledge and familiarity with digital health services strongly influence adoption rates.

The association between awareness and the uptake of pharmacy services highlights a critical gap between digital readiness and actual adoption. While technological advancements have transformed healthcare delivery, consumer awareness and trust remain significant determinants of e-pharmacy adoption. The findings by Sampene et al. (2024) emphasize the dual role of convenience and accessibility in driving adoption while identifying security, privacy, and regulatory concerns as barriers. This aligns with Ahmad, Gnanasan, & Karuppanan (2024), who found that despite high digital engagement, awareness of telepharmacy services was low, leading to moderate willingness to adopt such platforms.

The role of knowledge and perception in influencing uptake is further supported by Tegegne et al. (2024), who found that factors such as computer training, management support, and access to electronic devices significantly influenced pharmacy students' knowledge and perceptions of tele-pharmacy. The study underscores that limited awareness can create resistance to adoption, mirroring the trust and security concerns raised (Agyemang et al., 2024). Similarly, Blebil et al. (2023) identified low eHealth literacy as a key factor limiting the effective use of mobile health applications among pharmacy students. The lack of confidence in evaluating online health information and differentiating between reliable and unreliable sources points to a broader challenge in digital health adoption. (Mensah., et al 2022; Fan., et al 2024)

A consistent theme across the literature is the need for targeted educational initiatives to bridge the knowledge gap and promote trust in e-pharmacy services. Agyemang et al. (2024) recommend strengthening regulatory frameworks and consumer trust initiatives, while Tegegne et al. (2024) advocate for increased access to electronic devices and specialized training programs. Blebil et al. (2023) extend this argument by suggesting the integration of eHealth literacy programs into university curricula to enhance digital health adoption. These recommendations align with Ahmad et al. (2024), who emphasize public education to improve awareness and willingness to use telepharmacy services.

In linking these findings, it becomes evident that awareness plays an important role in the utilization of e-pharmacy services. While digital health solutions offer significant advantages in accessibility and efficiency, knowledge gaps and trust issues hinder widespread adoption. The literature collectively suggests that a combination of awareness campaigns, regulatory clarity, consumer education, and enhanced digital literacy initiatives can significantly boost the uptake of e-pharmacy services. Addressing these factors will not only improve consumer

confidence but also ensure the seamless integration of e-pharmacy into traditional healthcare systems.

5.5 Association between Accessibility and the Uptake of e-Pharmacy Services

The third objective of the study was to explore the association between accessibility and the uptake of e-Pharmacy services in Ghana. From the chi-square analysis, accessibility was significantly associated with the uptake of e-pharmacy services in Ghana ($\chi^2= 95.67$; $p<0.001$). Individuals with adequate accessibility (81.84%) were more likely to use e-Pharmacy services compared to those with inadequate accessibility (18.16%). This finding highlights the role of accessibility in determining the utilization of e-Pharmacy services. This suggests that infrastructural and technological barriers, such as internet connectivity and digital literacy, may limit the adoption of e-pharmacy services, particularly in underserved areas. Addressing these challenges through improved digital infrastructure and mobile health solutions could enhance access and drive utilization. These findings are in tune with other existing literature. For instance, Adebo et al. (2025) found that performance expectancy and social influence were key drivers of e-pharmacy adoption, reinforcing the idea that individuals with greater accessibility are more likely to utilize these services. Their study highlighted how social influence plays a mediating role in accessibility, suggesting that enhanced awareness and peer recommendations can further drive uptake. Similarly, Ezeudoka & Fan (2024) emphasized that perceived usefulness, trust, and technological literacy were crucial factors influencing accessibility. Their findings support the notion that individuals with better access to technology and digital skills are more likely to engage with e-Pharmacy platforms, paralleling the Ghanaian study's observation that individuals with adequate accessibility had a significantly higher uptake rate.

