Financing Sustainable Health Coverage and the Regulation of Online Pharmacies in Nigeria

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DOI: 10.56201/ijhpr.vol.10.no5.2025.pg27.45

Abstract
The study is a descriptive survey of internet pharmacy in Nigeria aimed at determining the level of online pharmacy practice in Nigeria. Primary data were obtained from the internet using Google and Yahoo search engines. The sampling method was a census of all two hundred and twenty-four internet pharmacies in Nigeria. The instrument employed was an observation guide which comprises two sections. The first section sought information on the level of online pharmacy practice in Nigeria. The second section sought information on the extent to which online pharmacy is regulated in Nigeria. Both sections employed a dichotomous scale of 'yes' and 'no' responses. The collected data were analyzed using descriptive statistics including frequencies, percentages and tables. The result of the study shows just 21.9% of the surveyed two hundred and twenty-four online pharmacies have active websites. It also shows that just 1.4% of the six thousand, two hundred and forty-four online pharmacies registered in Nigeria have online presence. From the result, it can be deduced that 44.9% of registered and 7% of unregistered online pharmacies have evidence of active websites. The study concludes that a low level of internet pharmacy is prevalent in the Nigerian space. Furthermore, despite the laws and regulations established, a notably low proportion of the online pharmacies are registered and licensed. It is thus recommended that there is need for regulators to intensify efforts in their quest to improve and promote internet pharmacies in a bid to promote sustainable health coverage in Nigeria.

Keywords: *Health coverage, online pharmacies, regulation, financing, pharmaceutical practice*

1. Introduction

The online space has revolutionized the information, communication and technological world like never before. Since its advent, it has formed a platform for information dissemination, medium for collaboration and interaction among individuals and entities without regard for their geographical location. This implies that people now make transactions and interact with one another all over the

world without seeing face-to-face. The health sector has not been left out in the online revolution, and part of this result is the development of internet pharmacy websites which basically involves clients placing orders for their medications, refills and other pharmaceutical preparations over the internet and having them delivered to their doorsteps without physical visit to a pharmaceutical store.

People increasingly spend the majority of their time online for a variety of reasons, including social, business, religious, and health-related ones. The fastest and simplest means for people to access information and other services is now through the internet, which is a network that offers a range of facilities and information. It is a useful resource for gathering data, connecting with people, and finding business partners around the globe. Also, it has the power to improve both personal and professional lives. The internet's introduction has been welcomed in the healthcare industry since it has been integrated into many different aspects of healthcare services (Shah, 2010). .

The United Nations' Sustainable Development Goals (SDGs) are a set of 17 goals designed to create a more sustainable world. While there is no specific SDG that relates exclusively to online pharmacies, there are a few SDGs that are relevant to online pharmacies. SDG 3 which relates to good health and well-being aims to ensure universal access to quality healthcare services, including medicines and vaccines. Online pharmacies can contribute to this goal by making medicines more accessible and affordable for people, particularly those in remote areas. Also, SDG 9 which is the industry, innovation and infrastructure focuses on building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation. Online pharmacies can be seen as part of the innovation and infrastructure necessary to achieve this goal, particularly in areas where traditional healthcare services are lacking. Lastly, another goal related to online pharmacies is SDG 17, partnerships for the goals. This goal recognizes that achieving the SDGs requires collaboration between governments, the private sector, civil society, and other stakeholders. Online pharmacies can play a role in this by partnering with governments and other organizations to ensure that medicines are safely and effectively distributed. Overall, online pharmacies have the potential to contribute to several SDGs, particularly those related to health, innovation, and partnerships. However, it is important to ensure that online pharmacies operate in a safe, ethical, and transparent manner to avoid potential risks to public health.

The Millennium Development Goals (MDGs) were a set of eight global development goals established by the United Nations in 2000. While there is no specific MDG that relates exclusively to online pharmacies, there are a few MDGs that are relevant to online pharmacies. MDG 4 which is to Reduce Child Mortality aims to reduce the under-five mortality rate by two-thirds between 1990 and 2015. Online pharmacies can contribute to this goal by making essential medicines more accessible and affordable for children, particularly those in remote areas. Also, MDG 5 which is to Improve Maternal Health, this goal focuses on reducing maternal mortality and ensuring universal access to reproductive health services. Online pharmacies can be seen as part of the solution to achieving this goal by providing access to contraceptives and other reproductive health products

In Nigeria, pharmacists should be aware of the increasing complexity of the issues associated with online pharmacies and seek to direct individuals to legitimate websites and promote the quality use of medicines. (Gabay, 2015). Advancement of pharmacy practice is at the center piece of health system development in Nigeria. This could be traced to the metamorphosis undergone by

pharmacy practice from pre-independence Nigeria to present day especially the milestones achieved over the last two decades under the Pharmacists Council of Nigeria (PCN), established in 1993 (Mora, 2014). Limited internet access, lack of trust in online platforms, regulatory challenges, limited payment options, and lack of awareness are some of the factors that have contributed to the slow adoption of online pharmacies in Nigeria.

