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Griffith College

Counterfeit drug: The role of pharmacists in improving drug quality in Nigeria.

A research dissertation submitted to Griffith College, Dublin, in partial fulfilment of the requirement for the degree of MSc in Pharmaceutical business and technology

Innopharma Faculty of Pharmaceutical Science

Dissertation Supervisor: Kathy Clarke

Chineke Njideka Peace

August 2024

CANDIDATE DECLARATION

I thereby declare that this dissertation titled "**counterfeit drugs; The role of pharmacists in improving drugs quality in Nigeria**, submitted as a requirement for **MSc in pharmaceutical business and technology** is genuine research conducted my me.

I also ensure that the works of other writers used in this research were referenced and acknowledged by me.

Supervisor's name & signature

Kathy Clarke 

26/08/2024

Candidate's name & signature

Chineke Njideka peace

26/08/2024

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Lastly, I dedicate this dissertation to my beloved country Nigeria, who are the Centre of great concern for this research, I hope this will contribute to a safer medication use in Nigeria.

ABSTRACT

The issue of counterfeit drugs poses a major threat to the health and wellbeing of the public, especially in Nigeria where the prevalence of substandard and falsified medicines is alarmingly high. This research focused on how pharmacists can play a part in enhancing drug quality. The study population of this study comprises registered pharmacists across Nigeria, chosen due to their vital place within both pharmaceutical supply chains as well as their direct engagement with consumers and manufacturers alike. A stratified random sampling technique was employed to select four states in Nigeria (**Lagos, Rivers, Kano, and Oyo states**) and 160 pharmacists working in **Federal**, **State**, **and Local Government** Areas hospitals were selected using simple random sampling, ensuring representation from various regions and settings, including urban, rural, and semi-urban areas. A structured questionnaire administered through Google Form was used as instrument to collect data on pharmacists' experiences with counterfeit drugs, their knowledge of drug quality control measures, and their perceptions of the effectiveness of current regulatory frameworks. The hypotheses were tested using Pearson correlation and linear regression and the demographic characteristics were analysed using descriptive analysis (charts and frequency tables). The results also indicate that while pharmacists are generally knowledgeable about drug quality and control, many face challenges in implementing these measures due to factors such as inadequate resources, limited access to reliable testing equipment, and insufficient support from regulatory bodies.

This study also highlights the critical role that pharmacists play in identifying and reporting counterfeit drugs, as well as in educating consumers about the dangers of substandard medications. However, the study also found the need for stronger collaboration between pharmacists, regulatory agencies, and other stakeholders in the pharmaceutical industry to effectively combat the counterfeit drug crisis.

The study concludes that pharmacists' engagement in public awareness campaigns and using of advanced technological tools will significantly improve drug quality in Nigeria. And there is a significant relationship between public awareness campaigns and counterfeit drug prevention. This study also concludes that stronger regulatory frameworks are significantly effective in preventing the circulation of counterfeit drugs in Nigeria. Based on the findings of this study, it is recommended that the government should intensify efforts to crack down on the production and distribution of counterfeit drugs by increasing surveillance and implementing more severe penalties for offenders.

Additionally, affordable and user-friendly technology should be given priority investments to ensure broad usage across all regions where there are practising pharmacists.

Keywords: Counterfeit drug, Drug quality, pharmacists' engagement, the use of advanced technological tools, counterfeit drug prevention, public awareness campaigns, and Pharmacists' effectiveness

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CHAPTER ONE

INTRODUCTION

1. Background to Study

Healthcare relies heavily on drugs, which are vital in mitigating most illness and disorders, diagnosing conditions, preventing diseases, treating health issues or maintaining overall well-being (White, 2021). Unfortunately, some people take advantage of the high demand for medication by creating counterfeit versions. Research indicates that up to 10% of prescription medicines sold worldwide are falsified or contaminated, this number can be as high as half in certain parts of Africa and Asia (White, 2021). The World Health Organization (WHO) defines counterfeit drugs as medicines that are deliberately and fraudulently mislabelled with respect to their identity and source (WHO, 2017). People who produce these counterfeit drugs aim to falsify consumer perceptions regarding packaging designs, label names, ingredient composition amount doses, and directions for origin history, among others (Goyanes, 2007). However, this definition excludes drugs with unintended defects (The European Parliament and The Council of The European Union, 2011; World Health Organization, 2018).

Counterfeiting often involves altering a drug's composition. Counterfeit drugs may lack the active pharmaceutical ingredient (API), contain incorrect dosages, or include harmful substances, posing significant risks to public health (United States Food and Drug Administration, 2019b). For example, Bate *et al*. (2013) conducted a study using semi-quantitative thin-layer chromatography on 713 samples of two first-line anti-tuberculosis medicines from various low- middle-income countries such as Africa, India, China, and Brazil, which revealed that some contained less than expected rifampicin or isoniazid content causing harm to individuals who were infected with tuberculosis. Similarly, using infrared spectroscopy technology, Neto & Lisboa's findings showed an analysis of 13 confiscated tablets falsely labelled as "Viagra" containing reduced sildenafil levels, while others had contaminants like starch and calcium sulphate compounds present within them posing potential danger if consumed incorrectly by patients disregarding these details when taking medication for erectile dysfunction (Neto & Lisboa, 2017).

According to O'Hagan and Garlington (2018), counterfeit drugs pose a significant danger to public health as they may contain harmful substances or lack necessary active ingredients. For instance, anti-malarial medicines with inadequate components can result in treatment failure, resistance buildup, and fatalities. While medications are vital for

managing illnesses and alleviating symptoms, their misuse or consumption of fake alternatives could worsen medical conditions and expose patients to further risks (Adekoya & Ekeh, 2021).

Onuh *et al*. (2022) stress that ingesting false medication robs individuals of essential healthcare services, which consequently leads towards aggravating sicknesses, resulting in prolonged illness periods and even death. Furthermore, rather than using authentic antibiotics when you ingest inferior quality substitutes, it speeds up the process by creating antibiotic resistance; this puts complications in treating infections and diseases more effectively without any additional costs (Ndubuisi 2021).

The counterfeiting of various commercial products, particularly pharmaceuticals, is a longstanding global concern that revolves around the prospects of obtaining substantial financial gains (Fisher *et al*., 2022). The trading and distribution of fake drugs have had adverse effects on high-income as well as low-to-middle-income countries with weaker regulations governing drug manufacturing, importation/exportation (Adekoya & Ekeh 2021).

A startling report from the National Agency for Food and Drugs Administration Control in Nigeria highlighted how up to 17% percent or more than one drug out of every six circulating within their country was counterfeit or substandard, imported mainly from China and India because regulatory laws are inadequately enforced (Joda *et al*., 2017).

Counterfeit production undermines not just the pharmaceutical industry but also poses significant threats towards public health outcomes worldwide (Mdege *et al*., 2016). As the primary healthcare professionals responsible for dispensing medications and advising patients, pharmacists are in a strategic position to ensure the quality and safety of drugs (Molzon, 1992). They can leverage their expertise to detect counterfeit drugs through visual inspections and knowledge of legitimate drug sources. Moreover, pharmacists can educate patients about the dangers of counterfeit drugs and the importance of purchasing medications from reputable sources (Molzon, 1992).

Erah and Opara (2020) emphasized the crucial role of pharmacists in identifying and preventing counterfeiting activities. Their findings revealed that knowledgeable and alert pharmacists effectively minimized the prevalence of counterfeit drugs within their communities. This highlights the significance of ongoing training programs to equip pharmacists with up-to-date knowledge on emerging counterfeiting tactics as well as advanced drug authentication technologies (Molzon, 1992).

Pharmacists, regulatory agencies, and law enforcement can strengthen counterfeit drug prevention strategies through collaborative efforts (Pascu *et al*., 2020).

The incorporation of technology like track-and-trace systems and mobile verification apps empowers pharmacists and consumers to authenticate medications better (Mackey and Nayyar, 2017). Implementing stricter regulations and improving enforcement mechanisms are also critical steps in reducing the prevalence of counterfeit drugs (Eruaga *et al*., 2024). It is imperative to implement health system interventions involving pharmacists globally, as they are integral in reducing the utilization of counterfeit drugs (Fadlallah *et al*., 2016).

Pharmacists have significant professional expertise that enables them to interact with patients, members of the public and other stakeholders within healthcare systems. They provide reliable measures for controlling counterfeit drug circulation and tackling consequent health system challenges (Mdege *et al*., 2016),

As argued by Lee *et al*. (2017), pharmacists are essential in ensuring the quality of medications and reducing the incidence of counterfeit pharmaceuticals through various vital responsibilities. These include patient education, vigilance in drug inspection, and the implementation of advanced drug authentication technologies (Lee *et al*. 2017).

Adekoya and Ekeh (2021) argue that pharmacists can enforce quality control measures in their practices, including thorough inventory management, correct storage procedures, and regular medication inspections aimed at detecting any anomalies.

This stance supports Mdege *et al*.'s (2016) emphasis on the importance of proactive pharmacist involvement in safeguarding drug quality. Nevertheless, there is a noticeable gap in existing literature regarding the precise ways by which Nigerian pharmacists contribute towards tackling counterfeit pharmaceuticals. Therefore, more comprehensive studies are needed to provide explicit data highlighting these connections between pharmacists' actions and outcomes concerning counterfeit drug elimination efforts within Nigeria's healthcare system.

The objective of this study is to gain crucial understanding regarding pharmacists' obligations in decreasing the prevalence of counterfeit medicinal products and improving drug standards in Nigeria.

1.2 Research Aim

The focus of this research is to examine the role(s) of pharmacists in the improvement of drug quality in Nigeria. Pharmacists are responsible for giving patients safe and efficient medications. They also act as essential gatekeepers in the pharmaceutical supply chain (Darrow, 2014). Thus, recognizing how pharmacists may enhance drug quality is crucial to formulating effective strategies to counteract the spread of fake pharmaceuticals.

1.3 Research Objectives

In line with the aim of the research, the following specific objectives are:

i. To Examine the roles of pharmacists in detecting and preventing the circulation of counterfeit drugs in Nigeria.
ii. To Assess the relationship between the level of pharmacists' engagement in public awareness campaigns and the prevention of counterfeit drug circulation in Nigeria.
iii. To challenges and barriers faced by pharmacists in improving drug quality and combating counterfeit drugs in Nigeria.
iv. To assess the perceptions of pharmacists on the impact of technology in identifying counterfeit drugs in Nigeria.
v. To provide recommendations for enhancing the role of pharmacists in improving drugs quality and reducing the prevalence of counterfeit drugs in Nigeria.

1.4 Research Questions

The following research questions will be answered.

i. What are the roles of pharmacists in detecting and preventing the circulation of counterfeit drugs?
ii. What is the relationship between the level of pharmacist engagement in public awareness campaigns and the prevention of counterfeit drug circulation?
iii. What are the challenges and barriers pharmacists face in improving drug quality and combating counterfeit drugs?
iv. To determine the perceptions of pharmacists on the impact of technology in identifying counterfeit drugs.
v. What are the ways to enhance the role of pharmacists in improving drugs quality and reducing the prevalence of counterfeit drugs in Nigeria?

1.5 Research Hypotheses

Hypothesis One

H_0: There is no significant impact of pharmacists' engagement in public awareness campaigns and the use of advanced technological tools on the improvement of drug quality.

H_1: Pharmacists' engagement campaigns and the use of advanced technological tools have a significant impact on the improvement of drug quality.

Hypothesis Two

H_0: There is no significant relationship between public awareness campaigns and counterfeit drug prevention.

H_1: There is a significant relationship between public awareness campaigns and counterfeit drug prevention.

Hypothesis Three

H_0: The strength of regulatory frameworks does not significantly influence pharmacists' effectiveness in preventing the circulation of counterfeit drugs in Nigeria.

H_1: The strength of regulatory frameworks significantly influences pharmacists' effectiveness in preventing the circulation of counterfeit drugs in Nigeria.

1.6 Justification and Significance of Study

The issue of counterfeit and low-quality medicines in Nigeria is extensively prevalent, calling for a comprehensive analysis to assess the contribution pharmacists can make towards enhancing drugs quality (Eruaga *et al*., 2024).

The alarming data released by the World Health Organization, stating that around 70 percent of medications sold are either fake or inferior, underlines how serious this problem has become (Bird, 2007). Additionally, records from the National Agency for Food and Drug Administration and Control (NAFDAC) reveal that approximately 41 percent of drugs available are fraudulent (Mackey and Nayyar, 2017; Yankus. 2006). Research conducted during the late nineties till the early two thousand affirms these figures as they estimate between thirty-six to forty-eight percent accessibility rate regarding counterfeits in Nigeria (Egbue, 2009).

The prevalence of corruption in Nigeria's healthcare industry intensifies the problem of counterfeit drugs. The transfer of medication from public medical facilities to private markets is widespread, and positions within the system are procured through financial transactions (Lewis, 2006; Gupta *et al*., 2004). Besides this, Nigeria ranks as one of the world's weakest enforcers when it comes to intellectual property rights. According to Property Rights Alliance in their International Property Rights Index report for 2009 (Property Rights Alliance, 2009), they occupy a lowly ranking at number ninety-four out one hundred fifteen countries scrutinized globally (Alliance, 2007). Addressing counterfeit drugs is a crucially important endeavour. The dangers of fake medications go far beyond economic harm and present an enormous risk to public health (Klantschnig and Huang, 2024).

Research shows that the distribution of counterfeit drugs has surged in Nigeria over the past twenty years, raising concerns about whether genuine medicines or fake ones dominate Nigerian markets (Richard, 2023). This issue is particularly concerning because the harmful effects of counterfeit drugs often go unnoticed until they result in significant health crises or mass casualties (Richard, 2023). The hidden nature of this threat complicates its detection and quantification, making it a critical public health challenge.

Government bodies such as NAFDAC possess a pivotal function in the oversight of the pharmaceutical industry and protection of public welfare. Policymakers and healthcare personnel can implement effective policies and interventions to alleviate or eliminate counterfeit drug predicaments by comprehending their seriousness.

The involvement of pharmacists is paramount for ensuring prescription legitimacy and effectiveness, and therefore, reducing the potential consequences correlated with fake medicines while concurrently enhancing patient safety (Koshkouei, 2023).

This study aims to augment the present body of knowledge on counterfeit drugs by furnishing viable solutions to enhancing drugs quality and patient safety in Nigeria. It will demonstrate the imperative role played by pharmacists in fighting against fake medicines while emphasizing that there is a pressing need for strong regulatory policies, coupled with patient education strategies, to tackle this widespread problem.

1.7 Overview and Structure of the Dissertation

The first chapter is the introductory part of the dissertation. The introduction describes the dissertation and gives a general overview of the issue of counterfeit drugs with a focus on Nigeria. It highlights the importance of researching this matter and emphasizes the necessity of successful solutions and the ramifications for public health. Along with an explanation of the dissertation framework, the chapter also includes the study aim, objectives, research questions, justification, significance and structure of the research.

The second chapter focuses on the review of related literature. It explores current scholarly work and research on the related topic. It also outlines the theoretical foundation supporting the current study, synthesizes findings from earlier investigations, and points out gaps in the literature. This chapter establishes the research process and thoroughly explains the topic.

The methodology is the third chapter of the dissertation. The methodology describes the study's research design, data-gathering strategies, and analytical approaches. It outlines the justification for the selected course of action, considering ethical issues and any restrictions. In addition, the Research Paradigm, Research Approach, Research Strategy, Sampling and Target Population, Reliability and Validity of The Research used for data collection and analysis regarding counterfeit medications and patient outcomes are covered in length in this chapter.

The fourth chapter focuses on the analysis of data. This chapter presents and analyses the results of the data obtained through the survey and the findings of the analysis.

The fifth chapter is the concluding part of the dissertation. The study's primary results are outlined in the conclusion chapter, along with suggestions for theory, policy, and practice. This chapter also reflects on the broader significance of the research findings, offers recommendations for future research, and concludes with a final reflection on the study's contribution to knowledge in the field.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

This chapter of the dissertation discusses the review of existing literature on the subject matter. The chapter is segmented into three major sections: conceptual framework, theoretical review, and empirical review. The conceptual framework is outlined under themes and concepts such as counterfeit and counterfeit drugs; global counterfeit drug market and size; the Nigerian pharmaceutical market/industry; factors enhancing counterfeit drugs; health, economic, and security impact of counterfeit medications; and Integral Roles that Pharmacists play in Strengthening the Health System. The study is anchored on Social Cognitive Theory and Institutional Theory. Existing studies relevant to the research topic are evaluated in the empirical review.

2.1 Theoretical Review

This section will focus on subject related directly to the objectives of this study such as; Counterfeit and Counterfeit Drug, Global Counterfeit Drug Market and Size, The Nigerian Pharmaceutical Market/Industry, Factors Enhancing Counterfeit Drugs, and Health, Economic, and Security Impact of Counterfeit Medications, Integral Roles that Pharmacists Play in Strengthening the Health System.

2.1.1 Social Cognitive Theory (SCT)

In the 1970s, Albert Bandura developed The Social Cognitive Theory (SCT), which provides a comprehensive framework for understanding and enriching pharmacists' contribution towards enhancing drug quality and curbing counterfeit drugs in Nigeria. SCT contends that conduct is shaped by an interdependent connection between personal factors, external influences, and behavioural determinants recognised as reciprocal determinism.

This model highlights observation-based learning's significance alongside self-reliance abilities and societal impact; all these facets align with pharmacists seeking to minimise fraudulent medication distribution rates.

Observational learning, which is emphasised by SCT (Social Cognitive Theory), holds relevance to the objective of pharmacists in recognising and halting counterfeit drugs. This theory indicates that individuals can learn new behaviours through observing others and comprehending their outcomes.

Pharmacists have a crucial responsibility as role models for other professionals and patients alike, demonstrated through their conduct and interactions. By maintaining consistently high standards related to drug authentication measures such as patient education, they establish effective practices that influence colleagues' behaviour positively towards detecting counterfeits with collective effort leading to its prevention.

Social influences, as highlighted by SCT, can shed light on the connection between pharmacists' involvement in public awareness initiatives and preventing counterfeit drugs' circulation. Public education campaigns hinge largely upon information spread and shaping of attitudes towards fake medicines. As trusted healthcare professionals, pharmacists can use their position to enlighten people about hazardous counterfeits while advocating for purchasing medication from authorised outlets. Effectively conveying such messages empowers them to change social norms and behaviours that encourage safer drug-purchase decisions within communities. Additionally, SCT places emphasis on the importance of self-efficacy in empowering pharmacists to improve drug quality by overcoming challenges and obstacles.

The term refers to an individual's confidence in their capacity to take actions that lead towards a specific goal. In the case of pharmacy practitioners, having high levels of self-efficacy encourages their ability to combat counterfeit drugs despite potential roadblocks like inadequate resources or stringent regulations.

By providing training programs, professional networks for support, and timely information updates, pharmacists' sense of self-efficacy can be enhanced to address such hurdles successfully. The valuable perspective of the SCT is instrumental in developing recommendations to strengthen pharmacists' role in enhancing drug quality and decreasing counterfeit drug prevalence in Nigeria.

Stakeholders can encourage pharmacists' self-efficacy by facilitating continuing professional development programs while creating systems that appreciate and incentivise their effective anti-counterfeit strategies. Furthermore, promoting observational learning through mentorship initiatives and collaborative networks would aid best practice dissemination across the profession.

In conclusion, the SCT presents a holistic perspective to comprehend and improve pharmacists' involvement in tackling counterfeit medicines in Nigeria. SCT concentrates on observational learning, self-assurance, and social impacts to offer a significant understanding into how pharmacists can efficiently identify and prevent fake drugs from circulating further. Engaging strategic campaigns that raise awareness among the masses

while surmounting challenges will resultantly advance drug quality standards. The theory stresses adopting diverse measures, including education programs for community participation and professional support, that are needed to combat this complex concern surrounding bogus medications effectively (Luszczynsk and Schwarzer, 2015).

Given the SCT's emphasis on the interplay of external influences (e.g., social norms and public awareness campaigns) and behavioural determinants (e.g., technology use in detecting counterfeit drugs), a hypothesis can be formulated to test the relationship between these variables.

Hypothesis: There is no significant impact on pharmacists' engagement in public awareness campaigns and the use of advanced technological tools on the improvement of drug quality.

Hypothesis: There is a significant relationship between public awareness campaigns and counterfeit drug prevention.

2.1.2 Institutional Theory

The issue of counterfeit drugs in Nigeria can be comprehensively addressed by using the valuable framework presented by Institutional Theory.

Pharmacists play a crucial role in elevating drug quality through this theory's examination of how social structures, norms, and rules impact behaviours and organisational practices. Considering the context of pharmaceutical regulation and practice in Nigeria, institutional theory proves especially pertinent as it highlights institutional influences such as healthcare systems, regulatory bodies, and cultural norms that contribute to the prevalence of counterfeit drugs while simultaneously offering potential mitigation strategies.

This theory emphasises how individual and organisational behaviour is shaped by institutional environments.

In Nigeria, the effectiveness of pharmacists in combating counterfeit drugs heavily depends on regulatory frameworks set up by institutions like the NAFDAC. Counterfeit drug proliferation may thrive when there are weak enforcement regulations or corrupt practices within these institutions that undermine pharmacist efforts. The understanding of such institutional pressures helps identify areas where reforms are necessary to enhance pharmacists' critical role empowerment.

Public health norms and policies have a significant influence on such campaigns, with healthcare organisations and government entities prioritising specific medical concerns.

When these institutions take an active stance against counterfeit medication, there is increased participation from pharmacists. Adequate institutional backing through resources like funding or training can also bolster campaign effectiveness for reducing the circulation of fake medicines.

The identification of obstacles and hindrances that impede pharmacists in enhancing drug quality and fighting against counterfeit drugs has institutional gains. Institutional theory theorises that barrier, such as inadequate funding, insufficient training opportunities, and bureaucratic red tape, arise from organisational failings. For example, if regulatory entities do not provide adequate resources for assuring the quality of medicinal products or if there is an absence of commitment to counteracting fake drugs at the institutional level, then pharmacists will encounter substantial difficulties in their endeavours.

Stakeholders can understand systemic dilemmas necessitating action by examining these structural factors for more effective support towards pharmacists' welfare. Institutional theory offers a ground for suggesting ways to improve the role of pharmacists in Nigeria toward improving drug quality and reducing the prevalence of counterfeit drugs. Institutions' pivotal responsibility includes facilitating collaboration between healthcare providers, law enforcement agencies, and pharmacists to develop comprehensive solutions against illicit drug proliferation.

In conclusion, institutional theory provides a broad perspective on how various factors influence the prevalence of counterfeit drugs in Nigeria. By investigating how institutions impact behaviour among pharmacists and within the pharmaceutical industry, this theory brings awareness to systemic issues requiring attention for improved drug quality. Robust regulatory frameworks, institutional support, and adherence to cultural norms are emphasised by this theory when implementing proper practices that can prevent the detection or usage of fake medications. Engaging with an approach like Institutional Theory enables stakeholders to establish more detailed tactics granting empowerment towards pharmacists (Rezali *et al*., 2021), thereby enhancing public health protection measures throughout Nigeria.

Institutional Theory provides a valuable framework for understanding the impact of social structures, norms, and rules on pharmacists' roles in improving drug quality and combating counterfeit drugs in Nigeria. Based on Institutional Theory, the following hypothesis is stated as;

Hypothesis: The strength of regulatory frameworks does not significantly influence pharmacists' effectiveness in preventing the circulation of counterfeit drugs in Nigeria.