Additionally, Al Halbusi et al. (2024) demonstrated that performance expectancy, effort expectancy, social influence, and word-of-mouth recommendations were critical in determining e-pharmacy adoption in Qatar. Their study found that individuals with higher

awareness and trust in e-pharmacy platforms were more likely to use them, similar to the Ghanaian findings that individuals with adequate accessibility had a higher uptake of e-pharmacy services. Furthermore, Sonawane et al. (2024) identified demographic characteristics such as age and education as significant moderators of accessibility, indicating that targeted interventions are needed to enhance uptake among different user groups.

The chi-square results from this study reinforce the broader empirical evidence that accessibility is a key determinant of e-pharmacy adoption. The significant association between accessibility and uptake ($\chi^2= 95.67$; $p<0.001$) aligns with previous studies demonstrating that factors such as performance expectancy, social influence, trust, and technological literacy shape accessibility and, in turn, drive uptake. To enhance uptake, the empirical literature suggests that interventions should focus on improving digital literacy, increasing awareness through social influence mechanisms, and tailoring platforms to accommodate diverse user needs.

5.6 Association between Perceived Benefits and the Uptake of e-Pharmacy Services

The last objective sought to explore the association between perceived benefits and the uptake of e-Pharmacy services in Ghana. From the chi-square analysis, perceived benefits were significantly associated with the uptake of e-Pharmacy services/platforms in Ghana ($\chi^2= 92.40$; $p<0.001$). Individuals who perceived e-Pharmacy services as beneficial (82.63%) were more likely to use them compared to those who did not (17.37%). This suggests that the perceived advantages of e-Pharmacy services play a key role in their uptake. This finding aligns with previous research, which highlights the role of perceived benefits in influencing e-Pharmacy uptake.

Sabbir, et al (2021), found that health literacy and perceived trust were key determinants of e-Pharmacy uptake/adoption among young consumers in Bangladesh. Their study suggests that

when individuals view e-Pharmacy services as reliable and easy to use, their likelihood of uptake increases. Similarly, this study shows that those who perceive e-Pharmacy services as beneficial are significantly more inclined to use them. This supports the argument that trust in the system and an understanding of its benefits are essential for adoption.

Assin et al. (2024) further reinforce this perspective by demonstrating that perceived usefulness facilitates the relationship between risk perceptions and purchase intentions in India. Consumers who acknowledge the advantages of e-Pharmacy, such as convenience and accessibility, are more likely to use these services, even when concerns about financial and privacy risks exist. The significant association found in this study suggests that similar factors may be at play, where individuals who recognize the benefits of e-Pharmacy services are more likely to integrate them into their healthcare practices.

Ahalawat et al. (2024) highlighted that the readiness of pharmacists is crucial for the successful implementation of e-Pharmacy. Their study in Nigeria found that negative attitudes among community pharmacists, influenced by organizational factors such as business size and financial performance, hindered adoption. The findings of this study, however, suggest that when individuals, including pharmacists and consumers, acknowledge the benefits, uptake improves. This underscores the need for awareness campaigns and incentives to encourage both pharmacists and consumers to embrace e-Pharmacy.

Pihl R. (2021) examined the role of education and training in shaping perceptions of telepharmacy services in Sweden. The study found that skepticism toward e-Pharmacy was rooted in limited exposure and education rather than actual service limitations. This parallels the findings of this study, as increasing awareness of the benefits of e-Pharmacy could further enhance its adoption.

The significant association between perceived benefits and e-Pharmacy uptake in this study is consistent with global research. The findings reinforce that promoting the advantages of e-Pharmacy, such as convenience, accessibility, and reliability, can increase usage, particularly when coupled with efforts to address skepticism and enhance trust in digital pharmacy services.

5.7 Study Implications

The study's findings indicate a strong public readiness for e-pharmacy services in Ghana, suggesting that policymakers should integrate digital health solutions into healthcare strategies to meet this demand. However, the relationship between digital literacy and e-pharmacy usage underscores the necessity for substantial investments in education, awareness campaigns, and technological infrastructure to ensure effective platform utilization. Furthermore, by identifying sociodemographic factors, such as age, employment status, and geographic location, awareness and accessibility that influence e-pharmacy usage, the study provides valuable insights for developing targeted interventions and policies aimed at promoting equitable access to digital health services across diverse populations.