The internet gives healthcare professionals quick access to information that can help with the diagnosis of medical disorders or the creation of effective treatment strategies in clinical settings. Additionally, it promotes more patient-centred care by allowing individuals to access relevant information on their own and electronically interact with other patients, consumers, and healthcare professionals. Modern services like online pharmacies, where patients may use the internet to obtain medications and have them delivered to their homes, have developed as a result of internet use (Shah, 2010). One major benefit for those with disabilities or those who are housebound is this. The most frequent reason people use the internet is for health-related issues, and one area of health care that has been especially well-suited to online use is online pharmacy.

Online pharmacies also referred to as e-pharmacies, cyber pharmacies, Internet pharmacies or virtual pharmacies are Internet-based vendors of medicines and health related goods and services (Ekpedeme *et al.*, 2019). They operate through websites and/or mobile applications and may be categorized into independent sites and those representing partnership among pharmacies (Fung, 2004). The goods they sell include medical devices, herbal products, pet medicines, beauty products, over-the-counter (OTC) medicines and prescription-only medicines (POM). Online pharmacies provide orders to consumers by mail, shipping firms, or an online pharmacy web site. Increased access, lower transaction and product costs, and better anonymity are among potential advantages of online pharmacy. However, to operate legally online, pharmacies must be licensed in every state in the US in which the sales occur (Montoya & Jano, 2007).

In many instances, these pharmacies provide pharmaceuticals to consumers without the traditional face-to face physical examination by a doctor, others prescribe deadly drugs by only requiring that the consumer fills out an effortless questionnaire. In June 2013, the US Food and Drug Administration (FDA) shut down 1,677 Web sites for selling counterfeit or substandard medications and for selling medications to consumers without appropriate safeguards (Hellerman, 2015). In addition to dispensing counterfeit, unapproved, misbranded, or adulterated medications, many illegal online pharmacies dispense prescription-only medications without a valid prescription or fill prescriptions generated by “cyber-doctors” who obtain patient information solely from a questionnaire (Fung, 2004).

Conversely, a legitimate online pharmacy site requires a valid prescription from a licensed health care professional prior to dispensing, contains appropriate contact information for the site, provides access to a licensed pharmacist, and is licensed by the State Board of Pharmacy where the Web site is located. The foremost advantage that online pharmacies provide is lower prices. The lower prices are facilitated through the absence of many operating costs associated with traditional brick and mortar sites, which include building costs, labour and employee training costs. Further, as more people use the Internet, the competition among online pharmacies for market share increases, which can create price wars among competitors in an effort to attract consumers

1.2 Statement of the Problem

In many respects, the existing and potential damages that the internet can cause to an individual’s

health and to society as a whole cannot be ignored. The ability to access prescription drugs without a confirmed face - to - face physician consultation creates a large risk of misdiagnosis which, in turn, results in the wrong prescription being dispensed. Online pharmacies also provide a relatively effortless way for drug abusers and addicts to acquire prescription drugs. Furthermore, many web sites are breaking Federal and State consumer protection laws by representing that certified-doctors are offering their medical opinions and prescribing drugs when, in reality, a computer database is deciding the appropriate drug or remedy.

The most serious threat posed by online pharmacies is to the patient's health. Before prescribing a drug, many sites offer very restricted consultations and merely ask the patient a few questions. Many internet pharmacies are breaching State and Federal consumer protection laws by leading customers to believe that ordering prescription drugs without the permission of a registered physician is entirely lawful. For instance, the issue of inappropriate use of antibiotics which can lead to antibiotics resistance is now very rampant and can have fatal consequences on patients. This also calls for regulation as antibiotics are meant to be prescription-only medicines and shouldn't be sold without proper prescription.

1.3 Research Questions

The following questions emerged from the highlighted problems of the study;

(i) What is the level of online pharmacy practice in Nigeria?
(ii) How are the online pharmacies regulated in Nigeria?

1.4 Objectives of the Study

The main objective of this study was to access the regulation of online pharmacies in the southwestern region of Nigeria. The specific objectives were to

(i) determine the level of online pharmacy practice in Nigeria
(ii) Explore how the online pharmacies are regulated in Nigeria

2. Literature Review

2.1 The Concept of Pharmacy Practice

The practice of pharmacy was technically the first form of science in which people used nature to treat diseases. Pharmacy is among the world's oldest professions, dating back to 2700BC. The practice of pharmacy was initially combined with medicine, and was not legally separated from medicine until 1200AD (Adje & Oli, 2013). The history of pharmacy in Nigeria, just like the rest of the world, is old and largely undocumented. Information about healing such as the materials and methodologies was passed down verbally from generation to generation and was sometimes lost due to death. Perhaps it wasn't until the latter half of the nineteenth century, with the introduction of Western education that some wise elders began passing such knowledge about healing information to their younger descendants for posterity.

Prior to the arrival of the early European missionaries, the traditional healers were the primary source of treating the sick, using clay, plants and animal parts, or supernatural means (or combinations thereof) to treat their patients (Cicero *et al.*, 2008). During this time, pharmacy education began with training Nigerians in dispensing through apprenticeship under the guide of physicians, to prepare simple solutions and mixtures, and then either serving as dispensers in hospitals or opening medicine shops to serve the Nigerian community. The number of internet

users has also been observed to increase considerably in the last couple of years (Cicero *et al*., 2008).