2.2 Conceptual Framework

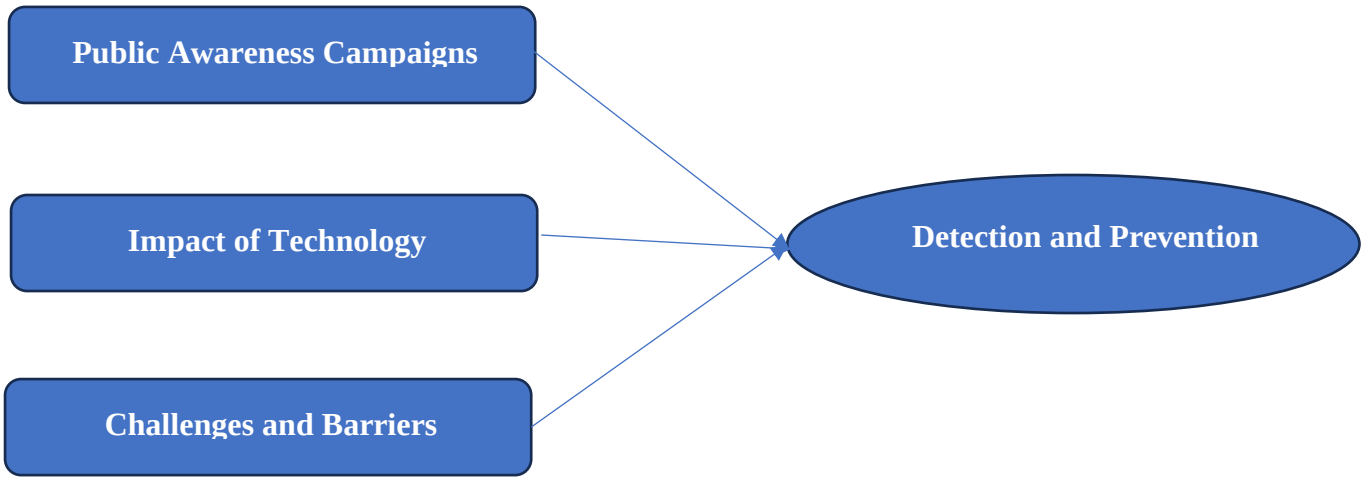


Figure 2.1: The role of pharmacists in improving drug quality in Nigeria
Source: Author's compilation

2.2.1 Counterfeit and Counterfeit Drug

As documented in the 2017 report by WHO, counterfeit drugs are products that have been fraudulently mislabelled in terms of identity or source. These falsified medications can range from those that contain correct ingredients but fake packaging to ones with incorrect components or insufficient active substances (WHO, 2019). Counterfeiting not only misleads consumers but also infringes on the intellectual property (IP) rights of patients and trademark holders. "Counterfeit trademark goods" are items, including packaging, that bear an unauthorised trademark identical to or indistinguishable from a legally registered one, violating the rights of the trademark owner under the importation country's laws (Okereke *et al*., 2021).

The WHO first brought attention to the problem of counterfeit drugs in 1985, and since then, it has only become more rampant (Aminu & Gwarzo, 2017).

In recent decades, drug counterfeiting has been on an alarming increase. Cockburn *et al*. (2021) assert that this illegal practice causes unnecessary sickness and death while eroding public trust in healthcare systems and medicines. The FBI also warns against drugs counterfeiting as they consider it to be the primary crime of our current century due to its profound implications for both economic health, resulting from job losses and plummeting

government revenues, upending legitimate businesses' profitability plus innovation across different sectors (O'Hagan & Garlington, 1018; Ekpenyong at el.,2018).

2.2.2 Global Counterfeit Drug Market and Size

The counterfeit drugs trade is the most profitable segment of illegally copied items, with estimates of its annual global value reaching up to €188 billion (US$200 billion). Based on a 2016 US Department of Commerce research, the global market for counterfeit drugs was estimated to be worth between US$75 and US$200 billion (Ekpenyoung *et al*., 2018). The consulting company McKinsey reported that the pharmaceutical sector in Africa increased in value from US$4.7 million in 2003 to US$20.8 billion in 2013 (Holt *et al*., 2015). The challenge in estimating market size arises from the regrettable fact that knowledge, testing, identification, capture, and reporting of worldwide drug quality are neither consistent nor systematic.

According to research conducted by WHO (2017), in low- and middle-income nations, one in ten medical items are either poor or fabricated.

Antimalarials and medicines are the most often reported medical product fraud incidents, accounting for almost 1,500 accusations of subpar or fabricated items that the organisation has received since 2013. Most reports (42%) are from Africa (WHO, 2017). A non-profit organisation called the Pharmaceutical Security Institute (PSI) has recorded over 3,500 "pharmaceutical crime incidents" and has reported even greater numbers.

2.2.3 The Nigerian Pharmaceutical Market/Industry

The pre-independence period in Nigeria saw companies like Glaxo and Pfizer monopolise the importation of drugs. Since then, the Nigerian pharmaceutical sector has grown. There are several participants in the sector, each with varying levels of involvement. In 2009, the industry was valued at an average of US$ 600 million and a 12% annual growth rate. However, it reached about US$ 717 million in 2011 (UNDO, 2011). In terms of generics (both branded and unbranded), the pharmaceutical sector is now valued at $1.5 billion. Despite a 20% increase in prices overall, the industry's growth rate has decreased from 8% in 2013 to less than 3% in 2018. Its GDP contribution is less than 0.5%.

With over 130 active producers, Nigeria's pharmaceutical sector is significant; however, only sixty of these are currently engaged in manufacturing (Bolla *et al*., 2020). Even though the country has the capacity to produce drugs domestically, its challenging economic environment leads it to rely heavily on imports. Despite having the potential

capabilities to supply between 50 and 75 percent of national drug demands, just a quarter - i.e., around twenty-five percent of local demand for medicine can be met within Nigerian shores while the remaining seventy-five percent is imported from Asian countries like China and India as per reports published by The Pharmaceutical Manufacturing Group of MAN along with UNIDO (2011) and reiterated by Isola & Mesagan(2016). Unfortunately, production levels remain low at below thirty percent, driving most Nigerian citizens to rely primarily on medications sourced elsewhere (Such as Asia), as reported recently by Adekoya & Ekeh (2021).

The Nigerian drug distribution system is unorganised. Drugs are marketed in venues such as night markets, motor parks, market kiosks, and roadside hawking (Fatokun, 2016). In fact, it is common to see vendors selling over-the-counter drugs, such as antibiotics, in public areas along with other goods like oranges, cigarettes, and kola nuts. The delivery of drugs is unregulated, and tablet preservation guidelines are not always followed, which puts residents' health in danger.

Drug counterfeiters are targeting Nigeria due to the potential for high profits despite their illegal activities. Asian businesses handle a significant amount of global outsourcing in both manufacturing and services.

India is responsible for 75% of counterfeit medications, as per European Commission data (Bottoni & Caroli, 2019). As a result, it's no surprise that most fake drugs discovered in Nigeria come from India (Fink *et al*., 2016). However, this issue is not confined to Asia alone; the counterfeit products are often mislabelled in locations far removed from their actual place of manufacture.

The Nigerian pharmaceutical sector has been turned into a dump for various counterfeit pharmaceutical items throughout the years by deceitful entrepreneurs and criminals. Due to a lack of infrastructure and pervasive systemic corruption, this illegal behaviour is nevertheless unchallenged.

Currently, the pharmaceutical business in Nigeria has a significant frequency of non-compliance with regulatory norms and laws. The trend is primarily ascribed to the shortcomings of current pharmaceutical laws and regulations, which limit the effectiveness of pharmaceutical inspectors in carrying out their duties by failing to fully capture some offences and the associated penalties for offenders (Oseni, 2019).

2.2.4 Factors Enhancing Counterfeit Drugs

Isola, Mdege, and Ekoh *et al*. (2016; 2022) have reported that Nigeria has become a notorious hub for the distribution of counterfeit and substandard drugs.

Gnegel *et al*. (2020) attribute corruption as a primary factor fuelling this burgeoning pharmaceutical industry in the country, with many participants resorting to unethical practices solely driven by financial gain while disregarding public health concerns. Challenges have been encountered when attempting to enforce current regulations as a result of ethical quandaries and the belief that the system is inflexible. Adjei and Ohene (2015) revealed dilemmas in Nigeria's pharmaceutical distribution network, citing multiple parties involved who rely on commercial logistics companies for dissemination purposes. This complex supply chain creates opportunities for fraud and corruption, compromising the overall quality of the process. As a result, expired drugs often enter the market, and unlicensed and unregistered businesses frequently sell medical supplies and pharmaceuticals (UNIDO, 2011). Fraudulent activities remain a prominent apprehension in the industry, particularly within Nigeria's pharmaceutical sector. Instances of fraud have plagued the area and resulted in weakened law enforcement measures (Lee *et al*., 2017). Compounding this issue is pervasive corruption and deceit throughout supply chains that involve multiple companies and manufacturers.

The weak oversight of the Nigerian health and economic systems has led to the spread of fake and counterfeit medications in the nation.

NAFDAC and other regulatory agencies play a significant role in the regulation and control of imported goods. This is done by placing inspectors at different seaports and airports. Before any medication may be sold in Nigeria, a prerequisite known as pharmaceutical registration must be satisfied. Inadequate laws and enforcement are a major barrier to tackling the issue of substandard medicines in Nigeria. Additionally, the country's public forensic laboratories need to be more adequately equipped to handle the volume of drugs coming in for quality control analysis testing, and a strong supply chain for imported medications can result in the availability of substandard medications (Wogu *et al*., 2019).

In addition, the punishments meted out to drug offenders do not match the seriousness of the offence. For example, the maximum penalty for breaking Nigeria's fake drug decree is currently ₦500,000, or a jail sentence of three months to five years upon conviction (Mackey and Nayyar, 2017).

Stricter penalties would make the fake drug trade more difficult and less profitable for drug counterfeiters (Ratanawijitrasin & Wondemagegnehu, 2002).

Ekoh *et al*. (2022) indicated that ignorance, greed, and corruption are some of the other factors that contribute to the prevalence of fake drugs in Nigeria. Greed and corruption are visible in certain unpatriotic drug regulatory authorities' officers as well as in drug importers and manufacturers. The high level of suspected official manipulation and corruption in the Nigerian healthcare system negatively impacts the efficacy of regulatory bodies. Certain law enforcement officials are allegedly paid to look the other way while the fake drug trade flourishes (El-Jardali *et al*., 2015).

2.2.5 Health, Economic, and Security Impact of Counterfeit Medications

The act of producing counterfeit pharmaceutical products, such as medication or drugs, has severe implications for public health, the private sector, national security, and the economy. According to Wilson *et al*. (2016), this illegal practice poses significant risks that affect various aspects of society's well-being.

Pharmaceutical companies face a substantial threat from counterfeiters' illicit activities, jeopardising their financial stability, leading to reputational damages and hindering operational viability (Ansari *et al*., 2016; Ndubuisi, 2021). The effects reach beyond immediate monetary losses as counterfeiting impacts wider communities in many ways (Mackey and Nayyar, 2017). The counterfeit drug market causes significant economic harm and presents a grave threat to public health. While the financial impact is staggering - with global sales of fake medications amounting to 10% of all medical product sales in 2003 ($32 billion) (WHO, 2019), resulting in annual losses for the pharmaceutical industry reaching $46 billion, it's human cost cannot be overstated. Adverse reactions caused by these false drugs are often irreversible and expensive (Etikan *et al*., 2016).

Moreover, those who need life-saving medication may end up wasting their money on fraudulent products that can cause numerous complications, leading to premature death instead (Gnegel *et al*.,2020).

Counterfeit drugs can have serious consequences, such as medication resistance among patients, particularly those being treated for AIDS (Bottoni & Caroli, 2019).

According to pharmacology and medicine professors from Trinity College and Stanford Medical School, as mentioned in the Financial Times, insufficient drug concentrations caused by counterfeit medications may result in treatment failures while promoting resistant forms of infectious agents. Such a situation would compromise future treatments'

efficacy (Ekoh *et al*., 2022). Mackey and Nayyar (2017) further noted that previous consumption of counterfeit medications could lead to resistance, rendering specific drugs ineffective when needed later.

The issue of fake drugs has caused embarrassment to Nigerian medical professionals and undermined public trust in the country's healthcare infrastructure. The spread has resulted in many Nigerians losing their lives to treatment failures, organ damage or dysfunction, and the worsening of chronic illness conditions. Resistance from prior use of counterfeit drugs prevents patients from responding to treatment, even when they are given real medications (Mackey and Nayyar, 2017). In order to reduce infant mortality, improve maternal health, and fight HIV/AIDS, malaria, and other diseases, among other things, the achievement of Millennium Development Goals 4, 5, and 6 is greatly threatened by counterfeit drugs (WHO, 2019). It denies the Nigerian people access to high-quality, safe, and effective medications.

Based on the issues above, drug counterfeiting is becoming an increasingly serious issue as it is progressively worsening crime and health issues in emerging nations.

To reduce its impact, the government's persistent political will, the development of suitable infrastructure such as state-of-the-art drug testing laboratories, and the reinforcement of industry regulators' authority through financial assistance may be crucial components in the fight against drug counterfeiting.

2.2.6 Integral Roles that Pharmacists Play in Strengthening the Health System

Over the past few decades, the job of the pharmacist has changed dramatically from dispensing to providing more direct patient care, administrative duties, and public health responsibilities (Sakeena *et al*., 2019).

The goal of pharmaceutical care is to improve patient's quality of life by delivering responsible and diligent drug therapy within an integrated health system, resulting in optimal medication results and increased patient satisfaction. This shows that pharmacists are extremely important to the healthcare system, particularly when it comes to improving the quality of medications (Sakeena *et al*., 2019).

According to Lingenfelter *et al*. (2016), pharmaceutical care services in hospitals support safe and economical prescription practices as well as optimal medicine consumption. Increased hospital pharmacy operations have improved patient outcomes by maximising

treatment, encouraging sensible prescriptions, reducing the use of unnecessary medications, and decreasing medication-related harms.

To help hospitalised patients use medications appropriately and to improve hospital medicine utilisation, several pharmacist-led strategies have been developed; these programs typically require interdisciplinary teamwork and frequently involve pharmacists with postgraduate training (Jaiprakash & Pawan, 2016). Conversely, a shortage of more clinical pharmacist-led initiatives in these nations' institutions results in a shortage of clinical pharmaceutical services in many developing nations. The causes of this are broad, but they can include the fact that the pharmacy field is still developing in these nations, professional seclusion, and an underappreciation of the importance of clinical pharmacy to the healthcare system. In response to the hospital's requirement for pharmaceutical treatment, Nigeria launched clinical pharmacy programs (Arit *et al*., 2021).

Pharmacists in developing nations, such as Nigeria, are essential to the pharmaceutical industry because they are in a unique position to guarantee that the most affordable medications are acquired from reliable suppliers in the most appropriate quantities and delivered when and where they are needed.

In addition, by encouraging responsible drug use and offering pertinent advice, pharmacists can minimise the purchase of needless and costly medications (Raza *et al*., 2022).

Community pharmacists are crucial to the health care system since they are often the first to encounter patients and provide guidance on common health issues. In addition, they link patients to other healthcare professionals and offer self-management advice for mild illnesses (Robert & Micheal, 2017). Similarly, pharmacists can be the patient's final point of contact prior to starting any kind of treatment, so they are crucial in ensuring proper medication use, promoting drug allergies, guaranteeing sufficient monitoring, offering advice on side effects and drug interactions, and enhancing medication adherence (Jaiprakash & Pawan, 2016).

Community pharmacists are crucial in maximising the community's use of medications to promote high-quality medication utilisation. Furthermore, because community pharmacists are evaluating patients, the higher vaccination rate improves public health (Arit *et al*., 2021).

Pharmacists have vital roles in the production, manufacture, and monitoring of medicinal goods at different stages, which makes them important contributors to the health system as well. The only medical practitioners with the training necessary to excel in

understanding drug action and providing pharmaceutical care are pharmacists (Elayeh *et al*., 2017). For this reason, the government must guarantee that pharmacists are completely integrated and engaged in the delivery of pharmaceutical care services within the healthcare system (Pillay, 2019).

2.3 Empirical Review

Adigwe *et al*. (2022) evaluated the behaviours and expertise of Nigerian pharmacists about counterfeit medications, along with the difficulties in preventing and controlling this threat inside the nation. Cross-sectional research was conducted to give questionnaires to pharmacists in Nigeria who work in different sectors. SPSS was used to analyse the data. The key hurdles to mitigating the circulation of fake medications in the country, according to the respondents, are inadequate inspection, weak law, bad teamwork, and poor cross-border enforcement. These issues also affect online drug trafficking. Approximately one-third of the sample said that their knowledge and abilities needed to be improved to spot counterfeit medications. The participants' skills in identifying counterfeit medications were highly impacted by their age, years of experience, and area of expertise. The study's findings demonstrated that Nigerian pharmacists were well-versed in the counterfeiting of pharmaceuticals. However, a few issues, including inadequate cooperation between regulatory bodies, inadequate inspection and legislation governing the pharmaceutical industry, and internet sales of medications, have facilitated the spread of counterfeit medications, which has subsequently impacted the nation's healthcare system.

Adigwe (2023) investigated the part pharmacists play in Nigeria's efforts to stop and manage the sale of fake pharmaceuticals. Using questionnaires, cross-sectional research was conducted in Nigeria to gather information from pharmacists working in different areas of pharmacy practice. A descriptive statistical analysis was conducted, employing chi-square to ascertain the correlation between variables and sociodemographic traits. The majority of the study sample indicated that the poor implementation of these laws was a major factor influencing the preponderance of counterfeit medicines in the country. Nearly all of the participants agreed that strict enforcement of drug laws can contribute to adequate control of counterfeit medicines in Nigeria. The study's conclusions not only validated the importance of pharmacists in the battle against fake medications, but they also pointed out several context-specific elements that might improve legislation, policy, and the healthcare system. As a result, the government and pertinent parties may start outlining strategic

changes for contextual policy interventions that tackle the counterfeiting of medications while giving pharmacists' roles in other vital aspects of the healthcare system a top priority. The present study focuses on the role of pharmacists in ensuring drug quality in Nigeria. In Adigwe (2023), a cross-sectional study was conducted to examine the role of pharmacists in Nigeria in preventing and controlling the sale of counterfeit pharmaceutical products. However, the focus of this study is on pharmacists' experiences and perceptions regarding the impact of counterfeit drugs on patient health and their role in assuring drug quality.

Okpe *et al*. (2016) evaluated the factors impacting consumers in rural communities' decisions to purchase counterfeit medications. This study is a cross-sectional descriptive research project that uses a pretested questionnaire to gather data and guarantee the instrument's validity and reliability. For this investigation, a sample size of 236 was employed. Data analysis was done with SPSS 20.0. According to the study's findings, people in the community typically utilise the drug's price to identify counterfeit medications. Additionally, it was believed that there was a risk of overdose and death, as well as unanticipated side effects, allergic responses, and worsening of medical conditions while using counterfeit pharmaceuticals.

The study found that the primary method used by drug users to identify counterfeit pharmaceuticals is the cost of the drugs. There is a correlation between the purpose, conduct, and attitude of consumers toward fake pharmaceuticals. While Okpe *et al*.'s study concentrated on the viewpoints of customers and the variables that influence the purchasing of counterfeit medications in rural areas, this study looks at pharmacists' experiences and opinions of counterfeit medications and how they affect patient health.

A study conducted by Rotimi *et al*. (2022) examined pharmacists' experiences in managing and preventing drug usage. Pharmacists' opinions on their involvement in the management and prevention of drug use in Nigeria were investigated using semi-structured interviews by the research. Thematic content analysis was employed once the data had been transcribed.

The study revealed four main themes: the degree of pharmacists' involvement in the decision-making process regarding substance use, the factors influencing Nigerian pharmacists' efforts to address substance use, strategies for enhancing rational prescribing practices, and capacity building to increase pharmacists' participation in substance use initiatives. The study concluded that while pharmacists can play important roles in the management and prevention of drug use, their full potential is limited by several systemic

and individual issues. To increase pharmacists' involvement in drug use prevention and management, these issues must be addressed. This study explored pharmacists' involvement in substance use prevention and management in Nigeria. However, this present study will investigate pharmacists' contributions to combating counterfeit drugs in Nigeria and enhancing drug quality assurance practices within the healthcare system.

2.4 Summary of findings of the reviewed literature

The review of the literature extensively covers different challenges and roles pharmacists face in Nigeria to tackle counterfeit medications. The summary is arranged based on the present study's research objectives, emphasising noteworthy discoveries while citing relevant authors' works.

Objective 1: Examine the roles of pharmacists in detecting and preventing the circulation of counterfeit drugs in Nigeria.

Adigwe's (2023) cross-sectional investigation in Nigeria highlighted their responsibility for queering sales of fake pharmaceuticals, with an array of measures including physical-chemical scrutiny on drug samples, attentive monitoring patient feedback, and enhancing professional vigilance. By raising alarm regarding questionable medications with regulatory entities alongside supporting surveillance programs aimed at certifying medication authenticity and security, they stand imperative when guaranteeing consumers are kept safe from potentially lethal counterfeits.

In their study, Rotimi *et al*. (2022) examined pharmacists' experiences in managing and preventing drug use. They discovered that these professionals play a vital role in substance-use decision-making processes as well as educating patients about counterfeit medications' risks. This level of involvement is crucial for reducing risks attributed to fake drugs while ensuring patients receive authentic pharmaceuticals with high standards of quality assurance.

Objective 2: Assess the relationship between the level of pharmacist engagement in public awareness campaigns and the prevention of counterfeit drug circulation in Nigeria.

A study conducted by Adigwe *et al*. (2022) suggests that pharmacists play a vital role in raising the general public's knowledge and understanding regarding fake medication hazards. Actively participating in educational initiatives, these professionals use their

respected standing within society to effectively disseminate information on safe practices among consumers.

Luszczynska and Schwarzer's (2015) review of the Social Cognitive Theory highlights how observational learning and social impacts play a critical role in public health promotions. Pharmacists' active engagement, as well as their ability to model behaviour, can significantly influence attitudes and actions towards counterfeit drugs, ultimately reducing their circulation with accurate information dissemination through participation in campaigns.

Objective 3: Identify the challenges and barriers pharmacists face in improving drug quality and combating counterfeit drugs in Nigeria.

According to Adigwe *et al.*'s (2022) research, major hurdles include insufficient inspection measures, weak legal frameworks and inadequate cross-border enforcement due to poor teamwork. These underlying problems significantly affect the ability of pharmacists to detect and prevent fake medications effectively. In addition, the study found that many pharmacists feel that their knowledge and skills require improvement when it comes to identifying counterfeit medicines - another challenge highlighted by the study.

In their study, Gnegel *et al*., (2020) identified corruption as a significant driver of Nigeria's counterfeit drug market. According to the research, ethical quandaries, unwieldy systems and convoluted supply chains all contribute to an environment ripe for fraudulence and illicit activity that jeopardises the efficacy of pharmaceuticals. These barriers present formidable challenges for pharmacists striving to uphold quality standards while verifying medication authenticity.

Objective 4: Assess pharmacists' perceptions of the impact of technology on identifying counterfeit drugs in Nigeria.

Adigwe (2023) states that pharmacists acknowledge the impact technological innovations can make on drug authentication procedures. Such tools enable swift detection of counterfeit medications, thus improving pharmacy practitioners' performance both efficiently and effectively.

The review of research reveals that pharmacists encounter obstacles such as high prices and the demand for technical knowledge. Nevertheless, incorporating sophisticated

technological instruments is considered an important measure in enhancing pharmacists' competence to combat fake medicines and guarantee drug quality in Nigeria.

2.5 Gaps in the Literature

The review of existing literature on the role of pharmacists in improving drug quality in Nigeria reveals significant gaps that underscore the necessity for the current research. While some studies have examined select aspects concerning pharmacists' responsibilities and the concern of counterfeit drugs, they frequently neglect to acknowledge the intricate relationships among various pharmacist functions, systemic obstacles encountered, and technological innovations that could improve their effectiveness.

Adigwe (2023) conducted an extensive cross-sectional study investigating pharmacists' contributions towards preventing and managing counterfeit pharmaceutical products in Nigeria. Nonetheless, this research emphasises the experiences and viewpoints of pharmacists concerning how fake drugs affect patients' health without exploring deeper into barriers affecting their effectiveness in promoting quality assurance measures and public awareness campaigns regarding counterfeits. This leaves a critical gap in understanding how pharmacists can be better supported through policy and infrastructural changes to enhance their role in combating counterfeit drugs.

The research conducted by Okpe *et al*. (2016) examined the various socioeconomic factors that impact consumer preference for fake drugs in rural communities; however, it lacks an exploration of how pharmacists can effectively employ targeted interventions and community engagement to reduce the distribution of counterfeit drugs despite their thorough understanding of consumers' behaviour patterns. This points to a gap in integrating pharmacists' roles with consumer education and behaviour modification strategies.

In their research, Rotimi *et al*. (2022) focused on pharmacists' experiences in managing and preventing drug usage, highlighting important issues such as influencing decision-making, employing logical prescribing approaches, and capacity development.

However, it is pertinent to note that this study solely focuses on substance use management rather than tackling wider concerns like counterfeit drug prevention. This indicates a gap in practical recommendations for strengthening these frameworks and fostering better collaboration among stakeholders, which the current research aims to address.