5.8 Study Strengths and Limitations

5.8.1 Strengths

This study benefits from a large sample size of 1,236 participants, ensuring robust and reliable data for analysis. Nationwide representation was achieved by recruiting participants from all 16 regions of Ghana, capturing diverse perspectives on ePharmacy uptake. Additionally, the study employed a quantitative approach to provide a comprehensive understanding of the factors influencing e-Pharmacy use. The analysis focused on key variables such as awareness, accessibility, and perceived benefits, offering strong empirical evidence to inform digital health policies and interventions.

5.8.2 Limitations

This study has some limitations. First, the study employed a cross-sectional design which, provides a snapshot of ePharmacy utilization at a single point in time, limiting the ability to capture long-term trends. Second, the study relied on self-reported data, which may potentially introduce recall bias in the study. A longitudinal study would offer deeper insights into changes in uptake over time.



CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The study found that the uptake of e-pharmacy services/platforms in Ghana is low. Religion affiliation, employment status, geographical location, awareness, accessibility, and perceived benefits were significantly associated with e-pharmacy uptake. This study highlights the critical role of awareness, accessibility, and perceived benefits in shaping e-pharmacy utilization in Ghana. While awareness, accessibility, and perceived benefits of e-pharmacy services are relatively high, actual uptake remains low, suggesting additional barriers such as skepticism, regulatory concerns, digital infrastructure gaps, and consumer trust issues. Addressing these challenges through policy reforms, public education, and improved service delivery models will be essential for increasing e-pharmacy uptake in Ghana.

6.2 Recommendations

1. **Strengthening Public Awareness Campaigns:** Given that awareness was a strong predictor of ePharmacy use, targeted educational campaigns via social media, healthcare institutions, and community outreach programs could enhance uptake.
2. **Improving Digital Infrastructure:** Expanding broadband access, mobile network coverage, and digital payment options can increase accessibility, especially in rural areas.
3. **Regulatory Oversight:** Developing stronger regulations on online pharmaceutical transactions, including certification processes for ePharmacy platforms, can enhance consumer trust and ensure compliances with safety standards.

4. Partnerships with Healthcare Providers: Encouraging collaborations between pharmacists, telemedicine providers, and digital platforms may facilitate user engagement and improve service credibility. Additionally fostering collaborations between traditional brick-and-mortar pharmacies and digital platforms can enhance service credibility, expand accessibility, and improve overall trust in e-pharmacy services.

6.3 Future Research

Future research should explore long-term usage patterns, qualitative user insights, and the impact of policy interventions on digital health uptake in Ghana. Future studies should also incorporate qualitative methodologies to explore personal experiences and identify barriers to e-pharmacy utilization. This will inform the development of targeted interventions and policies that address the specific needs and concerns of different demographic groups.



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APPENDIX I: PARTICIPANT'S INFORMATION SHEET AND CONSENT FORM

My name is Mubarik Sena Saaka. I am a graduate student from the School of Public Health, University of Ghana. I seek your voluntary participation in this study which is part of my requirements for completing a Master's Degree in Public Health program.

Title: Factors influencing the utilisation of e-Pharmacy in Ghana

Purpose of study

The study seeks to understand the factors influencing the utilization of pharmacy services/platforms in Ghana. The findings of the study will provide valuable information for policymakers, healthcare providers, e-Pharmacy service providers and patients, thereby facilitating the development of targeted systems and strategies to enhance the adoption and utilisation of e-Pharmacy services/platforms across Ghana.

Potential risks

The study does not pose any risk or cost except the valuable time you will spend participating

Benefits

There are no direct benefits from this study. However, the findings will inform development of targeted systems and strategies to enhance the utilisation of e-Pharmacy services/platforms across Ghana which will improve health outcome.