This trend has revolutionized lives in many ways. As access to the internet increased, so also did the applications to which these important resources have been exploited. Research revealed that approximately 4.5% of all internet searches in the world are linked to health-related enquiries. Population-based surveys revealed that 72% and 71% of internet users in the United States and Europe respectively, actually searched for health information at least once in a year (Cicero *et al*., 2008).

In the present time, consumers access the internet not only for retrieving health information but with deep interest to self-diagnose and possibly procure various health services or product (Bessen, 2008). The supply of pharmaceuticals has developed in various manners and in conformity with different models in each region of the world. This has resulted to the perception, diverse regulatory and economic stands alongside the cultural environments. As it is now, online pharmacies are available and can be accessed globally. However, the spontaneous development of the procurement of medicines outside of the regular supply chain has its economic and regulatory concerns which are the subject of this review.

Pharmacy education in Nigeria began during the colonial masters' time, in the early 1920s, when 'dispensers' were simply trained to administer drugs. The term "dispenser" was defined as "a person who holds a certificate awarded under the provisions of the Poisons and Pharmacy Ordinance 1936 or having other recommended certifications who has been issued a permit under this Ordinance to combine, compound, prepare, and dispense drugs and poisons where such license is still in force." (Ikhile *et al*., 2016). Pharmacy has evolved from a generalist discipline to one that specialises in fields like oncology, pediatrics, terminal care, and nuclear pharmacy. It has also evolved from the pharmacy to the hospital ward and from dispensing to pharmaceutical care (Ikhile *et al*.,2016). A trained pharmacist may work in any type of pharmacy. Some of the types of pharmacy are discussed below.

Community Pharmacy

A community pharmacy also known as Retail Pharmacy is a type of healthcare facility that can provide pharmacy services to people in the surrounding area (Manohar, 2021). This is the type that is most referred to as a pharmacist or chemist shop. A registered pharmacist with the education, skills, and competence to provide professional service to the community works in a community pharmacy to dispense medicine. A community pharmacist usually works in a store where people can get the medications they need as well as advice on how to use the medications safely and effectively. They can tell their customers which drugs may react with each other or with alcohol, and they can also help mitigate dangerous or worrisome medication combinations or side effects. One of their responsibilities also includes assisting patients with the reimbursement of drug expenses, supervising pharmacy technicians, and maintaining a stock of the medications.

This area of pharmacy appears to fall under the "labels" of community pharmacy, retail pharmacy, private sector pharmacy, and corporate pharmacy. We view community pharmacy as a communal type of practice centred on an organization entrenched within a community, despite major disparities in service delivery modalities. Despite the fact that community pharmacies are quite active, little organizational-level research is done (Scahill,2013).

Hospital Pharmacy

Hospital pharmacy is the practice of pharmacy inside of a hospital under the direction of a licensed pharmacist. In some hospitals, pharmacies provided medicine information, distribution, and compounding services (Alo,2016). Hospital pharmacies today can be divided into primary, secondary, and tertiary healthcare pharmacists based on the amount of healthcare they provide (PCN, 2009). This categorization took into account organizational structure, size and quality of operations, complement of human resources, and scale of operations, among others. This categorization includes the type of services and level of minimum standards, prescribed for each level in the PCN publication and the four-part compendium of minimum standards (Alo, 2016).

Medicines are prescribed and dispensed in dispensaries and primary health care facilities, for example, by community health extension workers or staff nurses who manage these facilities, whereas in secondary and tertiary health care facilities, pharmacists are usually solely responsible for dispensing functions. In contrast, there is no clear distinction between prescribing and dispensing functions in private facilities, and the majority of private clinics dispense medications at their health facilities. Although pharmacies and licensed drug outlets were required by law to only provide prescription-only medications (POMs) with a valid prescription, weak enforcement by the responsible authority meant patients could still purchase them without one (Alo, 2016)

Since the 1990s, hospital pharmacy practice has shifted from a mostly product-oriented to a more patient-centred approach to pharmaceutical care. This was not by chance, as the pharmacy curriculum is always evolving to mirror contemporary methods around the world. The introduction of clinical pharmacy courses into the curriculum in the late 1980s was the first great stride, followed by the recent introduction of PharmD degree programs in select universities. Yet, there are still obstacles to patient-centred hospital pharmacy practice. They include (but are not limited to) insufficient health manpower resources, insufficient professional development for pharmacists, pharmacists' resistance to change, and physicians' resistance owing to a perceived encroachment on their job (Alo, 2016).

Clinical pharmacy

In the 1960s, the US developed clinical pharmacy in response to the need for society to enhance the use of medications. Hospital sector initiatives drove this evolution and made it possible for pharmacy schools to change how pharmacists are educated after they graduate (Aguwa *et al.*, 2008). The clinical pharmacy can be found in a variety of places, such as hospitals, nursing homes, and other medical facilities. Clinical pharmacy typically includes the following three terms: professionalism, professional skills, and patient care. Clinical pharmacy is most frequently used in the context of hospital pharmacies, where pharmacotherapy and advanced subspecialties are the main areas of concentration.