In addition, prevalent theoretical frameworks such as Institutional Theory and Social Cognitive Theory emphasise the significance of institutional and social challenges confronted by pharmacists. These hurdles are exemplified in Institutional Theory's observation of frail regulatory structures coupled with scarce coordination among governing bodies that hinder proficient curtailment of fake drugs. This gap highlights the necessity for empirical research that validates these theories and provides actionable insights for pharmacists' training and professional development programs.
Moreover, the significance of observational learning and self-efficacy in influencing pharmacists' approaches and actions towards counterfeit drugs is emphasised by Social Cognitive Theory. Nonetheless, an inadequacy of elaborate exploration exists regarding how these theoretical principles can be put into practice in practical situations to improve pharmacists' competencies and assurance when dealing with counterfeit drugs. This void reveals the crucial need for empirical research that affirms these theories and offers effective guidance for training programs and professional growth initiatives targeted at pharmacists.

The review of empirical evidence reveals notable deficiencies in executing pharmacists' responsibilities. Inadequate inspection, weak legal measures, and deficient cross-border enforcement are significant obstacles to reducing the spread of counterfeit medicines, according to Adigwe *et al.* (2022). Nevertheless, this research does not provide exhaustive analysis or remedies for these structural challenges, highlighting a demand for studies exploring innovative strategies and technologies that can enhance inspection processes and legal frameworks, thereby enabling more efficient support for pharmacists.

Additionally, the literature suggests that preventing counterfeit drug circulation through public awareness campaigns is crucial. However, there has been limited investigation into how pharmacists can effectively contribute to these initiatives. While studies like Sakeena *et al*. (2019) and Lingenfelter *et al*.(2016) acknowledge the important role of pharmacists in healthcare, they do not specifically explore ways for optimising pharmacist involvement in combating fake drugs. This gap underscores the need for targeted research examining the relationship between pharmacist engagement in public awareness and the outcomes of such campaigns.

In summary, although the current literature offers useful perspectives on pharmacists' roles and difficulties in fighting counterfeit drugs, notable shortcomings persist. Henceforth, this research endeavours to bridge these gaps by providing a more comprehensive understanding of how pharmacists can be supported through improved regulatory frameworks, enhanced training and professional development, and innovative public awareness strategies... This will not only enhance the effectiveness of pharmacists in improving drug quality in Nigeria but also contribute to the broader goal of ensuring safer and more reliable healthcare for the Nigerian population.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter will focus on the methodology used to investigate counterfeit drugs and pharmacists' role in improving drug quality in Nigeria. The research design and methods adopted were chosen to address the research questions comprehensively and systematically and align with a positivism paradigm that emphasises measurable facts for conclusions. The deductive approach is used to test existing theories regarding counterfeit drugs and pharmacists' roles effectively because it allows the findings to be structured based on theory-driven exploration.

The quantitative method is used for this study by leveraging numerical data primarily through internet-administered close-ended questionnaires, which are known for being efficient as they can be used to collect data across an extensive sample size range (Connor Desai and Reimers, 2019). Key areas covered in this chapter include research paradigm, research approach, research strategy, collection of data, sampling and target population, approach to data analysis, and ethical implications. The objectives of this study are;

i. To Examine the roles of pharmacists in detecting and preventing the circulation of counterfeit drugs in Nigeria.
ii. To Assess the relationship between the level of pharmacist engagement in public awareness campaigns and the prevention of counterfeit drug circulation in Nigeria.
iii. To challenges and barriers faced by pharmacists in improving drug quality and combating counterfeit drugs in Nigeria.
iv. To assess pharmacists' perceptions of the impact of technology on identifying counterfeit drugs in Nigeria.
v. To provide recommendations for enhancing the role of pharmacists in improving drugs quality and reducing the prevalence of counterfeit drugs in Nigeria.

3.2 Research Paradigm

The design and implementation of studies are directed by research paradigms, which stimulate the methodology and data collection approach and interpretation (Collis & Hussey, 2009).

These ideologies manifest fundamental ideas regarding the nature of knowledge and beliefs about reality. Positivism and interpretivism represent two major paradigms employed in social study research (Atoyebi *et al*., 2023).

This study on Nigerian pharmacists' role in enhancing medicine quality leverages a positivist paradigm.

This research is suited for a positivist paradigm because it emphasises unbiased reality and scientific methods of acquiring knowledge.

The fundamental principle of positivism lies in the notion that tangible observations can be measured, leading to conclusive outcomes (Taylor and Bodgan, 1998). This approach aligns with the study's aim to assess pharmacists' roles, their engagement in public awareness campaigns, their challenges, and the ways to enhance their effectiveness in combating counterfeit drugs through quantifiable data.

These methods enable the systematic collection of numerical data to uncover correlations, patterns and causations (Mohajan, 2020). This focus on quantitative analysis enhances validity and reliability by ensuring findings are based solely on empirical evidence.

The employment of a positivist paradigm in this scenario is warranted due to the necessity for accurate and implementable perceptions regarding the duties and challenges experienced by pharmacists.

Objective measurements and statistical analysis will clearly understand how pharmacists detect and prevent counterfeit drugs, the effectiveness of public awareness campaigns, and the barriers to improving drug quality. Furthermore, the results can inform policy recommendations and strategic interventions to strengthen the role of pharmacists in ensuring drugs safety in Nigeria.

3.3 Research Approach

When conducting research, two leading approaches inform the planning and implementation of a study: the inductive and deductive approaches. An inductive approach involves creating theories based on observed patterns from analysed data (Saunders *et al*., 2009). In contrast, adopting a deductive method first considers previously established hypotheses derived through literature reviews before empirically testing them to confirm or disprove their validity. The most appropriate approach for examining the topic of counterfeit drugs in Nigeria and the role of pharmacists in enhancing drug quality is deductive.

This method aligns with the study's goal to draw factual conclusions by creating hypotheses such as testing the impact of pharmacists' engagement campaigns and the use of advanced technological tools on the improvement of drug quality, the relationship between public awareness campaigns and counterfeit drug prevention, and the influence of the strength of regulatory frameworks pharmacists' effectiveness in preventing the circulation of counterfeit drugs in Nigeria, then gathering of quantitative data and analysing the data. The deductive approach enables a structured investigation, beginning with specific hypotheses. The suitability of the deductive approach for this study is reinforced by its correlation with the positivist paradigm. Ott and Longnecker (2016) explain that the deductive research method aligns well with a philosophical stance prioritising objective measurement and empirical verification of hypotheses.

3.4 Research Strategy

Creswell and Creswell (2017) define a research strategy as an organised process that directs the gathering, scrutiny, and explanation of information. Two dominant methodologies are usually used in studies: quantitative and qualitative strategies (Atoyebi *et al*., 2023).

Quantitative research necessitates numerical data acquisition through various methods, such as surveys or experiments, to evaluate the subject being examined (Nardi, 2018). Given that this study's focus is on counterfeit drugs in Nigeria and pharmacists' contribution to enhancing medication quality standards, it is suitable to implement a quantitative methodology in this research. A quantitative approach is ideal as it permits

gathering numerical information that can be methodically evaluated to examine precise hypotheses (Mohajan, 2020).

By gathering data from numerous pharmacists and subjecting it to statistical analysis, insights relevant to Nigerian pharmacy professionals may be drawn. The results of this study will guide policy recommendations and strategic measures aimed at improving drug quality and safety throughout the country. Also, using quantitative methods aligns with the study's positivist paradigm, emphasising objective measurement and empirical testing of hypotheses.

This evidential approach complements the preselected deductive methodology for this research further (Denscombe, 2013) and Baydas *et al*. (2015). The effectiveness of using quantitative methods arises when relationships between variables need explication or results require generalisation with larger populations in mind.

3.6 Collection of Data

In the context of this study on counterfeit drugs and the role of pharmacists in improving drug quality in Nigeria, a web-administered questionnaire presents an efficient and effective method for data collection. The design of this research encompasses data collection, analysis, and interpretation, and a questionnaire-based survey aligns well with the study's objectives (Heath and Tynan, 2010). Rankin *et al*. (2008) highlight that web-administered questionnaires are cost-effective and require fewer resources than other methods, such as observations or interviews, ultimately saving time for researchers. This efficiency becomes crucial during large-scale studies like this one, where reaching significant participation numbers ensures reliable results.

To address the research questions regarding pharmacists' roles in identifying counterfeit drugs, their participation in public awareness campaigns, challenges encountered, and methods to enhance efficiency, a questionnaire is formulated as part of the study design. Using a web-based platform to administer this survey tool will enable a wider audience to reach and comprehensive data gathering.

The questionnaire has been segmented into distinct sections to ensure credibility and precision. Section A will collect basic personal information to understand relevant demographics. Other segments will concentrate on specific topics pertinent to the study, such as pharmacists' contribution towards detecting counterfeit drugs, their participation

in public awareness initiatives, and their challenges. All the questions were derived after analysing the literature review. Every question is structured on a 5-point Likert scale that ranges from Strongly Disagree (**SD**) to Strongly Agree (**SA**), thus enabling quantitative analysis effortlessly. The questionnaire link is distributed through the Pharmacists Council of Nigeria **(PCN),** leveraging their network to reach a wide range of pharmacists. The association's secretary will assist in disseminating the link and encouraging participation, ensuring a broad and representative sample. Participants is informed that completing the questionnaire will take approximately 10 minutes, making it a feasible and manageable task for busy professionals.

3.7 Sampling and Target Population

Choosing the appropriate sampling technique is vital in research to establish the soundness and credibility of the study's outcomes (Bougie and Sekaran, 2019). To begin the sampling process, a stratified approach is used to select four states out of Nigeria's 36 states. Each state is selected from each region (East, West, Midwest, and North) in Nigeria. Stratified random sampling divides a population into smaller groups, called strata, as part of the sampling process (Ding *et al*.,. 1996). This sampling technique ensures that diverse regions are included to gain a broad perspective on the issue at hand.

To account for the significant number of pharmacists in the selected hospitals, about 160 participants are chosen using a random sampling technique. Simple random sampling is a probabilistic technique in which a subset of participants is randomly chosen by the researcher from a population (Noor *et al*., 2022). This approach is beneficial as it guarantees an equal chance of selection for each pharmacist within the selected hospitals (Federal, State, and Local Government Areas hospitals), thereby improving sample representation.

Nigeria's healthcare system consists of various public and private health providers, incorporating both modern and traditional approaches to healthcare (Balogun, 2021). The responsibility for providing adequate care is shared across three levels of government: federal, state, and local. At the federal level, tertiary healthcare falls under their purview, and policies are formulated by the Federal Ministry of Health (FMOH). Specialised services are also offered through teaching hospitals along with federally run medical centres and research institutes (Global Fund to Fight Against AIDS, 2021). On a more

regional scale, State Governments generally handle secondary-level care via general hospitals but occasionally offer tertiary-care options as well at state-owned Teaching Hospitals (Onyeme, 2019). They additionally work in tandem with local government area (LGA) counterparts to implement primary healthcare through coordination provided by each respective region's state primary health care development agency (SPHCDA). Local Government Areas control ward/village health committees while managing an expanded array of supplementary service delivery channels, including numerous patient-oriented establishments such as privately held clinics alongside holistic practices like alternative or traditional medicine methods, all enhancing operational efficiency on behalf of community mobilisation efforts overall throughout Nigeria's diverse population settings (Global Fund to fight against AIDS, 2021).

Adejoro (2023) noted that there are currently 19,000 registered pharmacists in Nigeria according to reports from The Pharmacy Council of Nigeria on September 2, 2023, emphasising why an effective and organised sampling methodology is required to obtain a representative yet manageable sample size. This study will collect data from pharmacists who are already practising in any of the government-owned hospitals.

The determination of sample size is based on multiple aspects. Collis and Hussey (2009) stress the importance of the sample representing the population it comes from, while random sampling enables quantitative evaluation of its likelihood to do so (Maxwell, 2021).

Cochran's sample size formula determines the number of pharmacists needed for this study. Cochran's formula is a reliable tool for determining the necessary sample size to achieve a specific level of precision, confidence, and estimated population proportion. It is particularly useful for large populations, and this formula helps researchers ensure their sample is adequately representative. Cochran (1963) designed this equation to facilitate accurate sample size calculations in such contexts.

$$n_0 = \frac{Z^2 * p * q}{e^2}$$

n_0 represents the sample size, Z^2 is the area under the acceptance region in a normal distribution corresponding to the desired confidence level (1 - α), e^2 denotes the desired level of precision, p is the estimated proportion of an attribute in the population, and q is

simply 1 minus p. Together, these elements help determine the appropriate sample size needed for reliable and accurate results (Cochran, 1963).

$$n_0 = \frac{1.96^2 * 0.116 * 0.884}{0.05^2}$$

= 157.5732122

However, seeking robustness within results necessitates targeting approximately—160 pharmacists with 95% confidence level.

3.8 Reliability and Validity of The Research

reliability and validity are essential for any research study; therefore, it is crucial to ensure the reliability and validity of the data collected.

3.8.1 Reliability

According to Bell, Bryman, and Harley's (2022) definition, reliability pertains to the dependability of a concept measurement. In this research, guaranteeing reliability involves upholding stability in data collection instruments over time. The use of web-based closed-ended questionnaires fosters uniformity since responses are gathered numerically and impartially. This guarantees that recreating equivalent circumstances for undertaking similar studies would yield comparable outcomes, thereby confirming the soundness of employed measurements.

Moreover, the comprehensive record of the research procedure facilitates replication - a crucial element for establishing reliability. Other researchers can recreate this research by following an unambiguous and accurate methodology that not only verifies but also strengthens the dependability of results. Bell, Bryman, and Harley (2022) emphasised how this methodical documentation guarantees transparency and reproducibility throughout the entire study process.

3.8.2 Validity

This research examines multiple forms of validity to ensure the strength of the results.

To attain measurement validity, it is crucial to guarantee the questionnaire's items precisely represent the pertinent concepts. These include pharmacists' roles and drug quality. This requires an extensive analysis of prior literature and consulting professionals to form questions that are comprehensive as well as appropriate.

The causal connection between variables is the focal point of internal validity. By using a structured questionnaire and quantitative analysis, this research effectively establishes associations linking pharmacists' roles with better drug quality. The adoption of a deductive approach that commences from established theories and scrutinises them through data collection strengthens internal validity by furnishing an orderly framework for making inferences about causality.

External validity pertains to the extent of applicability of research outcomes beyond a given setting. Through an extensive and diverse sampling approach targeting Nigerian pharmacists, this study guarantees that its conclusions can be extended to the larger populace. The adoption of web-based surveys enhances broad geographical coverage, hence advancing sample representativeness.

Ecological validity is also considered, as the study seeks to understand pharmacists' practices in their natural settings. By using a survey method, the research captures real-world behaviours and attitudes without the artificial influence of a controlled environment, as discussed by Bryman and Bell (2011).

3.9 Approach to Data Analysis

The collected data were analysed using IBM- SPSS and Microsoft Excel. SPSS is a powerful tool that facilitates comprehensive data analysis by examining various indicators such as reliability, internal consistency, and convergent validity (Hair *et al*., 2016). These indicators are crucial for ensuring that the data collected through the questionnaire is reliable and valid, providing a solid foundation for further analysis.

Descriptive and inferential statistics were employed to analyse the data in this study. The 5-point Likert scale questions were coded and then analysed. Descriptive statistics was

used to summarise respondent characteristics and feedback using techniques such as mean, standard deviation, frequencies, and percentages to present information effectively. Moreover, visual tools like pie charts and bar graphs will also be employed to enhance the readability of demographic data and other key variables.

To provide empirical answers to the research questions, inferential statistics, particularly regression analysis and Pearson Correlation, were used. Regression analysis is suitable for examining relationships between variables, which is central to the research questions (Denscombe, 2007).

Understanding the relationship between the level of pharmacist engagement in public awareness campaigns and the prevention of counterfeit drug circulation requires a statistical technique to establish the strength and significance of such relationships.

SPSS's ability to handle large datasets and perform complex analyses makes it an ideal tool for this study. Moreover, using both descriptive and inferential statistics ensures a comprehensive analysis that addresses the data's immediate characteristics and the deeper, more complex relationships between variables.

The model used to test the hypotheses are:

$$\text{The improvement of drug quality} = \beta_0 + \beta_{(\text{Public Awareness Engagement})} + \beta_{(\text{Use of Technology})} + \varepsilon$$

$$\text{Effectiveness in Preventing Counterfeit Drugs} = \beta_0 + \beta_{(\text{Strength of Regulatory Frameworks})} + \varepsilon$$

3.10 Ethical implications

The research processes adhered to ethical guidelines at every stage, ensuring the protection of participants from unethical behaviour. The informed consent measures were strictly adhered to and the participants were informed the purpose of the study, the procedures to be employed and their rights concerning the survey, which includes withdrawal from the study at their discretion at any time. Explicit consent was obtained from each participant before any data is collected from them.

Since the study only use online survey and signed consent or personal information sheets were not gathered, the following ethical principles and ethics were strictly adhered and observed.

Information about participant identification were kept concealed by safeguarding all the collected data. Some of the measures that were taken involved hacking protection at various levels by encrypting the data and providing access only to a limited cycle of researcher, employees as well as using password- protected equipment.

As soon as the data was collected, basic identifying information was ensured to be masked in other to maintain participants anonymity.

This is to avoid regression of individual responses on the participants involved in the study.

Moreover; there was a normative aspect regarding the storage of the data for the right amount of time: The collected research data were adequately stored for a minimum of two years after the end of the study or longer if there is need for public use as to enable any form of validation of the study result in future without necessarily identifying the participants.

More so, clarity in data management procedure was also preserved across the research process. all participants were informed prior to the study that data were collected, stored and used for research purpose only.

Prioritising the data protective measures and anonymisation during research study procedures enhanced the participants confidence and willingness to adhere to the protocols.

Finally, the study respected the strict set laws and regulation on the data protection. including the GDPR for the European region among others.

This also include keeping relevant ethical clearance or permission from the concerned institutional review boards or ethical committee before adventuring into the research study.

CHAPTER FOUR

FINDINGS AND ANALYSIS

4.1. Introduction

This chapter presents the findings from the analysis aimed at examining the role of pharmacists in enhancing drug quality in Nigeria. Being quantitative research, to address the research questions effectively, this study designed a comprehensive questionnaire administered via a web-based platform to ensure extensive reach and thorough data collection.

The research questions of this study are:

i. What are the roles of pharmacists in detecting and preventing the circulation of counterfeit drugs?
ii. What is the relationship between the level of pharmacist engagement in public awareness campaigns and the prevention of counterfeit drug circulation?
iii. What are the challenges and barriers pharmacists face in improving drugs quality and combating counterfeit drugs?
iv. To determine the perceptions of pharmacists on the impact of technology in identifying counterfeit drugs.
v. What are the ways to enhance the role of pharmacists in improving drugs quality and reducing the prevalence of counterfeit drugs in Nigeria?

The survey is comprised of two distinct parts. The initial part collects demographic data, and this part of the questionnaire were analysed using descriptive statistics. The subsequent segment consisted of statements that aligned with the study's objectives, which were expressed on a Likert scale ranging from Strongly Agree **(SA)** to Strongly Disagree (**SD**).

This part will also be analysed using descriptive statistics like frequencies and percentages before testing the hypotheses with data.

According to Cochran's (1963) prescribed sample design, the questionnaire targets 160 pharmacists employed in **federal, state and local government area hospitals in four of Nigeria's 36 states.** This study targets 40 pharmacists in **Lagos, Rivers, Kano, and Oyo** states. The questionnaire link was administered through the Pharmacists Council of Nigeria **(PCN)** platform, which was facilitated by the secretary of PCN in each state, and

the secretaries supported and advocated for participation by Pharmacists, a satisfactory response rate of 142 respondents consented to participate in the study by completing the Google Forms. The raw data was downloaded using Microsoft Excel format, and all responses were summarised and cleansed before being analysed using IBM's Statistical Package for Social Sciences (SPSS).

Furthermore, to achieve the purpose of the study, this study only uses the responses of pharmacists who give their consent and the pharmacists who confirm that they are familiar with counterfeit drug issues in Nigeria.

The two respondents who revealed that they were not so familiar with counterfeit drug issues in Nigeria were removed. This resulted in using valid feedback from 140 pharmacists, accounting for an 87.5% response rate. This response rate is adjudged excellent for data analysis, as stated by Mugenda and Mugenda (2007). All the sections of the questionnaire were summarised using mean and standard deviation techniques. Moreover, inferential statistics like Pearson correlation and linear regression were used to test the hypotheses. The last section of this chapter focusses on a discussion of findings where the findings of this study were related to the literature review. The research hypotheses that were tested in this study are.

H_1: There is no significant impact pharmacists' engagement in public awareness campaigns and the use of advanced technological tools on the improvement of drug quality.

H_2: There is no significant relationship between public awareness campaigns and counterfeit drug prevention.

H_3: The strength of regulatory frameworks does not significantly influence pharmacists' effectiveness in preventing the circulation of counterfeit drugs in Nigeria.

4.2. Demographic Characteristics

Table 4.1: Highest Level of Education:

	Frequency (Number)	Percent
Bachelor's Degree	32	22.9
Master's Degree	63	45.0
Doctoral Degree	31	22.1
Others	14	10.0
Total	140	100.0

Source: Research Computation (2024)

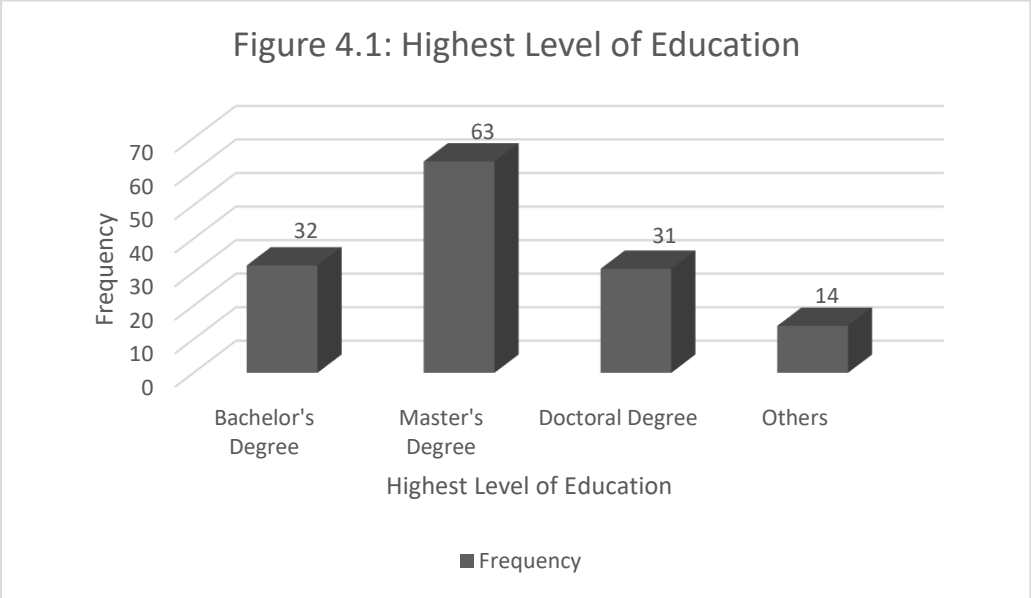


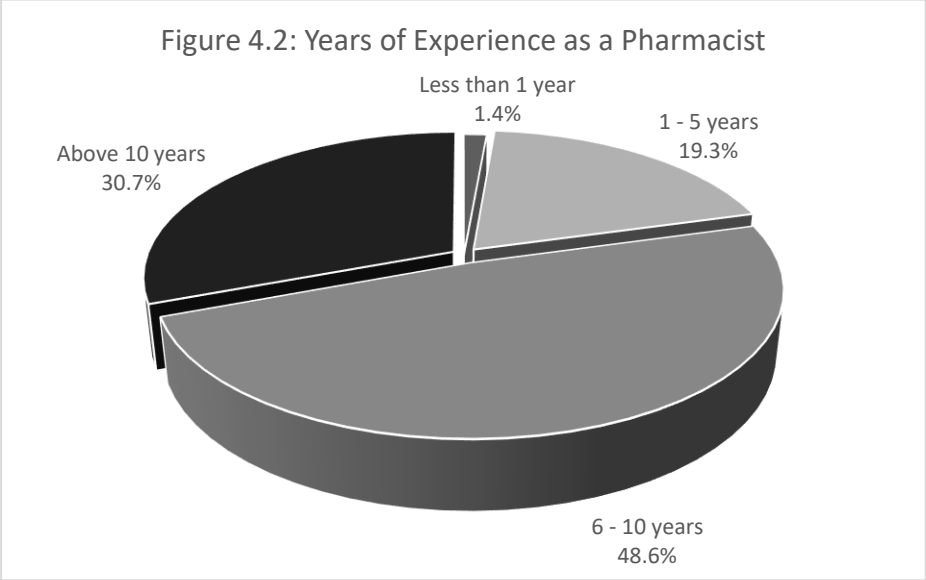
Table 4.1 and Figure 4.1 represent the frequency and percentage distribution of the pharmacists who took part in the study.