Privacy and Confidentiality

Your identity and information will be treated confidentially, and no personal identifiers will be used in any reports or publications resulting from this study

Participation/Withdrawal

Participation in this study is completely voluntary. You have the right to withdraw your participation at any point in the study with or without reason and without facing any consequences.

Contact for Clarification

Principal investigator: Mubarik Sena Saaka (email;ismubarik@gmail.com Phone; 0243806913)

Supervor; Dr. Harriet Affran Bonful

Your Right as a Participant

The study plan will be reviewed by the Institutional Review Board of Noguchi Memorial Institute for Medical Research (NMIMR-IRB) to ensure adherence to ethical principles and guidelines and to enhance the study's ethical credibility. If you have any questions about your rights as a research participant you can contact the IRB Office between the hours of 8am-5pm through the landline 0302916438 or email addresses: nirb@noguchi.ug.edu.gh.

APPENDIX II: QUESTIONNAIRE

TITLE: FACTORS INFLUENCING THE UTILISATION OF EPHARMACY IN GHANA

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS

1	Gender	a) Male b) Female	[] []
2	Age of Participant	a) 18-30 years b) 31-40 years c) 41-50 years d) 51-60 years e) Above 60 years	[] [] [] [] []
3	Marital Status	a) Single b) Married c) Widowed/Divorced	[] [] []
4	Religion	a) Christianity b) Islam c) Other	[] [] []
5	Level of education	a) High school education b) Diploma/HND c) Undergraduate Degree d) Master's Degree. e) PhD Degree	[] [] [] [] []
6	Employment status	a) Employed b) Unemployed c) Self-employed	[] [] []
7	Region of residence	Greater Accra Region Ashanti Region Western Region Central Region Eastern Region Volta Region Northern Region Upper East Region Upper West Region Western North Region Oti Region Bono Region Bono East Region Ahafo Region Savannah Region	[] [] [] [] [] [] [] [] [] [] [] [] [] [] []

		North East Region	[]
8	Have you ever purchased or ordered medicine online? (online pharmacy or e-Pharmacy services/platform)	(a) Yes (b) No	[] []
9	Are you willing purchase medicine online in the future?	(a) Yes (b) No	[] []

SECTION B: AWARENESS AND THE UPTAKE OF EPHARMACY SERVICES IN GHANA

To what extent do you agree with the following statement on awareness of ePharmacy services/platforms? Please indicate your response based on the scale; 1=Strongly Disagree; 2= Disagree; 3 = Neutral; 4= Agree; 5 = Strongly Agree			
1	I am aware of the existence of e-Pharmacy services/platforms (electronic Pharmacy) in Ghana.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
2	I am aware of the availability of e-Pharmacy services/platforms in Ghana	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
3	I am aware of the range of services offered by e-Pharmacy services/platforms including medication purchase, delivery, refill options and consultation.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
4	I am aware e-Pharmacy services/platforms are more cost-effective for purchasing medication compared traditional pharmacies.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []

5	I am aware e-Pharmacy services/platforms have time saving benefits for purchasing medication compared traditional pharmacies.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
6	I am aware e-Pharmacy services/platforms offers a more convenient alternative for purchasing medications compared to traditional pharmacies	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
7	I am aware of the potential risks associated using e-Pharmacy services/platforms such as medication authenticity, data privacy or security concerns.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
8	I am aware of limitations of e-Pharmacy services/platforms, such as delayed delivery, limited product availability, or lack of in-person consultation	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
9	e-Pharmacy services/platforms provide information about dosage, usage, potential side effects of medications and consultation.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
10	I understand the concept of e-Pharmacy services/platforms and how they operate.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []



SECTION C: ACCESSIBILITY AND THE UPTAKE OF EPHARMACY SERVICES IN GHANA

To what extent do you agree with the following statement on awareness of ePharmacy services/platforms? Please indicate your response based on the scale; 1=Strongly Disagree; 2=Disagree; 3 = Neutral; 4= Agree; 5 = Strongly Agree			
1	ePharmacy services/platforms (online pharmacies) are readily available in my Region or location.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
2	e-Pharmacy services are available 24/7, 7 days a week.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
3	e-Pharmacy services/platforms (online pharmacies) are easily accessible in my region or location.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
4	e-Pharmacy platforms (online pharmacies) are user-friendly in terms interface design and website/App navigation.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
5	I find it easy to navigate the functionalities and features of e-Pharmacy platforms.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
6	I consider e-Pharmacy services/platforms as a convenient option for purchasing medications	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
7	I consider the process of ordering medications through e-Pharmacy services/platforms very simple and flexible.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []

8	e-Pharmacy services/platforms (online pharmacies) ensure timely delivery of medication	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
9	e-Pharmacy services/platforms offer a range of delivery methods such as home delivery, pick-up, express shipping.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
10	I am satisfied with the speed and time efficiency of e-Pharmacy services in processing orders and delivery of medication.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []

SECTION D: PERCEIVED BENEFITS AND THE UPTAKE OF EPHARMACY SERVICES IN GHANA

To what extent do you agree with the following statement on awareness of ePharmacy services/platforms? Please indicate your response based on the scale; 1=Strongly Disagree; 2= Disagree; 3 = Neutral; 4= Agree; 5 = Strongly Agree			
1	e-Pharmacy services/platforms have improved my accessibility to medications	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
2	e-Pharmacy services are available and accessible 24/7, every day of the week.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
3	e-Pharmacy services/platforms provide access to a wide range of medications that may not be available in my region/location.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
4	e-Pharmacy services/platforms reduce the cost of accessing medications compared to traditional pharmacies	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree	[] [] [] []

		5= Strongly Agree	[]
5	Using e-Pharmacy services/Platforms saves me time compared to visiting traditional pharmacies.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
6	e-Pharmacy services/platforms provide a more convenient alternative to traditional pharmacies for obtaining medications.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
7	e-Pharmacy services/Platforms allow for greater privacy and confidentiality compared traditional pharmacy shops	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
8	e-Pharmacy services/platforms provide information about dosage, potential side effects, reminders on medication refill and consultation.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
9	e-Pharmacy services/platforms enhance accessibility to medications, especially for individuals with limited mobility	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []
10	I have confidence in the quality and authenticity of medications provided by e-Pharmacy services/platforms.	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree	[] [] [] [] []

Thank you

APPENDIX III: ETHICAL APPROVAL FOR THE STUDY



UNIVERSITY OF GHANA

NOGUCHI MEMORIAL INSTITUTE FOR MEDICAL RESEARCH (NMIMR)
COLLEGE OF HEALTH SCIENCES
INSTITUTIONAL REVIEW BOARD

7th August 2024

ETHICAL CLEARANCE

FEDERALWIDE ASSURANCE FWA 00001824 **IRB 00001276**
NMIMR-IRB CPN 004/24-25 **IORG 0000908**

On 7th August 2024, the Noguchi Memorial Institute for Medical Research (NMIMR) Institutional Review Board (IRB) conducted a full board meeting review and approved your protocol titled:

TITLE OF PROTOCOL : Factors Influencing the Utilization of ePharmacy In Ghana

PRINCIPAL INVESTIGATOR : Mubarik Sena Saaka

Please note that a final review report must be submitted to the Board at the completion of the study.
Your research records may be audited at any time during or after the implementation.

Any modification of this research project must be submitted to the IRB for review and approval prior to implementation.

Please report all serious adverse events related to this study to NMIMR-IRB within seven days verbally and fourteen days in writing.

This certificate is valid till 6th August 2025. You are to submit annual reports for continuing review.

Signature of Chair: .....
Dr. Abraham Hodgson
(NMIMR – IRB CHAIR)