2.1.1 The Concept of Online Pharmacies

According to Orizio *et al.* (2011), online pharmacies are those companies that sell pharmaceutical preparation including prescription only drugs on the internet. Yeğenoğlu (2012) defined internet pharmacy as that which sells drugs through the internet. The term internet pharmacy also referred to as online pharmacy or virtual pharmacy (Yeğenoğlu, 2012). 1. Online pharmacies also referred to as e-pharmacies or virtual pharmacies are internet-based vendors of medicines and health related goods and services (Ekpedeme *et al.*, 2019).

In recent years, technology has drastically changed several sectors. The development of novel and contemporary technical innovations has significantly altered the field of health. A retailer of non-prescription and prescription medications that dispenses or sells medications directly to patients through the mail and provides information about their products and services via the internet is referred to as "online pharmacy" (also known as an internet or mail-order pharmacy). They include brick-and-mortar pharmacies with an online presence, chain pharmacies that operate exclusively online, and internet pharmacies that operate only online (Fittler *et al*., 2013). Yet, with the rapid growth of online pharmacies and e-commerce, the availability of digital service offerings, and direct-to-consumer healthcare, the landscape of the online pharmacy has altered (Mackey & Mayar, 2016).

Internet pharmacy practice is one of the innovations in the health care delivery system. Some authors defined internet pharmacy as an online organization or system that plays the role of traditional pharmacies while some defined it as a platform for selling medicines through internet. Gondim and Falcao (2007) defined internet pharmacy as a computerized system that has potential role of real pharmacies and handling business transactions remotely with no physical proximity between the consumers and drug retailers.

When compared to brick-and-mortar pharmacies, consumers may prefer to use online pharmacies for a variety of reasons, including convenience, 24/7 accessibility, price transparency, potentially improved customer privacy, and product availability (Fung *et al*., 2004). The option of having medications delivered is clear for individuals who are unable to leave their homes or who are incapacitated and have trouble getting to a pharmacy. Online pharmacies increase access to medications and services, but there is a risk that consumers could self-medicate or self-diagnose incorrectly, participate in medically unnecessary behaviour, abuse drugs, or experience drug-to-drug interactions, contraindications, or bad effects (Orizio *et al*., 2011). The term "digital iatrogenesis" described as "preventable patient harm resulting from injury that occurs from the use of information, services, or products delivered or enhanced through the internet and related technologies" (Mackey & Liang,2014). Privacy violations, identity theft, and fraud involving non-delivered products are among other non-health dangers (Orizio *et al*., 2011). This emphasizes how crucial health professionals are to making sure that consumers are informed and empowered during the decision-making process.

2.1.2 Perceived benefits of online sourcing of drug

Due to its special service, online medicine supply is very beneficial to pharmacies. It is more cost-effective in terms of staffing and infrastructure than traditional pharmacies and serves a wider range of customers (Makinen & Rautava, 2005). In addition to the flexibility of time and place, which is very helpful for the elderly and disabled when buying medicine online, there are also the apparent advantages of privacy protection and affordability due to pricing disparities, especially when shopping internationally. An aged, disabled, or sick who is confined to their home can benefit from online information and the availability of medicines with home delivery ((Spain and Carolyn, 2001). Online pharmacies offer the ability to encourage communication between pharmacists, doctors, and patients. For instance, the availability of asking pharmacists questions at any time of day about the side effects of medications may motivate people to do so (Rice, 2001). Additionally, people might feel more comfortable making inquiries about some prescriptions online than they would in a busy pharmacy thanks to the anonymity the internet provides (Rice, 2001).

2.1.3 Perceived drawbacks of online sourcing of drugs

Online sourcing accelerates and simplifies the purchasing process between buyers and sellers, although there are some barriers for its adoption which include repercussions for businesses using the internet for transactions connected to security (Leal, 2010). It is also hard for consumers to ascertain the authenticity, safety and quality of drugs purchased online especially if unregulated pharmacies are used (Liang & Mackey, 2009). The risk of obtaining substandard drugs from registered pharmacies cannot be out rightly ruled out, however, purchasing drugs from online pharmacies that are not registered increases the risk of obtaining fake drugs that could contain dangerous substances that could affect safety of consumers adversely (Montoya, 2008). Also end users' aversion to change, lack of technical understanding and familiarity with electronic purchasing as well as worrying about being displaced by automated systems is another disadvantage (Zunk *et al*., 2014). Self-diagnosis and self-medication are two risks that go hand in hand because people can buy prescription pharmaceuticals without ever speaking to a pharmacist.

2.1.4 Level of online pharmacy practice in Nigeria

The practice of online pharmacy started way back in 1999; the first one was launched in that year in the United States of America (USA) and was called Soma.com (Shah, 2010) after which others like drugstore.com in USA and PlanetRx.com also in the USA were developed (Anand *et al.*, 2010). Since the launch, the practice has been the focus of great interest, and the interest pharmacy industry has changed rapidly in the short time span (Crawford, 2003). According to Shah (2010), the exact number of online pharmacies is not known, however the Food and Drugs Administration (FDA) estimated that there are about 400-1000 online pharmacies and half of them are of the United States origin.