Out of the 160 pharmacists, 32 (22.9%) possess bachelor's degrees, followed by 63 (45.0%), with master's degrees being the highest. While 31 pharmacists hold doctoral degrees, representing 22.1%, the remaining 14 pharmacists, representing 10%, possess other educational levels. This showed that all the pharmacists who participated in the study are educationally qualified; hence, their responses will generate a realistic outcome for the study.

Table 4.2: Years of Experience as a Pharmacist:

	Frequency (Number)	Percent
Less than 1 year	2	1.4
1 - 5 years	27	19.3
6 - 10 years	68	48.6
Above 10 years	43	30.7
Total	140	100.0

Source: Research Computation



The level of experience among pharmacists is highly relevant to the study's focus on the impact of counterfeit drugs on patients and the role of pharmacists in improving drug quality in Nigeria.

Table 4.2 and **Figure 4.2** represent the frequency and percentage distribution of the number of years of experience that the 140 pharmacists who participated in the study possess. Only 2, representing 1.4% of the pharmacists, have less than one year of experience. 27 pharmacists, representing 19.3% of the pharmacists that took part in the study, have between 1 and 5 years of experience. 68 pharmacists (48.6%), the largest proportion of the pharmacists, possess 6- and 10-years' experience, while the remaining 43, at 30.7% of the participants, have more than 10 years of professional experience.

The descriptive analysis of the participants' years of experience provides a significant foundation for the study, highlighting the extensive professional background of the pharmacists involved. This high level of experience enhances the credibility of the findings, ensuring that the study's conclusions are well-informed and reliable. By capturing the perspectives of experienced pharmacists, the study is better positioned to offer valuable insights and practical recommendations for addressing the challenges posed by counterfeit drugs and improving drug quality in Nigeria.

4.3: Answering of Research Questions

Descriptive statistics is used in this section to analyse the variables used to align with the study's objectives. Using techniques such as frequency, percentage, mean, and standard deviation, each statement of the variables was analysed for vivid understanding, as shown in the Tables.

4.3.1 What are the roles of pharmacists in detecting and preventing the circulation of counterfeit drugs?

Table 4.3: **The Roles of Pharmacists in Detecting Counterfeit Drugs**

	Strongly Agree		Agree		Undecided		Disagree		Strongly Disagree		Mean	Std. dev.
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%		
Pharmacists play a critical role in identifying counterfeit drugs through their daily interactions with patients.	109	77.9	30	21.4	0	0.0	0	0.0	1	0.7	1.24	0.521
Public awareness campaigns led by pharmacists can effectively reduce the prevalence of counterfeit drugs in Nigeria.	113	80.7	27	19.3	0	0.0	0	0.0	0	0.0	1.19	0.396
Regular inspection of medications by pharmacists is effective in detecting counterfeit drugs.	106	75.7	34	24.3	0	0.0	0	0.0	0	0.0	1.24	0.43
The collaboration between pharmacists and regulatory bodies like NAFDAC is vital in combating counterfeit drugs in Nigeria.	122	87.1	18	12.9	0	0.0	0	0.0	0	0.0	1.13	0.336
Implementing rigorous inventory management and regular inspection of medications by pharmacists can significantly reduce the circulation of counterfeit drugs.	119	85.0	19	13.6	2	1.4	0	0.0	0	0.0	1.16	0.409

The study surveyed 140 pharmacists across **Lagos, Rivers, Kano**, and **Oyo** states, yielding data revealing pharmacists' critical roles in this vital area.

Table 4.3 represents the findings from the descriptive statistics of the roles of pharmacists in detecting counterfeit drugs. 139 pharmacists, representing 99.3% of the pharmacists in the study, strongly agreed that pharmacists play a critical role in identifying counterfeit drugs through their daily interactions with patients. This is reflected in the mean and standard deviation values of 1.24 and 0.521, respectively. The 140 pharmacists (100%) agreed and agreed that public awareness campaigns led by pharmacists have effectively reduced the prevalence of counterfeit drugs in Nigeria, as indicated by the 1.19 mean and 0.396 standard deviations. Similarly, all 140 pharmacists (100%) agreed that regular pharmacist inspection of medications is effective in detecting counterfeit drugs, as shown by the mean value of 1.24 and 0.43 standard deviation. As seen by the mean (1.13), and standard deviation (0.336), the 140 pharmacists also strongly agreed and agreed that the collaboration between pharmacists and regulatory bodies like NAFDAC is vital in combatting counterfeit drugs in Nigeria. Finally, 138, representing 98.6% of the pharmacists in the study strongly agreed and agreed that implementing rigorous inventory management and regular inspection of medications by pharmacists can significantly reduce the circulation of counterfeit drugs, with a mean and standard deviation of 1.16 and 0.409, respectively.

The high levels of agreement across all measured roles underscore the multifaceted contributions of pharmacists in those areas. Pharmacists' daily interactions with patients, public awareness efforts, routine inspections, collaboration with regulatory bodies, and rigorous inventory management collectively form a comprehensive strategy against counterfeit drugs. The alignment of these descriptive statistics with the research question provides clear evidence that pharmacists are crucial in detecting and preventing counterfeit drugs, thereby supporting the study's objectives and enhancing its overall credibility.

4.3.2 What are the ways to enhance the role of pharmacists in improving drug quality and reducing the prevalence of counterfeit drugs in Nigeria?

Table 4.4: The roles of Pharmacists in preventing the circulation of counterfeit drugs

	Strongly Agree		Agree		Undecided		Disagree		Strongly Disagree		Mean	Std. dev.
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%		
Advanced technological tools and methods are necessary for pharmacists to effectively prevent counterfeit drugs.	112	80.0	27	19.3	0	0.0	0	0.0	1	0.7	1.22	0.51
The enforcement of strict drug laws can significantly enhance the ability of pharmacists to prevent counterfeit drug circulation.	99	70.7	40	28.6	0	0.0	1	0.7	0	0.0	1.31	0.507
The lack of resources and weak regulatory enforcement significantly hinder pharmacists' efforts to prevent counterfeit drugs.	97	69.3	42	30.0	0	0.0	0	0.0	1	0.7	1.33	0.555
The enforcement of strict drug laws can significantly enhance the ability of pharmacists to control counterfeit drug circulation.	99	70.7	40	28.6	0	0.0	1	0.7	0	0.0	1.31	0.507
Regular training and education for pharmacists are essential in enhancing their ability to detect counterfeit drugs.	92	65.7	47	33.6	0	0.0	1	0.7	0	0.0	1.36	0.524

The descriptive analysis of the roles of pharmacists in preventing the circulation of counterfeit drugs offers insightful data that help address the research question**.**

Table **4.4** above presents the findings from the roles of pharmacists in preventing the circulation of counterfeit drugs in Nigeria. 139 (99.3%) agreed and strongly agreed that advanced technological tools and methods are necessary for pharmacists to effectively prevent counterfeit drugs, as confirmed by the mean value of 1.22 and standard deviation of 0.51. By the mean value of 1.31 and standard deviation of 0.507, 139 pharmacists, representing 99.3% of the pharmacists in the study, strongly agreed and agreed that enforcing strict drug laws can significantly enhance the ability of pharmacists to prevent counterfeit drug circulation. 139 (99.3%) of the pharmacists also agreed and strongly

agreed that the lack of resources and weak regulatory enforcement significantly hinder pharmacists' efforts to prevent counterfeit drugs. This is as seen by the mean (1.33) and standard deviation (0.555).

Furthermore, the 139 pharmacists (99.3%) strongly agreed that enforcing strict drug laws can significantly enhance the ability of pharmacists to control counterfeit drug circulation, as seen by the mean value of 1.31 and standard deviation of 0.507.

Finally, by the mean and standard deviation values of 1.36 and 0.524, respectively, regular training and education for pharmacists are essential in enhancing their ability to detect counterfeit drugs, as strongly agreed and agreed by the 139 (99.3%) pharmacists who partook in the study. This, therefore, shows that pharmacists play a vital role in preventing the circulation of counterfeit drugs through the usage of advanced technological tools and methods, enforcement of strict drug laws, and their regular training and education, as 139 pharmacists (99.3) agreed with all the statements in table **4.4** above.

The descriptive analysis illustrates pharmacists' crucial roles in preventing counterfeit drug circulation. By leveraging advanced technologies, advocating for stringent drug laws, ensuring sufficient resources, and participating in continuous education, pharmacists can significantly improve drug quality in Nigeria. These findings provide a strong evidence base for recommendations to strengthen the roles of pharmacists and enhance the overall drug regulatory framework.

4.3.3 What is the relationship between the level of pharmacist engagement in public awareness campaigns and the prevention of counterfeit drug circulation?

Table 4.5: The level of Pharmacists Engagement in Public Awareness Campaigns about counterfeit drugs

	Strongly Agree		Agree		Undecided		Disagree		Strongly Disagree		Mean	Std. dev.
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%		
I actively participate in community outreach programmes to inform the public about counterfeit drugs.	94	67.2	38	27.1	0	0.0	3	2.1	5	3.6	1.48	0.901
Increased pharmacist involvement in public awareness campaigns can significantly enhance the quality of	95	67.9	42	30.0	1	0.7	0	0.0	2	1.4	1.37	0.65

medicines available in Nigeria.												
I believe that increasing public knowledge about counterfeit drugs can significantly decrease their prevalence.	97	69.3	39	27.9	2	1.4	1	0.7	1	0.7	1.36	0.624
Pharmacists have a responsibility to inform patients about the risks associated with counterfeit drugs through awareness campaigns.	107	76.4	32	22.9	0	0.0	1	0.7	0	0.0	1.25	0.482
Public awareness campaigns by pharmacists have led to increased trust in the healthcare system and pharmaceutical products among Nigerians.	108	77.1	31	22.2	0	0.0	0	0.0	1	0.7	1.25	0.525

The descriptive analysis results offer clear insights into the relationship between the level of pharmacist engagement in public awareness campaigns and the prevention of counterfeit drug circulation.

Table 4.5 above represents the analysis of the statements on the level of pharmacists' engagement in public awareness campaigns about counterfeit drugs. As reflected by the mean value of 1.48 and standard deviation of 0.901, 132 pharmacists (94.3%) strongly agreed and agreed they actively participate in community outreach programmes to inform the public about counterfeit drugs. 137 pharmacists, representing 97.9%, strongly agreed that increased pharmacist involvement in public awareness campaigns could significantly enhance the quality of medicines available in Nigeria by the mean (1.37) and standard deviation (0.65). 136 (97.2%) of the pharmacists strongly agreed that increasing public knowledge about counterfeit drugs can significantly decrease their prevalence, as seen by the mean 1.36 and standard deviation of 0.624. Also, by the mean of 1.25 and standard deviation of 0.482, 139 pharmacists (99.3%) strongly agreed and agreed that pharmacists are responsible for informing patients about the risks associated with counterfeit drugs through awareness campaigns. Lastly, the 139 (99.3%) pharmacists strongly agreed and agreed that public awareness campaigns by pharmacists have led to increased trust in the healthcare system and pharmaceutical products in Nigeria. The mean value is represented by 1.27, and the standard deviation is 0.525. The findings from this section thus reveal that pharmacists' engagement in public awareness campaigns about counterfeit drugs is

considerably high. It has significantly enhanced the quality of medicines in Nigeria, decreased the prevalence of counterfeit drugs, and led to increased trust in the healthcare system and pharmaceutical products among Nigerians as supported by over 97.5% of the participants. The descriptive analysis reveals a strong relationship between the level of pharmacist engagement in public awareness campaigns and the prevention of counterfeit drug circulation. The data indicate that pharmacists are highly engaged in community outreach and educational efforts, which they believe are crucial for improving drug quality and reducing counterfeit drug prevalence. Their active participation in these campaigns educates the public and fosters trust in the healthcare system.

4.3.4 What are the challenges and barriers pharmacists face in improving drug quality and combating counterfeit drugs?

Table 4.6: The challenges and barriers faced by Pharmacists in combating counterfeit drugs

	Strongly Agree		Agree		Undecided		Disagree		Strongly Disagree		Mean	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%		
Limited access to advanced technology and equipment hinders pharmacists' ability to identify and combat counterfeit drugs.	102	72.9	30	21.4	0	0.0	6	4.3	2	1.4	1.4	0
Insufficient training and continuous professional development are significant barriers for pharmacists in detecting counterfeit drugs.	87	62.1	39	27.9	0	0.0	6	4.3	8	5.7	1.64	1
The financial constraints faced pharmacists' organisations limit their ability to effectively combat counterfeit drugs and improve drug quality.	88	62.9	40	28.6	3	2.1	7	5.0	2	1.4	1.54	0
There is insufficient regulatory support for pharmacists to combat counterfeit drugs effectively	87	62.2	37	26.4	1	0.7	8	5.7	7	5.0	1.65	1
The workload and responsibilities of pharmacists impede their ability to focus on improving drug quality and combating counterfeit drugs	88	62.9	40	28.6	2	1.4	7	5.0	3	2.1	1.55	0

The descriptive analysis of the data provides a detailed understanding of the challenges and barriers pharmacists face in improving drug quality and combating counterfeit drugs in Nigeria.

Table 4.6 above represents the frequency, percentage, mean, and standard deviation distribution of the participants' responses on the challenges and barriers pharmacists face in combating counterfeit drugs. 132 (94.3%) pharmacists strongly agreed that limited access to advanced technology and equipment hinders pharmacists' ability to identify and combat counterfeit drugs, as reflected by the mean value of 1.4 and standard deviation of 0.821. Insufficient training and continuous professional development were strongly agreed upon as being significant barriers for pharmacists in detecting counterfeit drugs by 126 (90%) pharmacists. By the mean of 1.54 and a standard deviation of 0.877, 128 pharmacists (representing 91.5%) strongly agreed and agreed that the financial constraints faced by pharmacists' organisations limit their ability to combat counterfeit drugs and improve drug quality effectively. 124 pharmacists, representing 88.6%, strongly agreed that pharmacists have sufficient regulatory support to combat counterfeit drugs effectively, as seen by the mean (1.65) and standard deviation (1.092). Lastly, the response from 128 (91.5%) clearly shows that the workload and responsibilities of pharmacists impede their ability to focus on improving drugs and combating counterfeit drugs by their strongly agreed and agreed response as affirmed by the mean and standard deviation values of 1.55 and 0.916 respectively. The pharmacists, therefore, identified limited access to advanced technology as a hindrance to identifying counterfeit drugs. Other identified challenges and barriers towards combating counterfeit drugs are insufficient training and continuous professional development, financial constraints, insufficient regulatory support, and workload responsibilities.

The results of the descriptive analysis provide an understanding of the challenges pharmacists face in improving drug quality and combating counterfeit drugs in Nigeria. The high levels of agreement across various statements underscore the significant barriers that need to be addressed to enhance pharmacists' effectiveness in their roles. These insights validate the research findings and highlight critical areas for intervention, such as improving access to technology, providing on going trainings, increasing financial support and reducing workload pressure.

4.3.5 What are pharmacists' perceptions of the impact of technology in identifying counterfeit drugs?

Table 4.7: Pharmacists' perceptions on technology's impact in identifying counterfeit.

	Strongly Agree		Agree		Undecided		Disagree		Strongly Disagree		Mean	Std. dev.
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%		
Mobile Authentication Services (MAS) effectively identify counterfeit drugs and improve patient safety.	101	72.2	37	26.4	0	0.0	1	0.7	1	0.7	1.31	0.589
Integrating advanced technologies like Radio Frequency Identification (RFID) and MAS into pharmacy practice is crucial for combating counterfeit drugs in Nigeria.	109	77.9	27	19.3	0	0.0	2	1.4	2	1.4	1.29	0.684
Implementing MAS in pharmacies has led to a noticeable reduction in the circulation of counterfeit drugs.	93	66.5	41	29.3	1	0.7	3	2.1	2	1.4	1.43	0.75
Using SMS text messages from mobile phones significantly enhances the ability to authenticate the quality of drugs.	90	64.3	42	30.0	1	0.7	6	4.3	1	0.7	1.47	0.781
I feel confident in using technology to identify and report counterfeit drugs.	85	60.8	42	30.0	1	0.7	3	2.1	9	6.4	1.64	1.074

The descriptive analysis of pharmacists' perceptions of the impact of technology in identifying counterfeit drugs provides valuable insights into the potential and challenges associated with technological integration in the fight against counterfeit drugs in Nigeria.

Table 4.7 above represents the descriptive statistics of the responses of the 140 pharmacists who participated in the study on their perception of pharmacists on the impact of technology in identifying counterfeits. 138 (98.6%) of the pharmacists strongly agreed

that mobile authentication services (**MAS)** effectively identify counterfeit drugs and improve patient safety, as seen by the mean of 1.31 and standard deviation of 0.589. 136 (97.2%) strongly agreed and agreed that integrating advanced technologies like radio frequency identification (**RFID)** and **MAS** into pharmacy practice is crucial for combating counterfeit drugs in Nigeria, with a mean of 1.29 and a standard deviation of 0.684. By the mean (1.43) and standard deviation (0.75), 134 (95.8%) strongly agreed and agreed that implementing **MAS** in pharmacies has led to a noticeable reduction in the circulation of counterfeit drugs. 132 (94.3%) of the pharmacists strongly agreed that using SMS text messages from mobile phones significantly enhances the ability to authenticate the quality of drugs, as seen by the mean value 1.47 and standard deviation 0.781. Lastly, 127 (90.8%) pharmacists strongly agreed that they feel confident in using technology to identify and report counterfeit drugs by the mean (1.64) and standard deviation (1.074). The findings, therefore, reflect that technologies such as **MAS, RFID**, and **SMS** were perceived to have greatly impacted the identification of counterfeit drugs by pharmacists in Nigeria and have reduced the circulation of counterfeit drugs.

The descriptive analysis demonstrates that pharmacists in Nigeria perceive technology as a critical tool in combating counterfeit drugs. The strong support for **MAS, RFID**, and **SMS-**based authentication reflects a recognition of their potential to improve drug quality and patient safety significantly. However, the findings also highlight the need for continuous professional development and training to build confidence and competence in using these technologies. Addressing these needs can enhance pharmacists' effectiveness in identifying and preventing the circulation of counterfeit drugs, thereby contributing to improving drug quality in Nigeria.

4.4: Testing of Hypotheses

Hypothesis One

H_0: There is no significant impact pharmacists' engagement in public awareness campaigns and the use of advanced technological tools on the improvement of drug quality.

$H_{1:}$ Pharmacists' engagement campaigns and the use of advanced technological tools significantly impact the improvement of drug quality.

Table 4.8: **Parameter Estimates**							
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**		
Intercept	1	0.56843	0.07097	8.01	<.0001	**R-Square**	0.6979
Pharmacists' engagement in public awareness campaigns	1	0.45497	0.04364	10.42	<.0001	**Adj R-Sq**	0.6935
The use of advanced technological tools	1	0.11559	0.03460	3.34	0.0011		

a**. Predictors: (Constant), The improvement of drug quality**

The effect of pharmacists' engagement in public awareness campaigns and the use of advanced technological tools to improve drug quality in Nigeria is summarised in **Table 4.8;** the explanatory power is high, which shows that the model is a good fit. The R-Square value of 0.6979 indicates that approximately 69.79% of the variance in improving drug quality explains pharmacists' engagement in public awareness campaigns and using advanced technological tools. The Adjusted R-Square value of 0.6935 adjusts for the number of predictors in the model, accounting for the number of predictors in the model, but still indicates that the model explains a substantial portion of the variance.

As shown in **Table 4.8,** the model coefficients of β_0 (Intercept) are 0.56843, pharmacists' engagement in public awareness campaigns is 0.45497, and the use of advanced technological tools is 0.11559. This shows that the estimated pharmacist's engagement in public awareness campaigns and the use of advanced technological tools to improve drug quality in Nigeria is:

The improvement of drug quality = 0.56843 + 0.45497 (Pharmacists' engagement in public awareness campaigns) + 0.11559 (The use of advanced technological tools) …. 4.1

The intercept value is 0.56843, with a t-value of 8.01 and a p-value of <.0001. This indicates that when both variable pharmacists' engagement in public awareness campaigns and the use of advanced technological tools) are zero, the predicted improvement in drug quality is 0.56843. The intercept is statistically significant, as indicated by the p-value less

than 0.0001, suggesting that the baseline drug quality improvement level is different from zero.

The parameter estimates pharmacists' engagement in public awareness campaigns is 0.45497, with a standard error of 0.04364, a t-value of 10.42, and a p-value of <.0001. This suggests a positive and statistically significant relationship between pharmacists' engagement in public awareness campaigns and improving drug quality. This also implies that for each unit in pharmacists' engagement in public awareness campaigns, there is a corresponding increase of 0.45497 units in improving drug quality.

The parameter estimates for using advanced technological tools is 0.11559, with a standard error of 0.03460, a t-value of 3.34, and a p-value of 0.0011. This indicates a positive and statistically significant relationship between the use of advanced technological tools and the improvement of drug quality, which implies that for each unit increase in the use of advanced technological tools, there is a corresponding increase of 0.11559 units in the improvement of drug quality.

Table 4.9: Regression of Coefficients

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	27.37435	13.68718	158.28	<.0001
Error	137	11.84708	0.08648		
Corrected Total	139	39.22143			

a. Dependent Variable: The improvement of drug quality

b. Predictors: Pharmacists' engagement in public awareness campaigns, The use of advanced technological tools

The p-value associated with the F-statistic is <.0001, indicating that the overall regression model is statistically significant. This means that at least one of the predictors is significantly related to the dependent variable. The very low p-value (<.0001) suggests that the regression model significantly predicts the dependent variable, improving drug quality. The pharmacists' engagement in public awareness campaigns and the use of advanced technological tools statistically significantly impact improving drug quality in Nigeria.

Given the significance of the F-statistic and the low p-value, we reject the null hypothesis that there is no significant impact pharmacists' engagement in public awareness campaigns

and the use of advanced technological tools to improve drug quality in Nigeria. The data supports the alternative hypothesis, which states a significant impact.

The regression analysis indicates that pharmacists' engagement in public awareness campaigns and using advanced technological tools significantly improve drug quality in Nigeria. The significant F-statistic and the associated p-value confirm that the model is a good fit and that these predictors enhance drug quality.

Hypothesis Two

H_0: There is no significant relationship between public awareness campaigns and counterfeit drug prevention.

H_1: There is a significant relationship between public awareness campaigns and counterfeit drug prevention.

Correlation analysis was used to assess the relationship between the level of the study's 140 pharmacists' engagement in public awareness campaigns and the prevention of counterfeit drug circulation in Nigeria. Table 4.10 presents the outcome of the relationship between the two variables.

Table 4.10: Correlations

		Public Awareness Campaign	Counterfeit Drug Prevention
Public Awareness Campaign	Pearson Correlation	1	.689**
	Sig. (2-tailed)		.000
	N	140	140
Counterfeit Drug Prevention	Pearson Correlation	.689**	1
	Sig. (2-tailed)	.000	
	N	140	140

. **Correlation is significant at the 0.01 level (2-tailed).

By the Pearson correlation coefficient of 0.689 at p-value < 0.05, the level of the pharmacist's engagement in public awareness has a strong and significant positive relationship with counterfeit drug prevention. This shows that an increase in pharmacists' engagement in public awareness campaigns will strongly increase the prevention of counterfeit drug circulation in Nigeria. The p-value < 0.05 shows strong evidence of the level of significance of the relationship between the pharmacists' engagement in public awareness campaigns and counterfeit drug prevention. From the analysis presented in Table 4.10, an increase in the Public Awareness Campaign by pharmacists will lead to an increase in the prevention of counterfeit drug circulation in Nigeria.

Given the Pearson Correlation coefficient of 0.689 and the p-value of 0.000, we reject the null hypothesis that there is no significant relationship between public awareness campaigns and counterfeit drug prevention. The data supports the alternative hypothesis that there is a significant relationship between public awareness campaigns and counterfeit drug prevention.

Hypothesis Three

H_0: The strength of regulatory frameworks does not significantly influence pharmacists' effectiveness in preventing the circulation of counterfeit drugs in Nigeria.

H_1: The strength of regulatory frameworks significantly influences pharmacists' effectiveness in preventing the circulation of counterfeit drugs in Nigeria.