According to Seeberg-Elverfeldt (2009), the UK National Audit Office reported that only 1% of the UK respondents claimed to have purchased medicines over the internet in 2003, however, in 2008, the Royal Pharmacy Society of Great Britain reported that 2 million people in Great Britain were purchasing drugs online regularly. In the USA, the survey carried out in 2006 found that searching for information about prescription and over the counter drugs was the fifth most popular health topic searched for and a 2004 study found that 4% of Americans with population of about 300 million have purchased prescription medicines online (Fox *et al.*, 2005).

The proliferation and expansion of online pharmacy practice is as a result of combination of factors which include increasing access to internet, new technologies and all. Orizio *et al.* (2011) however concluded that very little is known of the internet pharmacy practice especially in developing countries because many online pharmacies operate from remote countries where business practices are largely inaccessible to international research.

With recent technological advancements and the global pandemic, the old method of providing pharmaceutical care services to patients has been enhanced, and a new system of care services which is internet pharmacy has been developed which is a cutting-edge method of providing health care services to patients and the general public via various telecommunication technologies such as cell phones, smart phones, tablets, wireless gadgets, and laptop computers (Dorsey and Topol, 2016). Initially, only 250,000 patients used internet pharmacy services, but with time, improved advertising, and other intervention initiatives, that number has risen to 3.2 million (Vecchione, 2016). Internet pharmacy also includes remote patient monitoring by utilizing web applications

has shown to improve patient-reported quality of life, medicine adherence, and lower health care expenditures (George & Cross, 2020)

The level of use of online pharmacy greatly increased during covid period. Pharmacies immediately altered their services to provide patient medication counseling, medication treatment monitoring, COVID-19 explanation and screening, and medicine home delivery, all of which enhanced patients' lives and made access to pharmacists easier throughout the COVID-19 period. The tasks of community pharmacists have expanded to include providing trustworthy illness information, public education on preventive measures, referring suspected cases, keeping a continuous supply of medicines and preventative goods, and vaccination (Ahmed & Saeed, 2020).

2.2 How online pharmacies are regulated in Nigeria

Online pharmacies that are not legitimate or legal are those that "either fail to comply with national or international pharmacy regulations or have not undergone the necessary regulatory evaluation, and/or certification."(Corey & Tu, 2008). Fittler *et al*. (2013) further point out that given the impalpable nature of the internet and its global scope, it is challenging to effectively regulate and execute laws pertaining to online pharmacies. (Fittler *et al.*, 2013). Orizio et al. (2011) also further point out that it is challenging to estimate the precise number of illegal internet pharmacies, evaluate the quality and safety of the accessible medicines or products, and estimate the volume of drugs provided and sold online. Determining the effect on the world's public health is therefore challenging. Orizio *et al*. (2011) also suggest a two-level strategy that includes having international rules regulating internet pharmacies and raising people's health/digital literacy levels in order to maximize the advantages of online pharmacies and minimize the risks (Orizio *et al.*, 2011).

In Nigeria, the regulation of internet pharmacies is carried out by the National Agency for Food and Drug Administration and Control (NAFDAC). NAFDAC is the regulatory body responsible for the regulation and control of the manufacture, importation, exportation, advertisement, distribution, sale, and use of drugs, cosmetics, medical devices, bottled water, and chemicals in Nigeria. Internet pharmacies are also required to comply with the guidelines provided by the Pharmaceutical Society of Nigeria (PSN), the professional body that regulates the practice of pharmacy in Nigeria (Ogundele *et al.*, 2021).

The guidelines for the operation of internet pharmacies in Nigeria were developed by NAFDAC and PSN in collaboration with the Pharmacy Council of Nigeria (PCN) and the Federal Ministry of Health (NAFDAC, 2019). These guidelines outline the requirements that internet pharmacies must meet in order to be licensed to operate in Nigeria. One of the requirements for internet pharmacies in Nigeria include having a registered pharmacist as the owner or superintendent pharmacist, obtaining a license from NAFDAC, maintaining accurate records of all transactions, ensuring that all drugs sold are genuine and of good quality, and complying with all relevant laws and regulations. In addition, internet pharmacies are required to display their license numbers on their websites and provide a phone number and email address for customers to contact them. They are also required to have a physical address and a functioning customer service system (NAFDAC, 2019).

2.2.1 The agencies responsible for the regulation of online pharmacies in Nigeria

In Nigeria, the National Agency for Food and Drug Administration and Control (NAFDAC) and the Pharmacy Council of Nigeria (PCN) are the two regulatory bodies responsible for the

regulation of online pharmacies. NAFDAC is primarily responsible for ensuring the safety and quality of drugs and other food and drug-related products, while the PCN is responsible for the regulation and control of the practice of pharmacy in Nigeria. NAFDAC and PCN have established guidelines and standards for the establishment and operation of online pharmacies in Nigeria. (Ogundele *et al.*, 2021). Another important regulatory agency relevant to pharmacy in Nigeria is the National Drug Law Enforcement Agency (NDLEA).

2.2.2 The laws regulating online pharmacies

Every internet service provider must operate in accordance with industry best practices and any applicable regulations imposed by the Nigerian Communications Commission, and other Federal Government Agencies, such as the PCN, among others. According to PCN online gazette, all internet pharmacies must be registered and licensed in the following manner (PCN, 2020).

1. All internet based Pharmaceutical Service providers in Nigeria shall be registered with the Pharmacists Council of Nigeria
2. Application for registration of online pharmaceutical services shall be made to the Registrar, Pharmacists Council of Nigeria by the Superintendent pharmacist specifically designated for the online pharmaceutical service who shall complete the application form which shall be accompanied by the following documents:

(a) Application letter for registration of online pharmaceutical services;
(b) Current Annual license of the Superintendent Pharmacist;
(c) Photocopy of the current premises registration license or evidence of current registration of the premises (in the case of existing pharmacies)
(d) Evidence of payment of prescribed fees to the Council;
(e) Letter of resignation from previous employment (if applicable);
(f) Letter of acceptance of resignation (if applicable);
(g) Letter of appointment as the Superintendent Pharmacist in the new premises (if applicable);
(h) Legal agreement between the Superintendent Pharmacist in the new premises and the owner of the pharmaceutical premises (if applicable);
(i) Company's Certificate of Incorporation (Evidence of registration of business name is acceptable for pharmacist-owned retail premises);
(j) Articles and Memorandum of Association; Application for registration of online Pharmacy Registration Authority Pharmacists Council of Nigeria Online Pharmacy Regulations, 2020;
(k) Certified true copies of CAC documents showing names and particulars of Directors; (l) NYSC Discharge or Exemption Certificate;
(m) An undertaking by the Superintendent Pharmacist to the effect that he is to be held accountable for the services provided on the online pharmacy platform(s);
(n) An undertaking by the Managing Director of the online Company to the effect that online pharmaceutical services shall be under the direct, personal control and management of the Superintendent Pharmacist (where applicable); and
(o) Policy documents which shall include – procedures and processes for all operations of the internet services

2.2.3 The mode of operation of the various bodies responsible for the regulation of online pharmacies in Nigeria

The Pharmacy Council of Nigeria (PCN) regulates online pharmacies in Nigeria through various measures (PCN, 2020). These measures include:

- Registration and licensing: The PCN requires online pharmacy operators to register with the council and obtain a license before commencing operations. This process involves the submission of an application form and the payment of registration and licensing fees.
- Inspection and accreditation: The PCN conducts inspections of online pharmacies to ensure compliance with established guidelines and standards. Accreditation is also granted to online pharmacies that meet the Council's standards.
- Monitoring and enforcement: The PCN monitors online pharmacies through post-marketing surveillance activities to detect and prevent the sale of counterfeit or substandard drugs. The council also conducts enforcement activities to ensure compliance with established regulations and guidelines.
- Continuing education: The PCN provides continuing education and training to online pharmacy operators on relevant laws, regulations, and guidelines.
- Complaint handling: The PCN provides a mechanism for the handling of complaints from the public about the activities of online pharmacies.

2.4 Gaps in the reviewed literature

Issues related to this topic which is the regulation of online pharmacies that were not found in the literature reviewed include the estimate of the extent of online pharmacy practice, evaluation of sales of medicines and compliance of online pharmacy websites with the regulations laid down which shows that these studies have not been extensively carried out in Nigeria. Also, there is limited research on exploration of how internet pharmacies are regulated in Nigeria. A comprehensive study would provide valuable insights into the progress, outcomes, and challenges associated with the regulation and the level of use of internet in sales of medicine which can help contribute to improving access to safe, effective, and high-quality medicines across Nigeria.

3. Methodology

Research design and location: This study is a descriptive survey of internet pharmacies in Nigeria and the actual location of the study was Obafemi Awolowo University where the internet pharmacies in Nigeria were checked with the aid of a laptop through google and other explorer browsers. The study was carried out for a period of three months between April and July 2023 via primary means.

Population of the study and sample size: The population of this study comprises all pharmacies in Nigeria whether licensed for practice or not. for the year in 2022. The sampling method was a census of all pharmacies with online presence in Nigeria. The list of the 2022 licensed pharmacy obtained from Pharmacy Council of Nigeria (PCN) was used to identify all registered pharmacies in Nigeria that have online presence using the Google and Yahoo search engines as well as others discovered in the process which may not have been registered. The sample size comprises the two hundred and twenty-four pharmacies found on the Internet operating in the Nigerian airspace.

Methods of data collection, preparation and analysis: The Google and Yahoo search engines were utilized to search for all retail pharmacies in Nigeria that have websites. Subsequently, the internet pharmacies were verified for their legal status by cross-referencing them with a list obtained from the Pharmacy Council of Nigeria (PCN). The data collected were coded and fed into computer using the Statistical Package for Social Sciences (SPSS) version 26. Descriptive statistics including frequencies, percentage, tables and also the use of charts to know if they are registered or not is employed in summarizing, organizing and presenting the data.