Table 4.11: Significance of the strength of regulatory frameworks pharmacists'' effectiveness in preventing the circulation of counterfeit drugs in Nigeria.						**Model Summary**	
Variable	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**Standardised Estimate**		
Intercept	1	0.86540	0.07330	11.81	<.0001	**R-Square**	0.5133
Pharmacists' engagement in public awareness campaigns	1	0.38700	0.03208	12.06	<.0001	**Adj R-Square**	0.5098

a. Predictors: (Constant), **The strength of regulatory frameworks.**
b. Dependent Variable**: Pharmacists' effectiveness in preventing the circulation of counterfeit drugs in Nigeria.**

The strength of regulatory frameworks = 0.86540 + 0.38700 (Pharmacists' engagement in public awareness campaigns) …. 4.2

Table 4.11 presents the model summary, the extent to which the strength of regulatory frameworks accounts for the variance in pharmacists' effectiveness in preventing the circulation of counterfeit drugs in Nigeria. The R-square is 0.5133, which implies that approximately 51.33% of the pharmacists' effectiveness in preventing the circulation of counterfeit drugs in Nigeria can be explained by the strength of regulatory frameworks. This is a moderate to strong explanatory power, suggesting that the regulatory frameworks significantly determine pharmacists' effectiveness. The adjusted R-Square value of 0.5098 indicates that the model is well-fitted, and the number of predictors does not inflate the explanatory power of the independent variable.

The intercept value of 0.86540 represents the expected value pharmacists' effectiveness in preventing counterfeit drugs when the strength of regulatory frameworks is zero. This serves as a baseline for the regression equation. The parameter estimate for the strength of regulatory frameworks is 0.38700. This coefficient indicates that for every unit increase in the strength of regulatory frameworks, there is an expected increase of 0.387 units pharmacists' effectiveness in preventing the circulation of counterfeit drugs. This positive coefficient suggests that stronger regulatory frameworks enhance pharmacists' effectiveness.

The large t-value (11.81) and the extremely small p-value (<.0001) indicate that the effect of the strength of regulatory frameworks on pharmacists' effectiveness is statistically significant. The regression analysis confirms that stronger regulatory frameworks are significantly effective in preventing the circulation of counterfeit drugs in Nigeria. This reveals the importance of robust regulatory measures in improving drug quality and safeguarding public health. By prioritising strengthening regulatory frameworks, stakeholders can significantly reduce the prevalence of counterfeit drugs and protect patients from their harmful effects.

4.5 Discussion of Findings

The roles of pharmacists in detecting and preventing the circulation of counterfeit drugs in Nigeria.

The findings of this study highlight the critical role pharmacists play in detecting and preventing the circulation of counterfeit drugs in Nigeria. This study highlights that pharmacists are highly involved in community outreach and educational initiatives, which they perceive as vital for enhancing drug quality and curbing the prevalence of counterfeit drugs. Their active participation in these campaigns educates the public and builds trust in the healthcare system. This finding supports the literature on the vital role pharmacists play in combating counterfeit drugs; Erah and Opara (2020eemphasisee the critical role of knowledgeable and alert pharmacists in the prevalence of counterfeit drugs within their communities. The study's findings reinforce their assertion by demonstrating that pharmacists' proactive measures effectively detect and prevent counterfeit drugs. Auta *et al*. (2014) highlight that pharmacists are on the frontline of healthcare delivery and are pivotal in ensuring drug safety. Also, Mdege *et al*. (2016) argue that pharmacists' professional expertise enables them to interact with patients, the public, and other healthcare stakeholders to control counterfeit drug circulation. The findings of this study align with this perspective, pharmacists' interactions with patients and collaboration with regulatory bodies were highlighted as key strategies in combating counterfeit drugs.

While the findings generally align with the existing literature, there are areas where this study provides new insights or contrasts with previous research. For instance, Joda *et al*. (2017) highlights the high prevalence of counterfeit drugs in Nigeria, estimating that up to 17% of drugs in circulation are counterfeit. This study corroborates the significant threat posed by counterfeit drugs but further quantifies pharmacists' specific roles in mitigating this issue. Moreover, while Eruaga *et al*. (2024) emphasise the need for stricter regulations and enforcement mechanisms, this study highlights the immediate and practical contributions pharmacists can make through daily interactions and routine inspections. Onwujekwe *et al*. (2018) argue that inadequate regulatory frameworks and limited resources can impede pharmacists' ability to combat counterfeit drugs effectively. This perspective contrasts our study, which found that strong regulatory frameworks significantly enhance pharmacists' effectiveness.

The findings of this study reveal the pivotal role that pharmacists can play in enhancing drug quality and curbing the prevalence of counterfeit drugs in Nigeria. This aligns with Mackey and Nayyar (2017), who noted that incorporating technology in the pharmaceutical sector could significantly reduce counterfeit drug circulation by improving drug authentication processes. Mdege *et al*. emphasise the importance of pharmacists' professional expertise in combating counterfeit drugs, which aligns with the high levels of agreement in this study pharmacists' roles in preventing counterfeit drug circulation.

Challenges and barriers faced by pharmacists in improving drug quality and combating counterfeit drugs.

The findings from this study provide a detailed understanding of the challenges and barriers pharmacists face in improving drug quality and combating counterfeit drugs in Nigeria. Financial constraints also emerged as a significant challenge in this study, corroborating the findings of Oluyemi and Omoniyi (2018). They highlight that inadequate financial support from both government and private sectors limits the capacity of pharmacists to perform their duties effectively, including the implementation of robust counterfeit drug prevention measures. Erah and Opara (2020) identify similar barriers, noting that inadequate access to technology, insufficient training, and limited financial support significantly hinder pharmacists' ability to detect and prevent counterfeit drugs. The results of this study corroborate these findings emphasising that these challenges are prevalent and require immediate attention to enhance pharmacists' effectiveness. In the study of Joda *et al*. (2017), the issue of workload pressures is also highlighted as a critical barrier. They argue that pharmacists often face overwhelming workloads that limit their capacity to engage in essential activities like public awareness campaigns and rigorous inspection processes. This study's findings align with their observations, indicating that reducing workload pressures is crucial for improving pharmacists' efficiency in combating counterfeit drugs. While many studies agree on the significant barriers pharmacists face, Ndubuisi (2021) advocates for a more decentralised approach to fighting counterfeit drugs, suggesting that empowering local communities and leveraging grassroots networks could mitigate some of the challenges identified in this study. Adekoya and Ekeh (2021) present a slightly different perspective. They argue that while access to technology and training are crucial, the organisational culture within pharmacies also plays a critical role in

combating counterfeit drugs. According to their research, fostering a culture of vigilance and ethical responsibility among pharmacists can significantly enhance the overall effectiveness of anti-counterfeit efforts, even in the face of resource limitations.

The perceptions of pharmacists on the impact of technology in identifying counterfeit drugs.

The results of this study provide a comprehensive view of how pharmacists in Nigeria perceive the role of technology in combating counterfeit drugs. The descriptive analysis indicates a strong endorsement of advanced technological tools such as Mobile Authentication Service (MAS), Radio Frequency Identification (RFID), and SMS-based authentication. This aligns with existing literature that emphasises the transformative potential of these technologies in enhancing drug quality and ensuring patient safety. Also, the study by Chika *et al*. (2022) and Erah *et al*. (2019) emphasises the transformative potential of advanced technologies in the pharmaceutical sector. They argue that tools like **MAS** and **RFID** improve the traceability of pharmaceutical products and empower pharmacists to verify the authenticity of drugs efficiently. This study supports their findings, demonstrating that Nigerian pharmacists recognise and value the impact of these technologies.

Furthermore, the research by Oparah and Enato (2020) underscores the significant benefits of SMS-based authentication systems in low-resource settings, where access to advanced technological infrastructure may be limited. The positive perception of SMS-based authentication among pharmacists in this study echoes their findings, suggesting that simple yet effective technological solutions can make a substantial difference in counterfeit drug prevention. The findings of this study also resonate with those of Mackey and Liang (2016), who stress the importance of SMS-based authentication, which allows consumers to verify drug authenticity instantly, thus empowering patients and pharmacists alike to detect counterfeit drugs efficiently. However, Eze *et al*. (2021) caution that while technology is crucial, it must be complemented by robust regulatory frameworks and continuous professional development to ensure its effectiveness.

Pharmacists' engagement campaigns and the use of advanced technological tools on the improvement of drug quality.

The findings of this study affirm the hypothesis that pharmacists' engagement in public awareness campaigns and the use of advanced technological tools significantly impact drug quality improvement in Nigeria. The results align well with existing research. For instance, Mackey *et al*. (2015) highlight the importance of public awareness campaigns in educating pharmacists and the public about the dangers of counterfeit drugs. Chika *et al*. (2022) and Erah *et al*. (2019) emphasised the importance of pharmacists in public health initiatives, particularly in raising awareness about the dangers of counterfeit drugs. Thus, study's finding that public awareness campaigns led by pharmacists significantly improve drug quality corroborates their conclusions. Chika *et al*. noted that pharmacists' direct engagement with the community helps to disseminate crucial information that can prevent the circulation of counterfeit drugs, a view that our study supports through empirical data.

Similarly, Adebayo and Hussain (2018) reveal the critical role of advanced technological tools, such as MAS and RFID, in authenticating drugs and reducing the prevalence of counterfeits in the pharmaceutical supply chain. These technologies enable real-time verification, which is essential for maintaining drug integrity and patient safety. However, according to Okeke and Agu (2019), while public awareness and technology are vital, their effectiveness is amplified by strong regulatory frameworks and robust law enforcement. They suggest that without stringent regulations and enforcement, the benefits of public awareness and technological tools may not be fully realised.

The relationship between public awareness campaigns and counterfeit drug prevention in Nigeria

The study's findings on Hypothesis Two indicate a significant relationship between public awareness campaigns and the prevention of counterfeit drugs. In the literature review, it is noted that counterfeit drugs pose significant risks due to their potential lack of active pharmaceutical ingredients or the presence of harmful substances (United States Food and Drug Administration 2019b; Bate *et al*. 2013). Erah *et al*. (2019) emphasises the role of pharmacists in public education and awareness, which is consistent with the findings of this study. Moreover, the review by Mackey and Nayyar (2017) discusses the importance of technology, such as mobile verification apps, in supporting these awareness efforts.

These tools empower pharmacists and consumers to verify the authenticity of medications, complementing public awareness campaigns.

Furthermore, Adekoya and Ekeh (2021) and Ndubuisi (2021) highlight the role of pharmacists in enforcing quality control measures and educating the public, aligning with the findings of this study that stress the significant impact of public awareness on preventing counterfeit drugs. Their research underscores the importance pharmacists' engagement in public awareness campaigns as a strategic approach to mitigating the risks associated with counterfeit medications. However, Okeke and Agu (2019) argue that while public awareness is essential, it must be complemented by stringent regulatory enforcement and technological interventions to be fully effective.

The strength of regulatory frameworks significantly on pharmacists' effectiveness in preventing the circulation of counterfeit drugs in Nigeria.

The findings from the regression analysis provide compelling evidence that the strength of regulatory frameworks significantly influences pharmacists' effectiveness in preventing the circulation of counterfeit drugs in Nigeria. As noted by Bate *et al*. (2016), effective regulatory frameworks are essential for the integrity of the pharmaceutical supply chain. They argue that strong regulations and strict enforcement can significantly reduce the prevalence of counterfeit drugs. This aligns closely with the findings of this study, which demonstrate that pharmacists are more effective in their roles when supported by stringent regulatory measures. Moreover, this finding supports the findings of Oparah and Enato (2020), who identified a direct correlation between the strength of regulatory frameworks and the reduction in counterfeit drugs. Their research showed that countries with well-developed regulatory systems experience lower rates of counterfeit drug circulation, which aligns with the current study's findings that stronger regulatory frameworks significantly enhance pharmacists' effectiveness in Nigeria. However, Adeyemi and Ibrahim (2018) argue that while regulatory strength is crucial, it must be complemented by other factors, such as continuous professional development and technological advancements. They suggest that pharmacists' effectiveness is maximised when regulatory measures are integrated with ongoing education and the adoption of advanced technologies for drug verification.

CHAPTER FIVE
CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary and Conclusion

The purpose of this study is to examine the role of pharmacists in improving drug quality in Nigeria. This study has made a significant contribution to understanding the critical role pharmacists play in addressing the circulation of counterfeit drugs in Nigeria, by focusing on various strategies employed by pharmacists, the challenges they come across, and technological tools' influence. This research supports the argument that pharmacists are indispensable frontline defenders in the fight against counterfeit drugs. The findings of this study reveal the multifaceted nature of the role of pharmacists, not only as healthcare providers but also as key agents in protecting drugs. The research's significant contribution also lies in its detailed examination of the procedures employed by pharmacists to identify and prevent counterfeit medications. It reveals the practical techniques used, including visual assessments, authentication technology implementation, and drug source verification. As a result, this study emphasises how proactive measures taken by pharmacists are to protect public health. This highlights the indispensable role of pharmacists in the healthcare system, a role that is often underappreciated yet vital in ensuring the safety of the pharmaceutical supply chain.

Moreover, the dissertation has established a distinct correlation between pharmacists' involvement in public awareness campaigns and preventing the circulation of counterfeit drugs. The study showed that when pharmacists proactively engage in educating the general population, they are better equipped to combat fraudulent drug distribution. These findings highlight how crucial it is for public outreach initiatives to work alongside regulatory practices and encourage greater participation from community-based pharmacists.

This study also identified and analysed significant challenges that pharmacists encounter in their fight against counterfeit drugs. These include insufficient access to advanced verification technologies and a lack of support from regulatory agencies. This new knowledge augments the understanding of the structural impediments inherent in the pharmaceutical sector, providing a foundation for future policy recommendations aimed at enhancing pharmacists' capabilities. This dissertation identified contrasting perceptions among pharmacists regarding the technological influence of advanced tools such as

blockchain and AI in drug verification. Although these technologies offer the potential for enhancing counterfeit drug detection, accessibility and training challenges have hindered their implementation, according to the study's findings. This finding highlights a demand for more comprehensive infrastructure and training initiatives that can optimise technology within this field.

This dissertation has successfully answered the main research question by demonstrating how pharmacists in Nigeria significantly enhance drug quality through their participation in detection, prevention, public education, and technology. The study contributes new knowledge by highlighting the practical and systemic challenges faced by pharmacists and advocating for enhanced support and training to empower them in their crucial roles. These invaluable findings serve as a fundamental basis for the framework for future research and policy development in the ongoing fight against counterfeit drugs.

Also, this study used a comprehensive approach to successfully achieve its research objectives, thereby contributing to the understanding of the role of pharmacists in addressing counterfeit drugs in Nigeria.

i. To Examine the roles of pharmacists in detecting and preventing the circulation of counterfeit drugs in Nigeria.

An extensive survey was conducted among pharmacists in different regions of Nigeria, and descriptive analysis was done to achieve this objective. The study investigated the various strategies employed by pharmacists, which include visual inspection and verification of drug sources, as well as implementing authentication technologies such as mobile verification systems. It was discovered that through these methods, pharmacists play a critical role in identifying counterfeit drugs at the point of sale. Data on specific actions taken by pharmacies were collected using questionnaires, providing a clear picture of their role in prevention.

ii. To Assess the relationship between the level of pharmacist engagement in public awareness campaigns and the prevention of counterfeit drug circulation in Nigeria.

Exploring the correlation between pharmacists' participation in public awareness campaigns and their effectiveness in reducing counterfeit drug circulation was the main

objective of this study. Through hypothesis testing, this study was able to establish a positive and statistically significant relationship between these two variables. In conclusion, this research demonstrated that initiatives aimed at raising awareness about counterfeit medications carried out by pharmacists will play an essential role in combatting such products effectively.

iii. To challenges and barriers faced by pharmacists in improving drug quality and combating counterfeit drugs in Nigeria.

The objective of the study was successfully achieved through the identification and analysis of challenges encountered by pharmacists, including inadequate regulatory backing, restricted access to technological resources, and insufficient training on identifying counterfeit drugs. The descriptive analysis effectively highlighted these impediments that obstruct pharmacists from executing their functions efficiently, providing a thorough perspective for policy interventions geared towards empowering them to counter counterfeit medicines. These findings are critically vital in enhancing the pharmacist's capacity to combat fraudulent medications.

iv. To assess the perceptions of pharmacists on the impact of technology in identifying counterfeit drugs in Nigeria.

To achieve the objective of analysing pharmacists' perceptions on technological tools in detecting counterfeit medications, descriptive analysis was conducted. The outcomes indicated that despite many recognising mobile authentication services and blockchain's potential to enhance drug quality, obstacles such as expenses, inadequate training and accessibility prevented widespread adoption. These results highlight the necessity for increased funding for developing technology and providing comprehensive education to enable pharmacists to employ these tools effectively.

5.2 Limitations of the study

The study's primary limitation pertains to its dependence on a quantitative research methodology, particularly the adoption of a survey-based design. Although this technique facilitated data gathering from a relatively large sample, it might have oversimplified the intricacies involved in pharmacists' efforts to combat counterfeit

drugs. The structured nature of the survey could also have restricted respondents' capacity to express significant views or provide detailed accounts of their experiences. By incorporating qualitative methods like focus groups and extensive interviews into the data collection process, researchers may acquire a more comprehensive understanding of pharmacy professionals' accomplishments and struggles when dealing with counterfeit drug distribution issues.

The study's geographical scope was limited to pharmacists working in government-owned hospitals within four selected states of Nigeria, posing another constraint. This limitation reduces the generalizability of results as it disregards perspectives from private sector pharmacists and those who operate in other areas in Nigeria where counterfeit drug distribution dynamics may differ significantly. To increase the reliability and applicability of findings, a more comprehensive approach involving participants from diverse regions and settings should be adopted.

The study's cross-sectional design only captures data at a single point in time and, therefore, cannot assess trends or changes over time. A longitudinal method would offer more extensive insights into the development of pharmacists' roles and intervention efficacy, providing a dynamic understanding of combatting counterfeit drugs.

5.3 Recommendation for Further Studies

Considering the limitations of this study, it suggests the scope for further study.

Future research could broaden scopes by encompassing a broader range of settings like private pharmacies as well as various other regions throughout Nigeria. This will provide an inclusive overview pertaining to the challenges and procedures encountered across varying environments.

Future studies can integrate qualitative approaches, including focus groups or interviews, to attain an in-depth understanding of the personal as well as professional experiences of pharmacists when managing counterfeit drug cases.

Conducting longitudinal studies would be advantageous in analysing how pharmacists' responsibilities and interventions develop over time. This could provide significant observations into the enduring consequences of different strategies on drug quality as well as counterfeit drug occurrence.

Finally, it is essential to conduct additional studies that focus on how upcoming innovations such as blockchain and AI could enhance pharmacists' ability to detect and prevent counterfeit drugs.

5.4 Recommendations of the study

This study's results suggest multiple practical and academic suggestions to improve the involvement of pharmacists in enhancing drug quality in Nigeria.

The findings of this study indicate a pressing necessity for regulatory bodies to reinforce the implementation of laws against counterfeiting. This study suggests that the government should intensify efforts to crack down on the production and distribution of counterfeit drugs by increasing surveillance and implementing more severe penalties for offenders. Furthermore, it is recommended that cooperative approaches be promoted among regulating organisations, pharmaceutical firms, and pharmacists in order to establish a stronger collective stance against counterfeit drugs.

The significance of incorporating advanced technology in the routine operations of pharmacists is revealed in this study. It is recommended that institutions offering pharmacy education and professional bodies establish training schemes concentrated on enhancing technological skills among pharmacists. This would strengthen their capacity not only to detect counterfeit drugs but also to improve their overall efficiency when managing drug quality. Additionally, affordable and user-friendly technology should be given priority investments to ensure broad usage across all regions where there are practising pharmacists.

Furthermore, this study examines the importance of continuous professional growth and organisational assistance. Pharmacists are advised to participate in consistent training and mentoring initiatives that enhance their self-confidence and observational skills. Furthermore, pharmaceutical establishments ought to establish a conducive setting that offers sufficient resources as well as support structures for pharmacists to execute their responsibilities successfully.

5.5 Reflection on the Dissertation

As I contemplate my experience of finishing my dissertation on the topic **"Counterfeit drug: The role of pharmacists in improving drug quality in Nigeria",** I find myself deeply appreciative of the complexity and importance of this subject. I have gained an immense understanding of pharmacists' diverse contributions to eradicating counterfeit drugs prevalent throughout Nigeria's pharmaceutical landscape.

My knowledge of the global counterfeit drug market and how it affects Nigeria's pharmaceutical industry was established in this study. This study revealed the pervasive nature of counterfeit drugs and highlighted the critical need for robust regulatory frameworks. These conclusions launched a deeper investigation into pharmacists' capacity to navigate this complex environment effectively.

This study enabled me to investigate how pharmacists view and approach the use of technology as a weapon against counterfeit drugs. My findings were eye-opening as they showcased diverse levels of acceptance and proficiency towards technological tools among respondents in this group. Through this study, it became apparent that while there is immense potential for improving drug quality via tech integration, its successful implementation depends on the willingness and capacity of pharmacists to adopt these resources into their regular routines.

Thorough insights were provided in this study, detailing the factors that facilitate pharmacists' efficacy in detecting and curbing counterfeit drugs. In light of the application of social cognitive theory and institutional theory, a strong framework has been established to understand how institutional environments influence observational learning, self-efficacy, and social influences on pharmacists. The findings from this research strongly recommend public awareness campaigns be propelled alongside regulatory measures for enhanced support towards their significant role.

In summary, completing this dissertation has not merely increased my understanding of the complex mechanics operating in Nigeria's pharmaceutical sector but also reiterated pharmacists' critical function in upholding public well-being. The knowledge obtained from this study will guide me as I endeavour to improve drug standards and tackle fake medicines beyond today.

References

Adejoro, L. 2023, “One pharmacist serves 13,385 Nigerians, PCN laments”, *Punch Newspapers*, 2 September, available at: https://punchng.com/one-pharmacist-serves-13385-nigerians-pcn-laments/ (accessed 12 March 2024).

Adekoya, H.O. and Ekeh, C.M., (2021). Awareness and adoption of drug mobile authentication service: a conscious approach in eradication of fake and counterfeit drugs in Nigeria. KIU Journal of Social Sciences, 7(1), pp.43-51.

Adigwe, O.P., (2023). The role of pharmacists in eliminating counterfeit medicines in Nigeria. *Frontiers in Public Health*, *11*, p.1170929.

Adigwe, O.P., Onavbavba, G. and Wilson, D.O.M., (2022). Challenges associated with addressing counterfeit medicines in Nigeria: An exploration of pharmacists' knowledge, practices, and perceptions. *Integrated Pharmacy Research and Practice*, pp.177-186.

Adjei, H.K. and Ohene, P., (2015). Counterfeit drugs: the relentless war in Africa. Pharm Pharmacol Int J, 2(2), p.00016.Akunyili, D.N., 2005. Counterfeit drugs and pharmacovigilance. Proceedings of the 10th Pharmacovigilance Training Course held at Uppsala Monitoring Centre.

Alliance, P.R., (2007). International Property Rights Index Report. *Washington, DC: Property Rights Alliance*.

Aminu, N.A.F.I.U. and Gwarzo, M.S., (2017). The eminent threats of counterfeit drugs to quality health care delivery in Africa: Updates on consequences and way forward. Asian Journal of Pharmaceutical and Clinical Research, 10(7), pp.82-86.

Arit, U., Mary, A., Umar, I.I., Basira, K.L., Kamilu, S.L., Ekpedeme, N., Kosisochi, A., Ayodeji, M., Olubukola, T., Unoma, O., and Eneyi, K. (2021). Clinical pharmacy services provided in public sector hospitals in Nigeria: a national survey. International Journal of Pharmacy Practice, 29(5), Pp. 471–479,

Atoyebi, O.M., Atoyebi, S.B. and Ajao, A.F., 2023. The Impact of Mathematics Anxiety on the Mathematical Value of Secondary School Students in Nigeria. *Asian Journal of Advanced Research and Reports*, *17*(11), pp.236-254.

Balogun, J.A., 2021. *Nigerian Healthcare System*. Springer International Publishing.

Bate, R., Jensen, P., Hess, K., Mooney, L. and Milligan, J., (2013). Substandard and falsified anti-tuberculosis drugs: a preliminary field analysis. *The international journal of tuberculosis and lung disease*, *17*(3), pp.308-311.

Baydas, O., Kucuk, S., Yilmaz, R.M., Aydemir, M. and Goktas, Y., 2015. Educational technology research trends from 2002 to 2014. *Scientometrics*, *105*, pp.709-725.

Bell, E., Bryman, A. and Harley, B., 2022. *Business research methods*. Oxford university press.

Bird, R.C., (2007). Counterfeit drugs: a global consumer perspective. *Wake Forest Intell. Prop. LJ*, *8*, p.387.

Bolla, A.S., Patel, A.R. and Priefer, R., (2020). The silent development of counterfeit medications in developing countries–A systematic review of detection technologies. International Journal of Pharmaceutics, 587, p.119702.