4.1 Results and discussion

4.1.1 Level of online pharmacy practice in Nigeria

Table 4.1 Evidence of Active Online Pharmacy Websites in Nigeria

	Frequency	Percentage
Yes	49	78.1
No	175	21.9
Total	224	100

The result of level of online pharmacy practice in Nigeria shows that just two hundred and twenty-four pharmacies in Nigeria practice internet pharmacy by selling medicines online. Most of the pharmacies run their pharmacies offline by having a physical walk-in premises rather than a website for the sales of medicines. According to the result gotten, table 4.1 shows that just (21.9%) among the online pharmacies (78.1%) have active website, majority of the ones that claim to have online presence do not have active website.

4.1.2 Level of online pharmacies regulation in Nigeria

Table 4.2 Level of online pharmacies regulation in Nigeria

Online Pharmacies Registered in Nigeria for the Year 2022	Frequency	Percentage
Yes	87	1.4
No	6134	98.2
Total	6244	100

This section shows the level of online pharmacies regulation in Nigeria. Table 4.2 shows that just (1.4%) of the six thousand two hundred and forty-four registered pharmacies have online presence while 98.2 have none.

Table 4.3 Evidence of active website among registered online pharmacies

Online pharmacies that were found to be in operation	Frequency	Percentage
Yes	40	44.9
No	49	55.1
Total	89	100

Table 4.3 shows that just (44.9%) of the eighty-nine registered online pharmacies has active website while 55.1% have none.

Table 4.4 Evidence of Active Websites among Unregistered Online Pharmacies

Unregistered Online Pharmacies with Evidence of Active Websites	Frequency	Percentage
Yes	9	7.0
No	119	93.0
Total	128	100

Table 4.4 shows that (7 %) of the one hundred and twenty-eight unregistered online pharmacies have active websites while 93% have none.

4.2 Discussion of findings

4.2.1 Level of online pharmacy practice in Nigeria

Internet pharmacies, also known as online pharmacies or e-pharmacies, have gained popularity worldwide as a convenient and accessible way to obtain medications. However, in Nigeria, the utilization of internet pharmacies remains relatively low according to the result gotten. The study carried out by Seeberg-Elverfeldt (2009) showed that the level of internet pharmacy practice in the UK, US and Germany was high, whereas in Netherlands, there were only ten internet pharmacies operating. Also, according to the result, the number of online pharmacies having active website/online presence is also low. This low level of internet pharmacy practice in Nigeria can be attributed to the following factors:

The first and major factor for the low utilization of internet pharmacies in Nigeria is the limited access to the internet and also because internet penetration in Nigeria is relatively low, with a significant portion of the population lacking reliable internet connectivity. Without sufficient access to the internet, individuals are unable to explore or benefit from the services provided by online pharmacies and this reason may limit the willingness of retail pharmacy to operate online Lack of trust and safety concerns is another significant factor hindering the adoption of internet pharmacies in Nigeria. The prevalence of counterfeit drugs and substandard medications within the country has created skepticism among the population regarding the authenticity and quality of medications available online. Many Nigerians prefer going to a physical pharmacy store, where they can physically verify the legitimacy of the medicines they purchase.

An infrastructural and logistic challenge is another factor. Nigeria faces significant infrastructural and logistic challenges, including unreliable power supply and postal services and inadequate transportation networks. These challenges can affect the timely delivery of medications ordered from online pharmacies, leading to concerns about medication availability and delays. Such logistical challenges further discourage individuals from opting for internet pharmacies. Another factor is data security. When purchasing drugs online, customers are required to share personal and sensitive information, including their medical history and payment details. Inadequate security measures can lead to data breaches, resulting in identity theft or misuse of personal information

From the finding of this study, the presence of online pharmacies in Nigeria is currently limited, and this can be attributed to the aforementioned factors, which, in turn, can decrease community pharmacies' inclination to establish their own websites and engage in internet pharmacy operations. Retail pharmacies are reluctant to take the risk of creating websites due to the potential impact on sales and the possibility of incurring losses

4.2.2 Level of online pharmacies regulation in Nigeria

The result obtained show that the level of pharmacies with online presence that are registered under the Pharmacy Council of Nigeria is very low which means that the level of online pharmacies that are unregistered is very high. According to Shah (2010), the world health organization (WHO) has no clear guidelines to control the online purchase of drugs. The implication of this includes the increase in the number of illegal internet pharmacies that sell fake or substandard medicines online. The PCN is solely responsible for the registration of pharmacies, both online and physical. Factors that can contribute to presence of large number of unregistered pharmacies may be due to lengthy registration process. Registering a pharmacy in Nigeria can involve a complex and time-consuming process. It often requires fulfilling multiple requirements, submitting various documents, and undergoing inspections by regulatory bodies, such as the Pharmacists Council of Nigeria (PCN) and the National Agency for Food and Drug Administration and Control (NAFDAC). The bureaucratic nature of the registration process can result in delays and extended timelines, which can deter potential investors or pharmacy owners.