Bougie, R. and Sekaran, U., 2019. *Research methods for business: A skill building approach*. John Wiley & Sons.

Chapman, S., McNeill, P. and Mcneill, P., 2005. *Research methods*. Routledge.

Cochran, W.G. 1963 Sampling Technique. 2nd Edition, John Wiley and Sons Inc., New York.

Collis, J. and Hussey, R., 2009. *Business research: A practical guide for undergraduate and postgraduate students*. Palgrave macmillan.

Connor Desai, S. and Reimers, S., 2019. Comparing the use of open and closed questions for Web-based measures of the continued-influence effect. *Behavior research methods*, *51*, pp.1426-1440.

Creswell, J.W. and Creswell, J.D., 2017. *Research design: Qualitative, quantitative, and mixed methods approach*. Sage publications.

Darrow, J.J., (2014). Pharmaceutical gatekeepers. *Ind. L. Rev.*, *47*, p.363.

Denscombe, M., 2017. *EBOOK: The good research guide: For small-scale social research projects*. McGraw-Hill Education (UK).

Ding, C.S., Haieh, C.T., Wu, Q. and Pedram, M., 1996, November. Stratified random sampling for power estimation. In *Proceedings of International Conference on Computer Aided Design* (pp. 576-582). IEEE.

Egbue, N.G., (2009). Globalization and Transnational Advance Fee Fraud: A Study of Perceptions of Undergraduates in Southeastern Nigeria. *The Nigerian Journal of Sociology and Anthropology Vol, 7*, p.62.

Ekoh, P.C., Chukwemeka, E., Ezulike, C.D., George, E.O., Egbo, I.E., Agbawodikeizu, P.U., Anthony, I.O. and Nnebe, I., (2022). Ageing and Health in Africa: Assessing how low-and Middle-class Older Adults with Chronic Illnesses Navigate the Problem of Counterfeit Drugs in Nigeria. Journal of Population Ageing, 15(4), pp.981-997.

Ekpenyong, A., Udoh, A., Kpokiri, E. and Bates, I., (2018). An analysis of pharmacy workforce capacity in Nigeria. Journal of pharmaceutical policy and practice, 11(1), p.20.

Elayeh, E., Akour, A., Almadaeen, S., AlQhewii, T. and Basheti, I.A., (2017). Practice of pharmaceutical care in community pharmacies in Jordan. *Tropical Journal of Pharmaceutical Research*, *16*(2), pp.463-470.

El-Jardali, F., Akl E.A., Fadlallah, R., Oliver, S., Saleh, N., and El-Bawab, L. (2015) Interventions to combat or prevent drug counterfeiting: a systematic review. *BMJ Open*, 5(3), pp. 62-90.

Eruaga, M.A., Itua, E.O. and Bature, J.T., (2024). Enhancing medication quality control in Nigeria: a comprehensive analysis of regulatory challenges and solutions. *International Medical Science Research Journal*, *4*(3), pp.284-294.

Etikan, I., Musa, S.A. and Alkassim, R.S., (2016). Comparison of convenience sampling and purposive sampling. American journal of theoretical and applied statistics, 5(1), pp.1-4.

Fadlallah, R., El-Jardali, F., Annan, F., Azzam, H. and Akl, E.A., (2016). Strategies and systems-level interventions to combat or prevent drug counterfeiting: a systematic review of evidence beyond effectiveness. *Pharmaceutical medicine*, *30*, pp.263-276.

Fink, C., Maskus, K.E. and Qian, Y., (2016). The economic effects of counterfeiting and piracy: A review and implications for developing countries. The World Bank Research Observer, 31(1), pp.1-28.

Finn, M. (2016) Top Markets Report: Pharmaceuticals, US Department of Commerce/International Trade Administration/Industry & Analysis, May 2016, www.trade.gov/topmarkets/pdf/Pharmaceuticals_Top_Markets_Reports.pdf.

Fisher, W., Okediji, R.L. and Sampath, P.G., (2022). Fostering production of pharmaceutical products in developing countries. *Mich. J. Int'l L.*, *43*, p.1.

Global Fund to fight against AIDS. (2021) Nigeria Health System. Severe Malaria Observatory. Available at: https://www.severemalaria.org/countries/nigeria/nigeria-health-system (Accessed: August 6, 2024).

Gnegel, G., Hauk, C., Neci, R., Mutombo, G., Nyaah, F., Wistuba, D., Häfele-Abah, C. and Heide, L., (2020). Identification of falsified chloroquine tablets in Africa at the time of the COVID-19 pandemic. *The American Journal of Tropical Medicine and Hygiene*, *103*(1), p.73.

Goyanes, M., (2007). *Tópicos em propriedade intelectual: marcas, direitos autorais, designs e pirataria*. Renovar.

Greenwood, D., Tully, M.P., Martin, S. and Steinke, D., (2019). The description and definition of Emergency Department Pharmacist Practitioners in the United Kingdom (the ENDPAPER study). *International journal of clinical pharmacy*, *41*, pp.434-444.

Hair Jr, J.F., Hult, G.T.M., Ringle, C.M., Sarstedt, M., Danks, N.P. and Ray, S., 2021. *Partial least squares structural equation modeling (PLS-SEM) using R: A workbook* (p. 197). Springer Nature.

Heath, M. and Tynan, C., 2010. Crafting a research proposal. *The Marketing Review*, *10*(2), pp.147-168.

Holt, T., Lahrichi, M. and Santos da Silva, J. (2015). Africa: A continent of opportunity for pharma and patients, *McKinsey & Company*, June 2015, www.mckinsey.com/ industries/pharmaceuticals-and-medical-products/ourinsights/africa-a-continent-ofopportunity-for-pharmaand-patients.

Jaiprakash, V, and Pawan, S. (2016). Roles of Pharmacist in Health Care System. The Journal of Community Health Management, 3(1), pp. 37-40.

Joda, A.E., Amadi, C., Adebayo, O.I., Maji, Y.I., Uchem, C. and Olih, H., (2017). Fake drugs: A survey of healthcare providers in Lagos State, Nigeria. *Nigerian Journal of Basic and Clinical Sciences*, *14*(2), pp.137-142.

Klantschnig, G. and Huang, C., (2024). Fake drugs: health, wealth and regulation in Nigeria. In *Capitalism and Economic Crime in Africa* (pp. 110-126). Routledge.

Koshkouei, M.J., (2023). *The impact of regulatory change on pharmacy practice: the implementation of the European Union falsified medicines directive in the United Kingdom* (Doctoral dissertation, University of Oxford).

Lee, K.S., Al-Worafi, Y.M. and Ming, L.C., (2017). Combating sale of counterfeit and falsified medicines online: A losing battle. Frontiers in pharmacology, 8, p.247197.

Lingenfelter, E., Drapkin, Z., Fritz, K.; Youngquist, S., Madsen, T., and Fix, M. (2016) ED pharmacist monitoring of provider antibiotic selection aids appropriate treatment for outpatient UTI. Am. J. Emerg. Med. 34, pp. 1600–1603.

Luszczynska, A. and Schwarzer, R., (2015). Social cognitive theory. *Fac Health Sci Publ*, *2015*, pp.225-251.

Mackey, T.K. and Nayyar, G., (2017). A review of existing and emerging digital technologies to combat the global trade in fake medicines. *Expert opinion on drug safety*, *16*(5), pp.587-602.

Maxwell, J.A., 2021. Why qualitative methods are necessary for generalization. *Qualitative Psychology*, *8*(1), p.111.

Mdege, N.D., Chevo, T. and Toner, P., (2016). Perceptions of current and potential public health involvement of pharmacists in developing nations: The case of Zimbabwe. Research in Social and Administrative Pharmacy, 12(6), pp.876-884.

Mohajan, H.K., 2020. Quantitative research: A successful investigation in natural and social sciences. *Journal of Economic Development, Environment and People*, *9*(4), pp.50-79.

Mugenda, O.M. and Mugenda, A.G., 2003. *Research methods: Quantitative & qualitative apporaches* (Vol. 2, No. 2). Nairobi: Acts press.

Nardi, P.M., 2018. *Doing survey research: A guide to quantitative methods*. Routledge.

Noor, S., Tajik, O. and Golzar, J., 2022. Simple random sampling. *International Journal of Education & Language Studies*, *1*(2), pp.78-82.

Onyeme, A., 2019. *Strategic measures for accessing effective healthcare delivery in rural Nigeria* (Doctoral dissertation, Loughborough University).

Ndubuisi, P.O., (2021). Evaluating the ethical climate of the Nigerian pharmaceutical industry in enhancing health security. Journal of Emerging Trends In Management Sciences And Entrepreneurship, 3(1), pp.60-67.

Neto, J.C. and Lisboa, F.L., (2017). ATR-FTIR characterization of generic brand-named and counterfeit sildenafil-and tadalafil-based tablets found on the Brazilian market. *Science & Justice*, *57*(4), pp.283-295.

Ndubuisi, P.O., (2021). Evaluating the ethical climate of the Nigerian pharmaceutical industry in enhancing health security. Journal of Emerging Trends In Management Sciences And Entrepreneurship, 3(1), pp.60-67.

O'Hagan, A. and Garlington, A., (2018). Counterfeit drugs and the online pharmaceutical trade, a threat to public safety. *Forensic Research & Criminology International Journal*, *6*(3), pp.151-158.

Okereke, M., Anukwu, I., Solarin, S. and Ohuabunwa, M.S., (2021). Combatting substandard and counterfeit medicines in the Nigerian drug market: how industrial pharmacists can rise up to the challenge. INNOVATIONS in pharmacy, 12(3).

Okpe, A.P., Okareh, O.O., and Eteng, U.E. (2016) Factors Influencing the Purchase of Counterfeit Drugs among Consumers in Rural Community of Cross River State, Nigeria. Texila International Journal of Public Health, 4(4), pp. 1-12.

Onuh, G., Hinga, S.K., Nyamweya, B.M. and Aderemi, A.A., 2022. Assessment of consumers' awareness and proposed measures against the prevalence of counterfeit drugs in developing countries. *BMC Public Health*.

Ott, R.L. and Longnecker, M., 2016. *An introduction to statistical methods and data analysis*. Cengage Learning.

Oseni, Y. O. (2019). Evaluation of pharmacy practice regulations in Nigeria: The pharmaceutical inspectors' perspective. Tropical Journal of Pharmaceutical Research, 18(6), 1353-1360.

Pascu, G.A., Hancu, G. and Rusu, A., 2020. Pharmaceutical serialization, a global effort to combat counterfeit medicines. *Acta Marisiensis-Seria Medica*, *66*(4), pp.132-139.

Pillay, N., (2019). *Integration of Pharmaceutical Care in rural Public Health: A case study in Ugu and Umzinyathi districts in KwaZulu-Natal* (Doctoral dissertation).

Rankin, K.M., Rauscher, G.H., McCarthy, B., Erdal, S., Lada, P., Il'yasova, D. and Davis, F., 2008. Comparing the reliability of responses to telephone-administered versus self-administered Web-based surveys in a case-control study of adult malignant brain cancer. *Cancer Epidemiology Biomarkers & Prevention*, *17*(10), pp.2639-2646.

Raza, M.A., Aziz, S., Noree, M., Anjum, I., Raza, S.M. (2022). A Portrait of the Pharmacy Profession Globally: Pharmacist Universal Professional Identity and Establishment of Global Pharmacy Council. INNOVATIONS in pharmacy. 13(1), 4-23.

Rezali, N., Ali, M.H., Idris, F., Yunus, Y.M. and Yunan, Y.S.M., (2021). Exploration of institutional theory in green supply chain initiatives for healthcare industries in Malaysia. *International Journal of Business Continuity and Risk Management*, *11*(2-3), pp.126-141.

Richard, O., (2023). Fraud, corruption and counterfeits in the Nigerian pharmaceutical industry. *Univ Portsm*.

Robert, A, and Micheal, L. (2017) The Role of Pharmacist in Health Care: Expanding and Evolving. North Carolina Medical Journal, 78(3), pp. 165-167.

Rotimi, K., Edeh, F.K., Aiden, J., Itiola, A.J. and Obamiro, K., (2022). Factors that influence pharmacists' efforts in addressing substance use in Nigeria: An exploratory study. *Exploratory Research in Clinical and Social Pharmacy*, *8*, p.100189.

Sakeena, M.H.F., Bennett, A.A., and McLachlan, A.J. (2019) The Need to Strengthen the Role of the Pharmacist in Sri Lanka: Perspectives. Pharmacy. 7, pp. 54.

Saunders, M., Lewis, P. and Thornhill, A., 2009. *Research methods for business students*. Pearson education.

Schwarz, N., Groves, R.M. and Schuman, H., 1998. Survey methods. *The handbook of social psychology*, *1*, pp.143-179.

Singh, Y.K., 2006. *Fundamental of research methodology and statistics*. New Age International.

Taylor, S.J., Bogdan, R. and DeVault, M.L., 2015. *Introduction to qualitative research methods: A guidebook and resource*. John Wiley & Sons.

United States Food and Drug Administration - Counterfeit Medicine, 2019. [cited 2020 Feb 10]. Available from: https://www.fda.gov/drugs/buying-using-medicine-safely/counterfeit-medicine

White, C.M., (2021). Counterfeit drugs: A major issue for vulnerable citizens throughout the world and in the United States. Journal of the American Pharmacists Association, 61(1), pp.e93-e98.

Wogu, J.O., Omaka-Amari, L.N., Ugwu, U.C., Ugwuoke, J.C. and Agu, M.A. (2019). Influence of NAFDAC Mobile Drugs Authentication Service on the Use of Fake Drugs Among Consumers in Southeast Nigeria. *Global Journal of Health Science*, *11*(5), p.87.

World Health Organization, (2017). WHO Global Surveillance and Monitoring System for substandard and falsified medical products. World Health Organization.

World Health Organization, (2019). The WHO Member State mechanism on substandard and falsified medical products: how WHO Member States work together to safeguard access to safe and effective medicines, vaccines and other medical products (No. WHO/MVP/EMP/SAV/2019.04). World Health Organization.

World Health Organization - Substandard and falsified medical products, 2018. [cited 2024 June 29]. Available from: https://www.who.int/news-room/fact-sheets/detail/substandard-and-falsified-medical-products

Yankus, W., 2007. Counterfeit Drugs: Coming to a Pharmacy Near You. *Journal of Pharmaceutical Finance Economics and Policy*, *16*(3), p.3.

Appendix

Questionnaire

Topic: Counterfeit Drugs: The Role of Pharmacists in Improving Drug Quality in Nigeria.

Dear Participant,

I am Chineke Njideka Peace; I am currently undertaking my dissertation as part of the requirement for my **master's degree in pharmaceutical business and technology at Griffith College, Dublin, Ireland.**

You have been cordially invited to participate in the research titled "**Counterfeit Drugs: The Role of Pharmacists in Improving Drug Quality in Nigeria."** This study is being conducted as part of my master's dissertation in Pharmaceutical Business and Technology at Griffith College in Dublin, Ireland.

This study aims to investigate and understand the involvement of pharmacists in detecting and preventing counterfeit drug circulation within Nigeria. Furthermore, it seeks to recognise obstacles and limitations that hinder pharmacists' ability to carry out this critical responsibility and evaluate their participation in public awareness campaigns pertinent to counterfeit drugs.

The threat of counterfeit drugs to public health and safety is considerable. As vital healthcare team members, pharmacists uphold medication quality and shield patients from counterfeit drugs. Your expertise and first-hand knowledge will prove invaluable towards formulating practical measures that can effectively address this issue.

Completing the survey is voluntary. The questionnaire includes closed-ended questions requiring 10-15 minutes to finish. Any responses you provide will remain private and solely used for academic purposes.

The study will ensure that all gathered data remains anonymous and secure. The outcome shall be exhibited collectively without revealing the identity of any participant. Your involvement and the information delivered are guaranteed to receive the utmost confidentiality and respect.

Ethics Application & Declaration Form

DISSERTATION TITLE**: Counterfeit Drug**: ***The Role of Pharmacists in improving of Quality drugs in Nigeria.***

RESEARCHER'S NAME**: Chineke Njideka Peace**

PROGRAMME OF STUDY: **Pharmaceutical Business and Technology**.

SUPERVISOR'S NAME**: KATHY CLARKE**

DECLARATION:

The information in this application form is accurate to the best of my knowledge. I undertake to abide by the principles outlined by Innopharma/Griffith College ethics policy in my research dissertation. I confirm that I have completed a full ethics assessment for my research dissertation as per the college guidelines. I will not begin my primary research until such approval from my supervisor and/or ethics Committee has been obtained.

I pledge to carry out my research according to the **Innopharma/Griffith College academic** integrity standards. Any results presented in my dissertation will be from my own, original research, I will reference and/or acknowledge any material or sources used in its preparation and I will not plagiarise the work of anyone else.

For Student:
STUDENT SIGNATURE**:**

DATE:**17/07/2024**

The research contained within this research dissertation proposal has been approved.

For Supervisor:
Ethics Committee Approval Required: Yes [ ] No [X]

SUPERVISOR SIGNATURE:

DATE: 12/07/2024

For Ethics Committee (if required):

Ethics Committee Approval Given: Yes ☐ No ☐

ETHICS COMMITTEE MEMBER SIGNATURE:

DATE:

NOTE: Supervisors are responsible for ensuring their students fill in this form correctly and that all ethical areas have been considered.

SECTION 1: DESCRIPTION OF RESEARCH STUDY

Purpose and objectives of research.

The purpose of this research is to examine the role of Pharmacists in improving drugs quality in Nigeria. Drugs are essential to healthcare at all levels. However, because of the enormous benefits of pharmaceuticals and their widespread use, some dishonest people view them as a quick way to get money.

The World Health Organization (WHO) defines counterfeit drugs as medicine that is purposefully and fraudulently mislabelled about identification or source (WHO, 2017).

Africa accounts for almost half of all cases of counterfeit drugs market in the world (WHO, 2017). Unregulated drug markets, porous pharmaceutical supply chains, and reliance on imported drugs are primarily responsible for counterfeiting concerns in Nigeria (Olliaro, 2005; Adebisi et al., 2022), which has made it challenging to tackle such issues despite legislative control mechanisms like 'Food and Drugs Related Products Act' (Gurney et al., 2017; O'Hagan & Garlington, 2018). Therefore, the purpose of this study is to provide essential insights into pharmacists' responsibilities in reducing the presence of counterfeit drug items and increasing drug quality. To achieve the purpose of the study, the following objective will be fulfilled.

objectives

1. To examine the roles of pharmacists in detecting and preventing the circulation of counterfeit drugs.

2. To Assess the relationship between the level of pharmacists' engagement in public awareness campaigns.

3. To Identify challenges and barriers faced by pharmacists in improving drugs Quality and combating counterfeit drugs.

4. To Provide recommendation for enhancing the role of pharmacists in improving drugs quality and reducing the prevalence of counterfeit drugs in Nigeria.

Research methodology:

A quantitative research strategy will be used for this study. This method will be used because it makes it possible to effectively and methodologically collect data from many participants in a short

period of time. For this research, the survey questionnaire will be used to collect data because of its quantitative nature, using a survey questionnaire allows researchers to plan their approach to collecting data by using a tool that helps them identify the information they want to collect ahead of time (Bryman,2016). The questionnaire's framework aims to gather information about pharmacists "knowledge, attitude, and behaviour's concerning counterfeit drugs and the roles of pharmacists in improving drugs quality in Nigeria.

The questionnaires will be administered through the internet -Google form. The study will employ multistage sampling to choose participants. For the first stage, a stratified sampling technique will be used to select 2 states out of the 36 states in Nigeria. Purposive sampling will be used to choose the organisation where the pharmacist work, (**federal, state and private hospital**). However, due to large number of pharmacists in these hospital, random sampling will be used to select about one hundred and fifty (**150**) pharmacists who will save as study respondents.

The data gathered from the questionnaire will be examined following the study's goal using Microsoft EXCEL and SPSS software. To enhance readability, descriptive statistics will be used in the study to aid in investigating role of pharmacists' function in enhancing drugs quality.

Charts like pie, and bars will be used to present the demographic data while all the variables will be presented using frequencies and percentages, mean and standard deviations also will also be used to present every data section, regression analysis will be employed to ascertain the relationship between the variables, to achieve the objective of this study.

SECTION 4: ABOUT YOUR PARTICIPANTS

4.1. **Outline your participant profile and why you have chosen them for this study** ***[Do not provide names except where it is deemed impossible to conceal identity].***

Nigerian pharmacists will be the participants of this study.

They are chosen because of the aim of this study which is to investigate the role of pharmacists in improving drugs quality in Nigeria.

4.2 **How do you plan to gain access to/contact/approach your participant(s**).

The author intends to leverage my existing connection with a formal lecturer, who is a member of the PCN (**pharmacists council of Nigeria**), author will firstly reach out to the lecturer to explain my research and seek his assistance in introducing me to other relevant officials within the PCN, following this, I will send a formal email to the identified officials. This email with be followed up with call to ensure receipt and personally request their consent.
Once consent is given, I will send a link to my questionnaire via bulk email to the participants. This approach will ensure that all participants received questionnaires simultaneously, streamlining the data collection process.
Other platforms like LinkedIn and WhatsApp groups belonging to pharmacists' council of Nigeria (PCN) also be used to send the link to my questionnaire in other to achieve expected number of participants.

SECTION 5: INFORMATION, CONSENT AND CONFIDENTIALITY

5.1 Participant Information Letter (PIL) for participants

Please confirm below that your information letter covers:

Description of the research topic and method	N/A
Details of what participation will involve	**N/A**
Rights to anonymity	N/A
Confidentiality	N/A
Rights to withdraw from the research	**N/A**
The contact details of the researcher and supervisor (if necessary)	**N/A**

5.2 Informed Consent Form (ICF) for participants

Please indicate below if your research requires a signed consent form by selecting the relevant option only:

No: My research study involves an online survey only and/or does not require signed consent

SECTION 6: STORAGE OF DATA

6.1. How will you store the research data and for how long? How will you manage data protection.

Data will be stored in a password- protected in online OneDrive Griffith account. This info will only be accessible to researcher, supervisor and external evaluator.

Data will be stored for two years. The raw data will be kept on file until my degree has been awarded. After my degree has been awarded, interview transcript will be kept on file for two years, with all identifying information deleted.

All the data will be encrypted and anonymized in order to handle data protection problems All publications and reports will maintain the anonymity of all the participants, personal data guidelines and GDPR will be obeyed throughout the study period. I may have to violate confidentiality, if I believe that there is a significant risk of damage or danger to participant or to another person in compliance with the legal and ethical requirement. Under laws pertaining to freedom to information, participants and entitled to see they submitted at any time.

SECTION 7: NON-DISCLOSURE AGREEMENT & STUDENT CONSENT

7.1 Non-Disclosure Agreement (NDA)

Will the final dissertation contain any information pertaining to any source what would warrant the use of a Non-Disclosure Agreement (NDA) e.g. industry-based research?

NO

7.2 **Student consent**

If a Non-Disclosure Agreement (NDA) is not required, does the student consent to allow their completed dissertation to be held/published by Innopharma/Griffith College?

yes

SECTION 8: RECORDING AND RETENTION OF DISSERTATION VIVA

8.1 **Viva Recording**

The Dissertation viva will be recorded. This recording may be used to facilitate assessment by Innopharma staff, a third reader if necessary and/or if requested by the external examiner for the Programme. The recording will be held in line with current GDPR guidelines and will not be made publicly available.

I consent

SECTION 9: DOCUMENT CHECKLIST

NOTE: Applicants must attach the following documents in electronic format to the appendix.

Which documents are added to the appendix? Please tick N/A if not applicable:

9.1 Participant Information Letter (PIL) for participant	N/A
9.2 Informed Consent Form (ICF) for participant	N/A
9.3 Questions/survey for interviewees/focus groups etc *(can be in draft form)*	*YES*
9.4 Any other documents e.g. Non-Disclosure Agreement	N/A

I confirm that this application is complete, and all required documents are included in the appendix.

For Student:

STUDENT SIGNATURE:

DATE:**04/07/2024**

SURVEY QUESTIONNAIRE

Statement of Consent:

I understand the objective of this research and what my involvement encompasses.

I recognise that my involvement is optional and that I can discontinue the study without any negative repercussions.

I comprehend that my answers will remain private and exclusively employed for scholarly research objectives.

I hereby consent to participate in this study by proceeding with the survey.

If you have questions or apprehensions regarding this research, please reach me at **Njidekapeace Chineke@student.grriffith.ie**

I am grateful for the time you have taken to participate in this research and appreciate your valuable contribution.

Sincerely,

Chineke Njideka Peace

Consent Statement:

Do you consent to participate in this study?

Yes, I consent to participate ☐ No, I do not consent to participate ☐

SECTION A- PERSONAL INFORMATION

1. **Highest Level of Education**:

Bachelor's Degree ☐ Master's Degree ☐
Doctoral Degree ☐ Others ☐

2. **Years of Experience as a Pharmacist**:

Less than 1 year ☐ 1 - 5 years ☐

6 - 10 years ☐ Above 10 years ☐

3. **Familiarity with Counterfeit Drugs Issue**:

Very Familiar ☐ Somewhat Familiar ☐

Not Familiar ☐ Other ☐

SA = Strongly Agree, A= Agree, ND= Undecided, D= Disagree, and SD = Strongly Disagree.

SECTION A: The roles of pharmacists in detecting counterfeit drugs

S/N	ITEMS	SA	A	ND	D	SD
1	Pharmacists play a critical role in identifying counterfeit drugs through their daily interactions with patients.					
2	Public awareness campaigns led by pharmacists can effectively reduce the prevalence of counterfeit drugs in Nigeria.					
3	Regular inspection of medications by pharmacists is effective in detecting counterfeit drugs.					
4	The collaboration between pharmacists and regulatory bodies like NAFDAC is vital in combating counterfeit drugs in Nigeria.					
5	Implementing rigorous inventory management and regular inspection of medications by pharmacists can significantly reduce the circulation of counterfeit drugs.					

SECTION B: The roles of pharmacists in preventing the circulation of counterfeit drugs

S/N	ITEMS	SA	A	ND	D	SD
6	Advanced technological tools and methods are necessary for pharmacists to effectively prevent counterfeit drugs.					
7	The enforcement of strict drug laws can significantly enhance the ability of pharmacists to prevent counterfeit drug circulation.					
8	The lack of resources and weak regulatory enforcement significantly hinder pharmacists' efforts to prevent counterfeit drugs.					
9	The enforcement of strict drug laws can significantly enhance the ability of pharmacists to control counterfeit drug circulation.					

10	Regular training and education for pharmacists are essential in enhancing their ability to detect counterfeit drugs.					

SECTION C: The level of pharmacist engagement in public awareness campaigns about counterfeit drugs

S/N	ITEMS	SA	A	ND	D	SD
11	I actively participate in community outreach programmes to inform the public about counterfeit drugs.					
12	Increased pharmacist involvement in public awareness campaigns can significantly enhance the quality of medicines available in Nigeria.					
13	I believe that increasing public knowledge about counterfeit drugs can significantly decrease their prevalence.					
14	Pharmacists have a responsibility to inform patients about the risks associated with counterfeit drugs through awareness campaigns.					
15	Public awareness campaigns by pharmacists have led to increased trust in the healthcare system and pharmaceutical products among Nigerians.					

SECTION D: The challenges and barriers faced by pharmacists in combating counterfeit drugs

S/N	ITEMS	SA	A	ND	D	SD
16	Limited access to advanced technology and equipment hinders pharmacists' ability to identify and combat counterfeit drugs.					
17	Insufficient training and continuous professional development are significant barriers for pharmacists in detecting counterfeit drugs.					
18	The financial constraints faced by pharmacists' organisations limit their ability to effectively combat counterfeit drugs and improve drug quality.					
19	There is sufficient regulatory support for pharmacists to combat counterfeit drugs effectively					
20	The workload and responsibilities of pharmacists impede their ability to focus on improving drug quality and combating counterfeit drugs					

SECTION E: The perceptions of pharmacists on the impact of technology in identifying counterfeit

S/N	ITEMS	SA	A	ND	D	SD
21	Mobile Authentication Services (MAS) effectively identify counterfeit drugs and improve patient safety.					
22	Integrating advanced technologies like Radio Frequency Identification (RFID) and MAS into pharmacy practice is crucial for combating counterfeit drugs in Nigeria.					
23	Implementing MAS in pharmacies has led to a noticeable reduction in the circulation of counterfeit drugs.					
24	Using SMS text messages from mobile phones significantly enhances the ability to authenticate the quality of drugs.					
25	I feel confident in using technology to identify and report counterfeit drugs.					

Raw Data

Do you consent to participate in this study?	Highest Level of Education	Years of Experience as a Pharmacist	Familiarity with Counterfeit Drug issue	Pharmacists play critical role in identifying counterfeit drugs through daily interactions with patients.	Public awareness campaigns led by pharmacists can effectively educate the prevalence of counterfeit drugs in Nigeria.	Regular inspection of medications by pharmacists is effective in detecting counterfeit drugs in Nigeria.	The collaboration between pharmacists and regulatory bodies like NAFDAC is vital in combating counterfeit drugs in Nigeria.	Implementing rigorous inventory management and regulations inspection of medications by pharmacists can significantly reduce the circulation of counterfeit drugs	Advanced technologies and methods are necessary for pharmacists to effectively prevent counterfeit drugs	The enforcement of strict drug laws can significantly enhance the ability of pharmacists to prevent counterfeit drugs circulation.	The lack of resources and weak regulatory enforcement significantly hinder pharmacists' efforts to prevent counterfeit drugs	The enforcement of strict drug laws can significantly enhance the ability of pharmacists to control counterfeit drugs circulation.	Regular training and education on pharmacists are essential in enhancing their ability to detect counterfeit drugs	actively participate in community outreach programmes to inform the public about counterfeit drugs	Increased pharmacist involvement in public awareness campaigns can significantly enhance the quality of medicines available in Nigeria.	believe that increasing public knowledge about counterfeit drugs can significantly decrease their prevalence	Pharmacists have a responsibility to inform patients about the risks associated with counterfeit drugs through awareness campaigns	Public awareness campaigns by pharmacists have led to increased trust in the healthcare system and pharmaceutical products among Nigerians.	Limited access to advanced technologies and equipment hinders pharmacists ability to identify and combat counterfeit drugs	Insufficient training and continuous professional development are significant barriers for pharmacists in detecting counterfeit drugs	The financial constraints faced by pharmacists organization limit their ability to effectively combat counterfeit drugs and improve drug quality	There is sufficient regulatory support for pharmacists to combat counterfeit drugs effectively	The workload and responsibilities of pharmacists impede their ability to focus on improving drug quality and combating counterfeit drugs	Mobile Authentication Services (MAS) effectively identify counterfeit drugs and improve patient safety	Integrating advanced technologies like Radio Frequency Identification (RFID) and MAS into pharmacy practice is crucial for combating counterfeit drugs in Nigeria.	Implementing MAS in pharmacies has reduced the circulation of counterfeit drugs	Using SMS text messages from mobile phones significantly enhances the ability to authenticate the quality of drugs	feel confident in using technology to identify and report counterfeit drugs
Yes, consent to participate	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	2	2
Yes, consent to participate	1	3	1	1	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	4	4	2	2	2	2	2
Yes, consent to participate	2	3	1	1	1	1	1	1	1	2	2	2	2	2	2	2	1	2	2	1	2	2	2	2	2	1	3	1
Yes, consent to participate	2	3	1	2	2	2	1	1	1	1	2	2	2	2	2	1	1	1	2	2	1	1	2	2	2	2	2	2
Yes, consent to participate	1	2	1	1	2	1	1	1	1	2	1	1	2	2	1	2	1	2	2	2	1	2	1	1	1	2	1	1
Yes, consent to participate	2	3	1	2	1	1	2	2	1	1	1	2	2	1	2	2	2	2	2	2	2	1	1	1	1	1	1	1
Yes, consent to participate	3	4	1	1	1	2	1	1	1	1	2	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1
Yes, consent to	1	3	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1

parti pate																												
Yes, cons nt to parti pate	1	4	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1
Yes, cons nt to parti pate	3	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	2	2	1	1	2	1	2
Yes, cons nt to parti pate	3	4	1	1	1	2	1	1	2	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	2	1
Yes, cons nt to parti pate	2	3	1	1	1	1	1	1	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1
Yes, cons nt to parti pate	2	4	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2	1	2	1
Yes, cons nt to parti pate	2	2	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Yes, cons nt to parti pate	2	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Yes, cons nt to parti pate	1	4	1	1	2	1	1	1	1	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1
Yes, cons nt to parti pate	3	3	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Yes, cons nt to parti pate	3	4	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1
Yes, cons nt to parti pate	1	4	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	2	2	1	2	2	2	1	1	1	1
Yes, cons nt to parti pate	3	3	1	1	1	2	1	1	2	1	1	1	2	1	1	2	2	2	1	1	1	2	2	1	2	2	1	1
Yes, cons nt to parti pate	2	4	1	2	1	2	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1
Yes, cons nt to	2	4	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2

Yes, consent to participate	3	3	1	2	1	2	1	1	2	1	2	1	1	1	1	2	1	1	1	2	2	1	2	2	2	1	1	2
Yes, consent to participate	2	4	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1
Yes, consent to participate	3	4	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	4	5	1	2	1	2	1	4
Yes, consent to participate	2	3	1	2	1	2	1	1	1	2	1	1	1	1	1	2	1	1	1	4	2	4	4	2	2	2	2	5
Yes, consent to participate	2	3	1	1	1	2	1	1	1	1	1	2	2	2	1	1	1	2	1	5	1	2	3	1	2	2	4	4
Yes, consent to participate	3	4	1	1	1	2	1	2	1	1	1	1	1	2	1	2	1	1	1	4	1	4	2	2	1	1	4	2
Yes, consent to participate	1	2	1	1	1	2	1	1	1	2	1	1	2	1	2	1	1	2	4	1	4	4	2	2	2	4	4	5
Yes, consent to participate	1	2	1	1	1	2	1	2	1	1	1	1	2	2	2	1	1	1	4	5	5	5	5	1	5	4	4	5
Yes, consent to participate	1	2	1	1	2	1	1	1	1	1	1	1	1	2	2	2	1	1	4	5	2	4	2	1	5	2	4	5
Yes, consent to participate	1	3	1	1	1	1	2	1	1	2	1	1	1	2	1	1	1	1	1	4	4	5	5	1	4	4	2	4
Yes, consent to participate	1	3	1	1	1	1	2	1	1	2	1	1	2	1	2	3	1	1	1	2	1	2	4	2	1	2	2	2
Yes, consent to participate	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	2	2	1	1	1	2
Yes, consent to participate	2	2	1	2	2	1	1	1	1	1	1	1	1	2	1	1	1	1	2	2	1	1	1	1	1	1	1	2
Yes, consent to	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1

parti pate																												
Yes, cons nt to parti pate	2	2	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Yes, cons nt to parti pate	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1
Yes, cons nt to parti pate	2	3	1	1	1	1	1	1	1	1	1	2	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1
Yes, cons nt to parti pate	2	3	1	2	1	1	1	1	1	2	1	1	1	2	2	1	1	2	1	1	1	1	2	1	1	1	1	2
Yes, cons nt to parti pate	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	2	1	1	2	1	2	1	1	1	1	1	2	2
Yes, cons nt to parti pate	2	3	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2
Yes, cons nt to parti pate	2	3	1	1	1	1	1	1	1	1	1	2	2	2	1	1	2	1	1	1	1	1	2	1	1	2	2	1
Yes, cons nt to parti pate	2	3	1	1	2	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	2	1	1	2	1	1
Yes, cons nt to parti pate	2	4	1	2	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Yes, cons nt to parti pate	2	3	1	1	1	2	1	1	1	1	2	1	1	1	1	1	1	1	2	1	2	2	2	1	1	2	2	1
Yes, cons nt to parti pate	2	3	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1
Yes, cons nt to parti pate	1	3	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1
Yes, cons nt to parti pate	3	3	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Yes, cons nt to	2	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

parti pate																												
Yes, cons nt to parti pate	2	4	1	1	1	1	1	2	1	2	1	1	2	2	2	1	2	2	1	1	1	1	1	2	1	1	2	1
Yes, cons nt to parti pate	2	3	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1
Yes, cons nt to parti pate	2	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	1	1	1	1
Yes, cons nt to parti pate	2	3	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1
Yes, cons nt to parti pate	2	3	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Yes, cons nt to parti pate	2	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	
Yes, cons nt to parti pate	2	3	1	2	1	2	1	1	1	1	1	1	2	2	2	3	1	1	2	2	1	2	1	2	1	1	1	2
Yes, cons nt to parti pate	1	2	1	2	2	2	1	1	1	1	2	2	1	1	1	2	2	1	1	1	2	1	2	2	1	1	1	2
Yes, cons nt to parti pate	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	2	2
Yes, cons nt to parti pate	1	3	1	1	1	1	2	2	1	1	2	1	1	1	1	2	1	1	1	1	2	2	2	1	1	1	2	1
Yes, cons nt to parti pate	2	2	1	1	1	1	1	1	1	2	2	1	1	1	2	1	1	1	2	2	1	2	1	1	2	1	1	1
Yes, cons nt to parti pate	1	2	1	1	2	1	1	1	2	1	2	1	1	4	2	2	1	2	1	2	2	1	2	1	1	2	2	2
Yes, cons nt to parti pate	2	3	1	1	1	1	2	2	2	1	2	2	2	2	2	2	1	2	1	1	2	2	2	1	1	2	2	2
Yes, cons nt to	4	4	1	1	1	2	1	1	1	1	1	2	1	2	1	2	2	2	2	2	1	2	1	1	2	2	1	2

barti bate																												
Yes, cons nt to barti bate	4	4	1	1	1	1	1	2	1	2	1	2	1	5	2	1	2	2	2	2	1	1	2	2	1	2	2	2
Yes, cons nt to barti bate	4	4	1	1	2	2	1	3	1	1	2	1	1	1	1	2	2	1	1	2	1	1	1	2	1	1	2	1
Yes, cons nt to barti bate	4	3	1	1	1	1	2	1	1	2	1	2	2	2	2	2	1	2	1	2	2	1	1	1	1	1	1	1
Yes, cons nt to barti bate	1	3	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	2	1	2	1	1	1	1
Yes, cons nt to barti bate	1	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1
Yes, cons nt to barti bate	3	3	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1
Yes, cons nt to barti bate	3	4	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1
Yes, cons nt to barti bate	4	4	1	1	1	1	1	1	1	2	2	2	1	2	2	1	1	1	1	2	1	1	1	1	1	1	1	1
Yes, cons nt to barti bate	2	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2	1	1
Yes, cons nt to barti bate	3	4	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	2	1	1	1	1	1	1
Yes, cons nt to barti bate	3	4	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1
Yes, cons nt to barti bate	2	3	1	1	1	2	1	1	1	1	1	2	2	1	2	1	2	1	1	2	1	1	1	1	1	1	1	1
Yes, cons nt to barti bate	3	4	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2	1	1	1	2	1
Yes, cons nt to	3	4	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1

oartic oate																												
Yes,	1	1	2	1	1	2	1	1	2	2	1	2	1	1	2	1	1	2	1	2	1	1	1	2	1	1	1	1
cons nt to oartic oate																												
Yes,	3	3	1	2	2	1	1	1	1	1	1	2	1	1	1	1	1	2	2	1	1	1	1	2	1	1	1	1
cons nt to oartic oate																												
Yes,	1	1	1	1	1	1	1	1	2	2	1	1	2	5	5	1	1	1	2	1	2	1	2	2	1	1	1	1
cons nt to oartic oate																												
Yes,	3	4	1	1	1	1	1	1	1	2	2	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1
cons nt to oartic oate																												
Yes,	4	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1
cons nt to oartic oate																												
Yes,	3	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2	1	1
cons nt to oartic oate																												
Yes,	4	4	1	2	1	1	1	1	1	1	1	1	1	4	2	1	2	2	2	1	1	2	1	2	1	1	1	1
cons nt to oartic oate																												
Yes,	4	4	1	1	1	2	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	2
cons nt to oartic oate																												
Yes,	2	3	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1
cons nt to oartic oate																												
Yes,	3	3	1	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	2	1	2	1	1	1	1
cons nt to oartic oate																												
Yes,	3	3	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1
cons nt to oartic oate																												
Yes,	3	3	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1
cons nt to oartic oate																												
Yes,	3	4	1	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1
cons nt to oartic oate																												
Yes,	2	3	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1
cons nt to																												

Yes, consent to participate	4	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2
Yes, consent to participate	2	3	1	1	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1
Yes, consent to participate	2	4	1	1	1	2	1	1	1	2	1	2	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1	1
Yes, consent to participate	4	3	1	1	2	1	1	1	1	1	1	1	1	1	2	1	2	2	2	2	1	1	1	2	2	1	1	1
Yes, consent to participate	2	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2	1	1	4	1	2	2	1	1	1	2	5
Yes, consent to participate	1	2	1	1	1	1	1	1	2	1	1	2	2	5	1	1	2	1	1	2	2	5	1	1	1	2	1	5
Yes, consent to participate	2	3	1	1	1	1	1	1	1	1	2	2	1	2	1	1	2	1	1	1	1	1	1	1	1	1	2	2
Yes, consent to participate	2	3	1	2	1	2	1	1	1	1	1	1	1	2	2	1	2	1	1	1	2	1	1	2	2	2	1	1
Yes, consent to participate	1	2	1	1	1	1	2	1	1	2	1	2	1	2	2	1	1	1	2	1	1	1	1	1	1	1	1	2
Yes, consent to participate	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1	2	2	1	1	1	1	1	1	1	2	1	1	1
Yes, consent to participate	2	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1
Yes, consent to participate	2	3	1	1	2	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1
Yes, consent to participate	2	2	1	1	1	1	1	1	1	1	2	1	1	2	1	2	1	1	1	2	2	1	1	1	2	2	1	5
Yes, consent to	2	3	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	2

parti pate																												
Yes, cons nt to parti pate	2	2	1	1	1	1	1	1	2	2	1	1	1	2	1	1	1	1	1	1	2	2	1	2	1	1	1	1
Yes, cons nt to parti pate	2	4	1	1	1	1	2	1	1	2	1	2	2	1	1	2	2	1	1	1	1	1	1	1	1	2	2	1
Yes, cons nt to parti pate	1	2	1	1	2	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	2	2	1	1
Yes, cons nt to parti pate	2	3	1	1	1	1	2	1	2	1	1	1	2	5	1	4	1	1	1	2	1	2	2	2	2	1	2	2
Yes, cons nt to parti pate	4	4	1	1	1	1	1	3	1	1	1	2	2	2	3	2	2	1	2	2	2	1	1	1	1	1	1	1
Yes, cons nt to parti pate	1	2	2	2	2	1	1	2	1	2	1	2	2	1	2	2	2	1	1	1	2	1	2	1	1	2	2	2
Yes, cons nt to parti pate	3	2	1	1	1	2	1	1	2	1	1	1	2	1	2	1	1	1	2	2	1	1	2	1	1	1	2	2
Yes, cons nt to parti pate	1	2	1	2	1	1	1	2	1	2	2	2	2	1	2	1	1	1	1	1	2	1	2	2	1	2	2	1
Yes, cons nt to parti pate	3	4	1	2	2	1	1	1	1	1	2	2	2	1	1	2	1	1	2	1	2	2	2	1	2	3	1	1
Yes, cons nt to parti pate	2	3	1	5	2	1	1	1	1	2	2	2	1	2	1	1	1	2	1	2	1	2	1	1	2	2	1	1
Yes, cons nt to parti pate	2	3	1	1	2	1	1	1	2	2	2	1	1	2	2	1	2	1	1	2	2	1	1	1	1	2	2	2
Yes, cons nt to parti pate	3	2	1	1	2	2	1	1	2	1	2	1	2	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1
Yes, cons nt to parti pate	4	4	1	1	1	1	1	2	2	2	1	2	2	1	2	2	1	1	1	2	1	1	1	1	1	1	1	2
Yes, cons nt to	2	3	1	1	1	1	2	1	1	1	2	2	1	1	2	1	2	1	1	1	1	2	1	1	2	1	1	1

parti pate																												
Yes, cons nt to parti pate	3	4	1	1	1	1	1	1	1	1	1	1	1	5	1	1	1	1	1	2	2	2	1	1	1	2	1	1
Yes, cons nt to parti pate	2	3	1	1	1	1	1	1	2	1	2	2	1	2	1	1	1	1	2	2	2	2	2	1	1	1	1	2
Yes, cons nt to parti pate	3	4	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	2	2	1	2	1	1	1	1	2	2
Yes, cons nt to parti pate	2	3	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	2	1	2
Yes, cons nt to parti pate	3	3	1	1	1	2	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	2	1	1
Yes, cons nt to parti pate	4	4	1	1	2	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	2	1	1	2	1	1	2	2
Yes, cons nt to parti pate	2	3	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	2	2
Yes, cons nt to parti pate	1	2	1	1	1	1	1	1	1	1	2	1	2	2	2	2	1	1	1	5	2	4	5	1	2	5	5	5
Yes, cons nt to parti pate	4	4	1	1	1	1	1	2	5	4	5	4	4	4	5	5	4	5	5	5	5	5	4	5	4	5	4	5
Yes, cons nt to parti pate	2	3	1	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	4	4	4	4	4	1	1	1	2	1
Yes, cons nt to parti pate	2	3	1	1	2	2	1	1	1	1	2	1	1	1	1	1	1	1	2	2	2	2	1	2	1	1	1	2
Yes, cons nt to parti pate	3	4	1	1	1	1	1	2	1	2	1	1	2	1	2	1	1	1	4	5	3	5	4	2	1	2	2	3
Yes, cons nt to parti pate	2	4	1	2	1	1	1	2	1	2	2	1	1	2	1	2	1	1	5	5	4	3	4	2	1	2	2	2
Yes, cons nt to	1	3	1	1	1	2	2	1	2	2	2	2	2	1	1	2	2	2	1	5	4	4	2	4	1	1	2	2

parti pate																												
Yes, cons nt to parti pate	2	3	1	2	1	2	1	1	1	2	2	1	2	1	1	2	2	1	1	1	2	2	1	1	2	2	1	2
Yes, cons nt to parti pate	3	3	1	1	1	1	2	1	2	2	1	1	2	1	2	2	1	2	4	4	4	5	2	1	1	1	2	2
Yes, cons nt to parti pate	2	3	1	2	1	1	1	2	1	2	2	2	2	1	2	2	2	1	1	2	3	2	3	2	1	1	1	1
Yes, cons nt to parti pate	2	4	1	2	1	1	1	2	2	2	2	2	2	1	2	2	2	2	1	1	3	1	2	2	1	2	2	1
Yes, cons nt to parti pate	2	2	1	1	2	2	1	1	1	1	2	2	2	2	1	1	2	2	1	2	2	1	2	1	1	2	2	2
Yes, cons nt to parti pate	2	3	1	1	2	1	1	1	2	1	2	2	2	1	2	1	1	1	1	2	1	2	2	1	1	1	1	2
Yes, cons nt to parti pate	2	3	1	2	1	1	1	2	2	2	1	2	1	1	1	2	2	2	1	2	2	2	1	1	1	1	1	1
Yes, cons nt to parti pate	1	3	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	1	2	1	2	1	1	1	1

Hypotheses Analysis

Number of Observations Read	140
Number of Observations Used	140

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	2	27.37435	13.68718	158.28	<.0001
Error	137	11.84708	0.08648		
Corrected Total	139	39.22143			

Root MSE	0.29407	**R-Square**	0.6979
Dependent Mean	1.66429	**Adj R-Sq**	0.6935
Coeff Var	17.66922		

Parameter Estimates						
Variable	**Label**	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	Intercept	1	0.56843	0.07097	8.01	<.0001
Campaigns	Pharmacists' engagement in public awareness campaigns	1	0.45497	0.04364	10.42	<.0001
Tech	The use of advanced technological tools	1	0.11559	0.03460	3.34	0.0011

Correlations

		CD_Prevention	PAC
CD_Prevention	Pearson Correlation	1	.689**
	Sig. (2-tailed)		.000
	N	140	140
PAC	Pearson Correlation	.689**	1
	Sig. (2-tailed)	.000	
	N	140	140