According to PCN (2020), application for registration of online pharmaceutical services shall be made to the Registrar, Pharmacists Council of Nigeria by the Superintendent pharmacist specifically designated for the online pharmaceutical service who shall complete the application form and other processes. These processes can be seen as long and stressful to some individuals and they may end up running internet pharmacy without wanting to go through the long process of registration. The registration process may involve navigating through procedural barriers, paperwork, and red tape. This can be challenging for individuals or businesses without prior experience in dealing with government agencies. The cumbersome administrative procedures can discourage internet pharmacy owners from completing the registration process or can lead to errors or omissions that further delay the process.

Regulatory compliance is a good reason behind not registering websites. Along with the registration process, registered pharmacies must adhere to stringent regulations and guidelines set by regulatory bodies. These regulations include record-keeping, staffing requirements, and regular inspections. Ensuring compliance with these regulations can be time-consuming and costly, particularly for small or struggling pharmacies. Failure to comply with the regulations can result in penalties or even the cancellation of the pharmacy's registration, further devaluing the business.

A cost implication is another important factor. Registering a pharmacy in Nigeria often involves various fees, such as application fees, inspection fees, and licensing fees. Additionally, there may be requirements to provide certain infrastructure or equipment, which can add to the overall cost. The financial burden associated with the registration process can deter potential investors, especially if they are uncertain about the return on investment or if they face limited financial resources. Beyond the initial registration costs, running an online pharmacy entails various ongoing expenses. These include utilities, salaries for qualified staff, inventory replenishment, compliance with regulatory requirements, and other operational overheads. The cumulative costs of sustaining a registered online pharmacy can further strain financial resources, particularly if the pharmacy struggles to generate sufficient revenue or faces challenges in maintaining a consistent customer base considering the fact that most individuals in Nigeria prefer to go physical pharmacies.

According to Shah (2010), the Food and Drug Administration which is responsible for regulation in the United States has been able to state some guidelines to be followed by online pharmacies.

According to the result obtained, the high value of unregistered online pharmacies can also be attributed to this factor of following some set down guidelines by PCN. According to the findings from this study, the presence of active website among online pharmacies is low which does not correlate with the work done by Orizio *et al* (2011). The low level of active website among registered online pharmacies can be solely attributed to cost of building a website. Some of the factors that increase cost of website development are as follows:

The first factor can be the initial Development Cost. Building a website involves several components, such as designing the user interface, developing the functionality, and integrating necessary features like shopping carts, payment gateways, and inventory management systems. Depending on the complexity and scale of the website, these development costs can vary. Small or newly established online pharmacies with limited financial resources may find it challenging to allocate a significant portion of their budget to website development. Websites also require continuous maintenance to ensure they remain secure, functional, and up to date. This includes regularly updating software, monitoring for security vulnerabilities, and fixing any bugs or issues that arise. Ongoing maintenance costs, including hiring web developers or subscribing to website management services, can add up over time. Online pharmacies with limited budgets may struggle to allocate funds for these ongoing expenses, resulting in outdated or poorly functioning websites.

According to the result gotten, there's also presence of active website by unregistered online pharmacies which correlated to the work done by Fittler *et al.* (2013). The major reason attributed to presence of active website by these illegal online pharmacies can be for profit motive. Unregistered online pharmacies may be driven by the potential for financial gain. By operating outside the legal framework and avoiding regulatory requirements, they can potentially cut costs and maximize profits. The ease of setting up an online presence allows them to attract customers and conduct illicit transactions, taking advantage of the growing demand for online pharmaceutical services.

Also, regulatory bodies responsible for monitoring and enforcing pharmaceutical regulations may be facing challenges in identifying and taking action against unregistered online pharmacies. Limited resources, inadequate monitoring systems, or difficulty in tracking down illegal operators could contribute to the continued existence of their active websites.

5.1 Conclusion and Recommendations

From the findings of this study, it is concluded that the level of online pharmacy practice in Nigeria is very low and the level of online pharmacy regulation is low as well. From the findings and conclusion of this study, the following recommendations are hereby proffered:

i. The Federal Government of Nigeria should make pronouncement and intensify efforts aimed at effective regulation of online pharmacy practice in Nigeria**.**

ii. Implementation of robust cyber-security measures and encryption protocols to safeguard patient data and protect against cyber threat**.**

Conflict of Interest: The authors hereby declare that there are no ethical issues and conflict of interest in this manuscript.

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APPENDICES

Appendix 1: Observation guide employed in the study

(A) Evidence of online pharmacy practice in Nigeria

S/N	KEYWORDS SEARCHED ON THE SEARCH ENGINES
1	Online pharmacy in Nigeria
2	Online pharmacy practice in each state in Nigeria
3	Evidence of presence of active website by each online pharmacy in Nigeria

(B) Evidence of regulation of online pharmacies

S/N	VARIABLES
1	Online pharmacies observed compared to the PCN list of registered pharmacies
2	Registered online pharmacies checked for presence of active website
3	Unregistered online pharmacies checked for presence of active website