**. Correlation is significant at the 0.01 level (2-tailed).

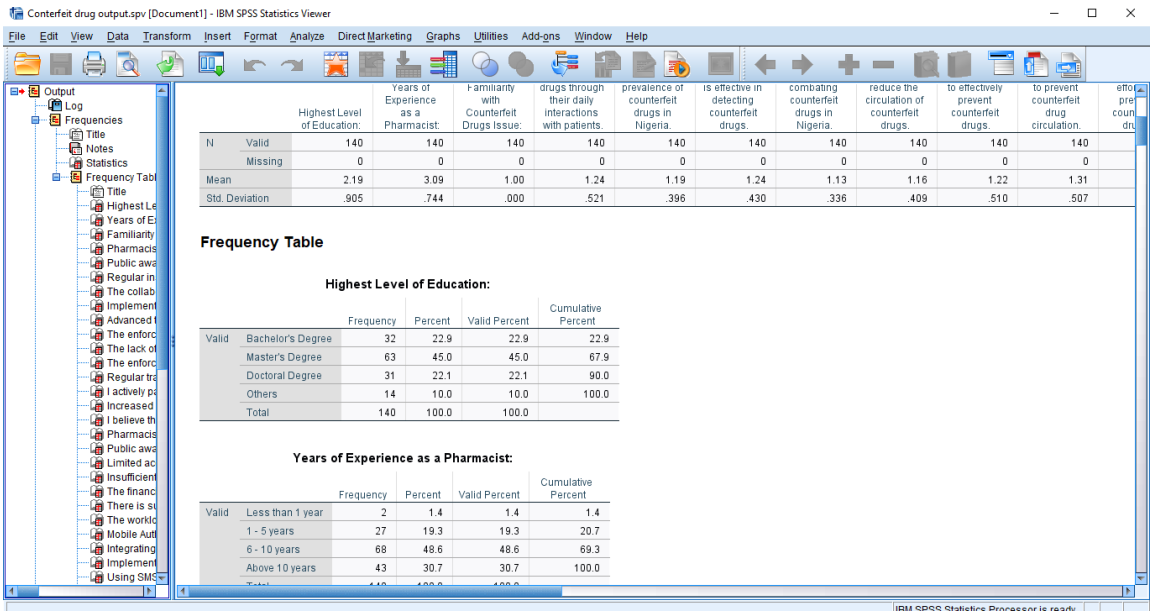
Number of Observations Read	140
Number of Observations Used	140

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	1	20.13242	20.13242	145.54	<.0001
Error	138	19.08901	0.13833		
Corrected Total	139	39.22143			

Root MSE	0.37192	**R-Square**	0.5133
Dependent Mean	1.66429	**Adj R-Sq**	0.5098
Coeff Var	22.34726		

Parameter Estimates						
Variable	**Label**	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	Intercept	1	0.86540	0.07330	11.81	<.0001
Campaigns	Pharmacists' engagement in public awareness campaigns	1	0.38700	0.03208	12.06	<.0001

SPSS Output


Conterfeit drug output.spv [Document1] - IBM SPSS Statistics Viewer
File Edit View Data Transform Insert Format Analyze Direct Marketing Graphs Utilities Add-ons Window Help
Output
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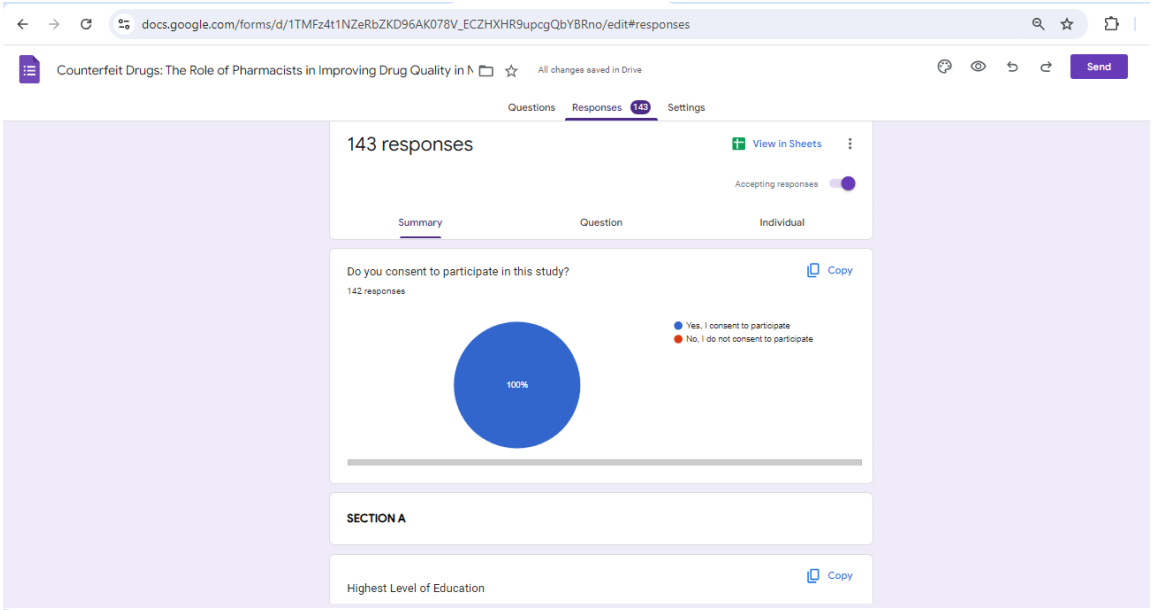
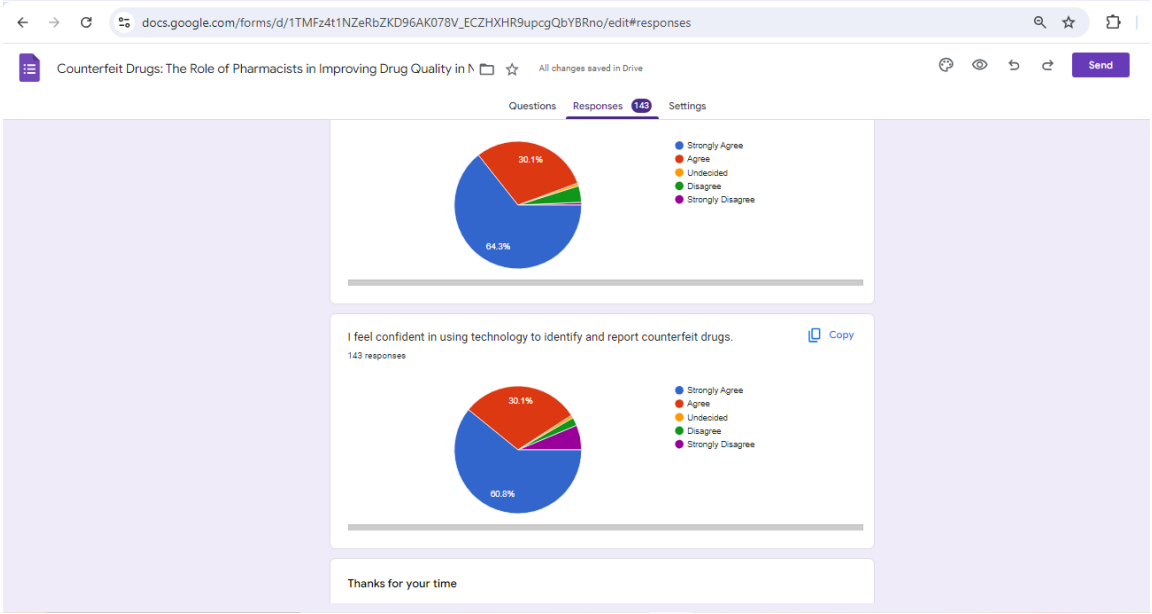
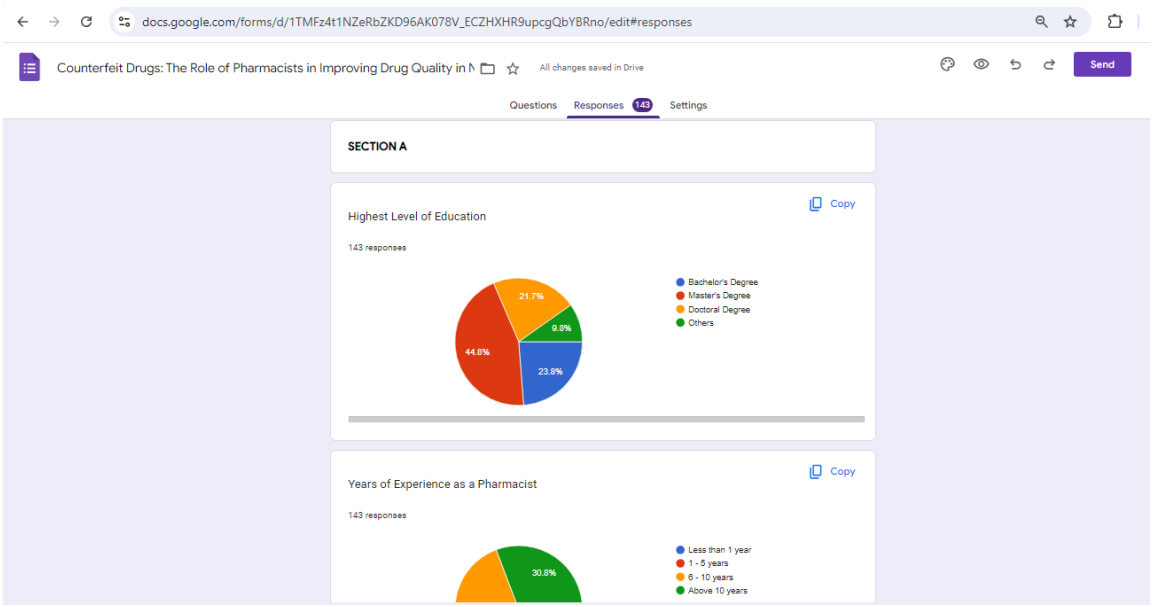
Highest Level of Education:
Years of Experience as a Pharmacist:
Familiarity with Counterfeit Drugs Issue:
drugs through their daily interactions with patients.
prevalence of counterfeit drugs in Nigeria.
is effective in detecting counterfeit drugs.
combating counterfeit drugs in Nigeria.
reduce the circulation of counterfeit drugs.
to effectively prevent counterfeit drugs.
to prevent counterfeit drug circulation.
N Valid 140 140 140 140 140 140 140 140 140 140
Missing 0 0 0 0 0 0 0 0 0 0
Mean 2.19 3.09 1.00 1.24 1.19 1.24 1.13 1.16 1.22 1.31
Std. Deviation .905 .744 .000 .521 .396 .430 .336 .409 .510 .507
Frequency Table
Highest Level of Education:
Frequency Percent Valid Percent Cumulative Percent
Valid Bachelor's Degree 32 22.9 22.9 22.9
Master's Degree 63 45.0 45.0 67.9
Doctoral Degree 31 22.1 22.1 90.0
Others 14 10.0 10.0 100.0
Total 140 100.0 100.0
Years of Experience as a Pharmacist:
Frequency Percent Valid Percent Cumulative Percent
Valid Less than 1 year 2 1.4 1.4 1.4
1 - 5 years 27 19.3 19.3 20.7
6 - 10 years 68 48.6 48.6 69.3
Above 10 years 43 30.7 30.7 100.0

Google Form

https://docs.google.com/forms/d/1TMFz4t1NZeRbZKD96AK078V_ECZHXHR9upcgQbYBRno/edit#responses



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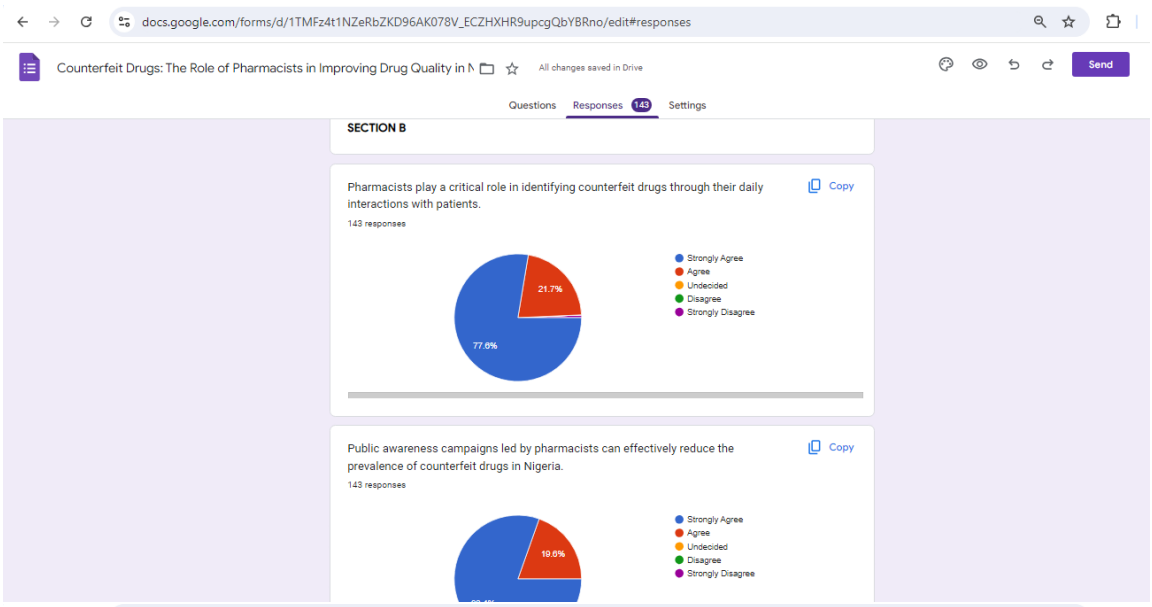
Counterfeit Drugs: The Role of Pharmacists in Improving Drug Quality in N
All changes saved in Drive
Send
Questions
Responses 143
Settings
SECTION A
Copy
Highest Level of Education
143 responses
21.7%
9.8%
44.8%
23.8%
Bachelor's Degree
Master's Degree
Doctoral Degree
Others
Copy
Years of Experience as a Pharmacist
143 responses
30.8%
Less than 1 year
1 - 5 years
6 - 10 years
Above 10 years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Counterfeit Drugs: The Role of Pharmacists in Improving Drug Quality in N
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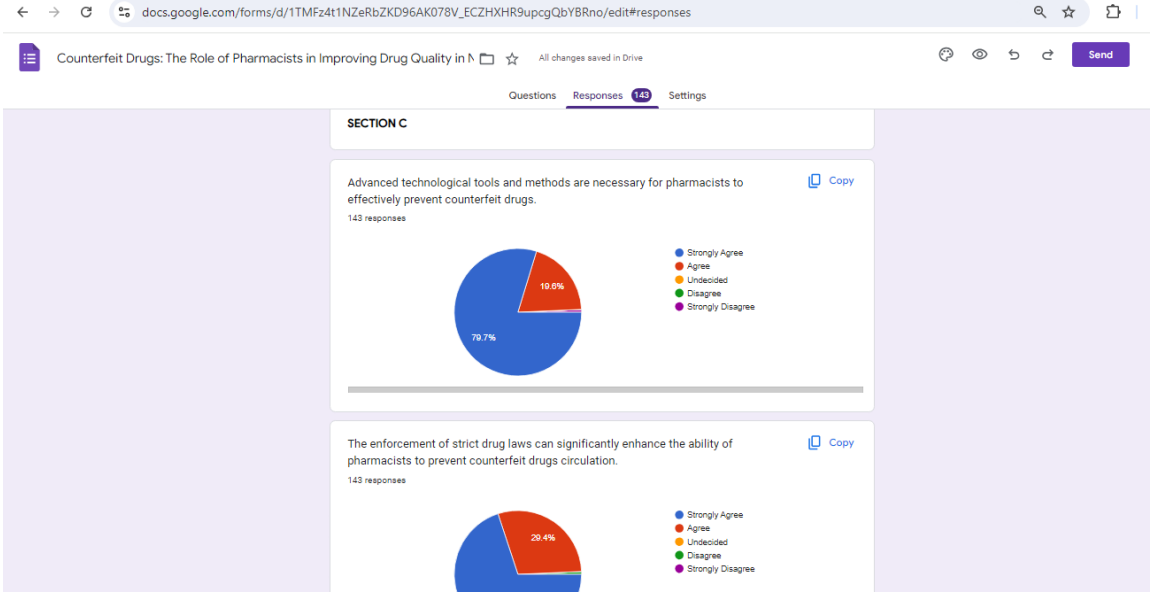
Send
Questions
Responses 143
Settings
SECTION B
Pharmacists play a critical role in identifying counterfeit drugs through their daily interactions with patients.
Copy
143 responses
21.7%
77.6%
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree
Public awareness campaigns led by pharmacists can effectively reduce the prevalence of counterfeit drugs in Nigeria.
Copy
143 responses
19.6%
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree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Counterfeit Drugs: The Role of Pharmacists in Improving Drug Quality in N
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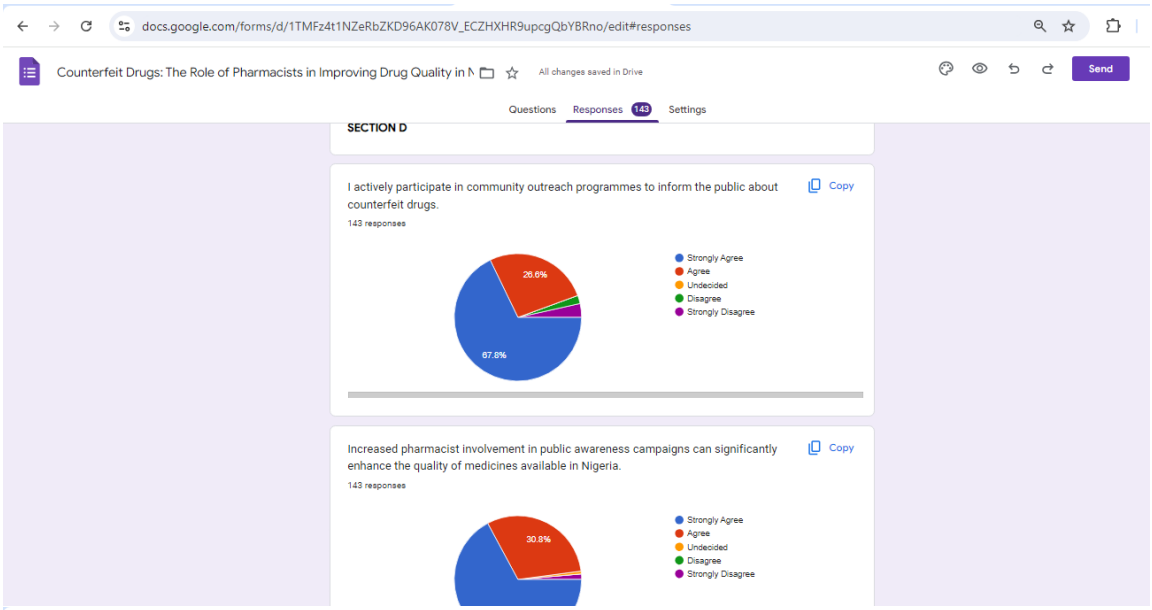
Questions
Responses 143
Settings
SECTION C
Advanced technological tools and methods are necessary for pharmacists to effectively prevent counterfeit drugs.
Copy
143 responses
19.6%
79.7%
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree
The enforcement of strict drug laws can significantly enhance the ability of pharmacists to prevent counterfeit drugs circulation.
Copy
143 responses
29.4%
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree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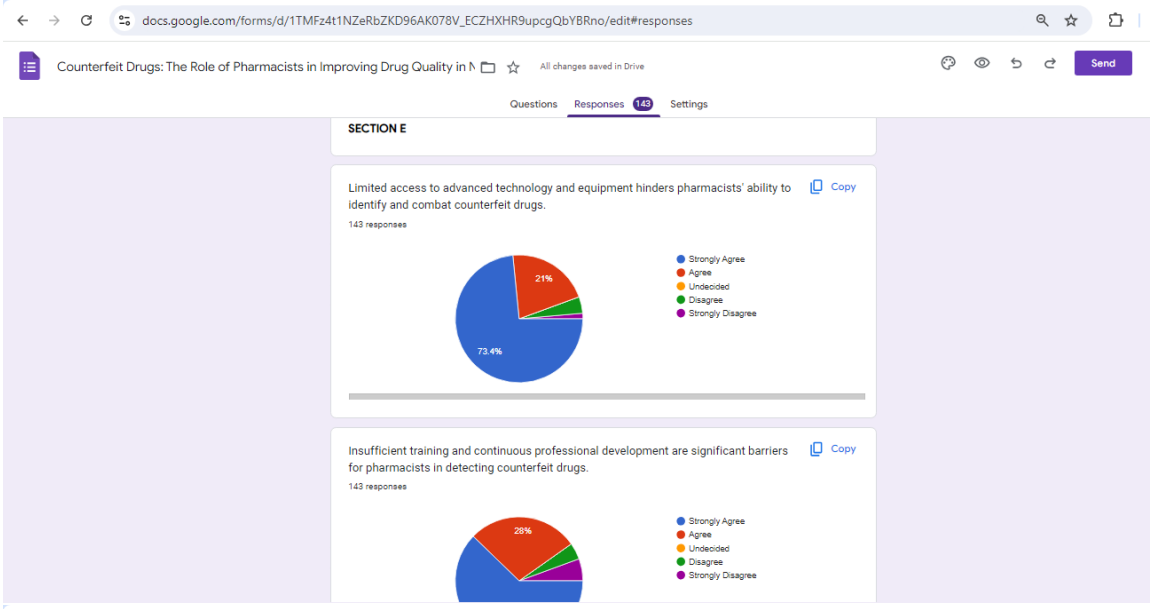
Counterfeit Drugs: The Role of Pharmacists in Improving Drug Quality in N
All changes saved in Drive
Send
Questions
Responses 143
Settings
SECTION D
I actively participate in community outreach programmes to inform the public about counterfeit drugs.
Copy
143 responses
26.6%
67.8%
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree
Increased pharmacist involvement in public awareness campaigns can significantly enhance the quality of medicines available in Nigeria.
Copy
143 responses
30.8%
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree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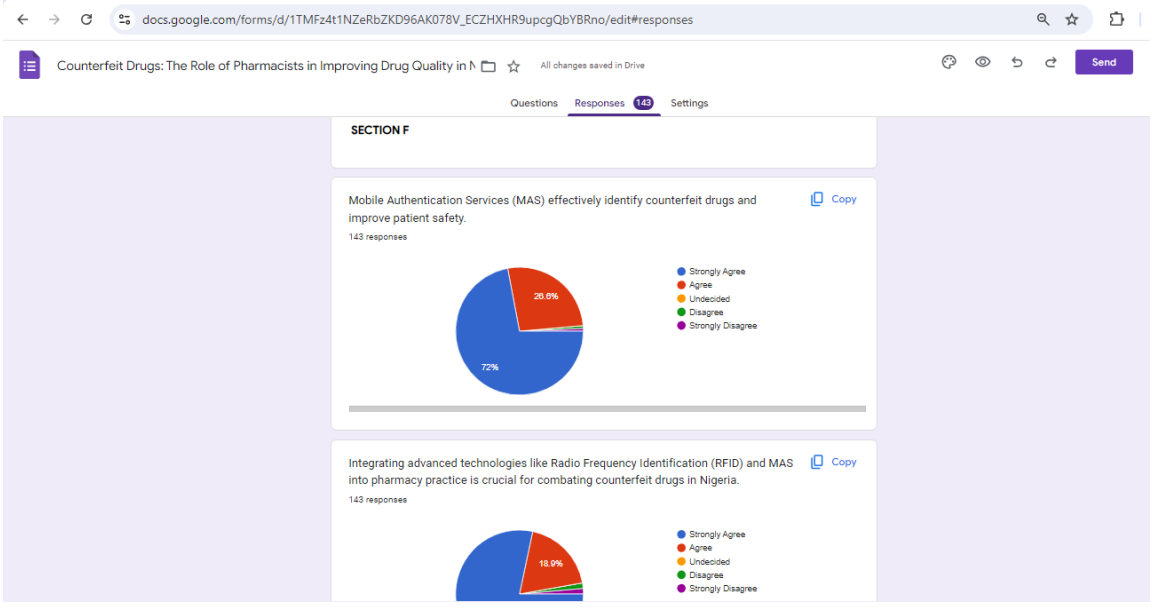
Counterfeit Drugs: The Role of Pharmacists in Improving Drug Quality in N
All changes saved in Drive
Send
Questions
Responses 143
Settings
SECTION E
Limited access to advanced technology and equipment hinders pharmacists' ability to identify and combat counterfeit drugs.
Copy
143 responses
21%
73.4%
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree
Insufficient training and continuous professional development are significant barriers for pharmacists in detecting counterfeit drugs.
Copy
143 responses
28%
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree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Counterfeit Drugs: The Role of Pharmacists in Improving Drug Quality in N
All changes saved in Drive
Send
Questions
Responses 143
Settings
SECTION F
Mobile Authentication Services (MAS) effectively identify counterfeit drugs and improve patient safety.
Copy
143 responses
26.6%
72%
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree
Integrating advanced technologies like Radio Frequency Identification (RFID) and MAS into pharmacy practice is crucial for combating counterfeit drugs in Nigeria.
Copy
143 responses
18.9%
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree