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Knowledge And Perceptions Of Online Pharmacy Regulations And Services Amongst Community Pharmacists In Two Nigerian States

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Abstract:
Background*: There is limited data on the extent to which community pharmacists clearly understand the recently introduced Pharmacy Council of Nigeria (PCN) online pharmacy regulations. The study evaluated the knowledge and perceptions of online pharmacy regulations and services amongst community pharmacists in two Nigerian States.*
Methods*: The cross-sectional study (February 2022 to April 2022) employed a questionnaire-based research design. The study instrument was a 44-item structured, self-administered questionnaire in five sections. Data were analyzed using the IBM SPSS Version 25.0. Statistical significance was set as P < 0.05.*
Results*: One hundred and sixty-eight (168) questionnaires were completed by community pharmacists in the two States that participated in the study. Majority of the respondents were between 26 to 45 years old (n = 122, 72.6%), male (n = 103, 61.3%), and owned community pharmacies (n = 108, 64.3%). More than two-thirds of the respondents had plans to register an online pharmacy (n = 121, 72.0%). More than four-fifths of the respondents knew that online pharmacies in Nigeria must be registered with PCN (n = 143, 85.1%). A little above half of the respondents had good knowledge of PCN online pharmacy regulations (n = 91, 54.2%) and favourable perceptions of online pharmacy (n = 91, 54.2%).*
Conclusion: *Slightly over half of respondents had good knowledge and favourable perceptions of the Pharmacy Council of Nigeria (PCN) online pharmacy regulations. This highlights the need for PCN to intensify sensitization efforts, ensuring broad awareness and understanding of the current regulatory framework for online pharmacies.*

Key Words*: Community Pharmacists; Knowledge; Online Pharmacy Regulations; Perceptions; Nigeria*

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I. Introduction

The advent of technology has revolutionised healthcare, and pharmacy practice is not left behind[1]. Community pharmacies are integral to healthcare systems[2]. The emergence of online pharmacies represents a major shift in pharmacy practice. This shift from the traditional pharmacy to the growing utilisation of online pharmacies is due to convenience in the purchase of health products and comparatively lower costs due to price transparency[3]. Patients could use online pharmacies to access medicines for self-recognised ailments[4].

Although internet-based pharmacies became popular in developed countries in the late 1990s, low-income and middle-income countries, like Nigeria, have only recently adopted the practice in the last decade[5]. Despite the delay in adoption, the emergence of online pharmacies in Nigeria has gained significant traction over the years. Online pharmacy in Nigeria is projected to grow by more than 16% between 2023 and 2027, reaching a volume of approximately US$396.90 million[6].

Online pharmacies, as defined by Fung *et al.*, fall into three categories: independent Internet-only sites, online branches of "brick-and-mortar" pharmacies, and sites representing partnerships among neighbourhood pharmacies[7]. Other names for online pharmacies include internet pharmacies, mail-order pharmacies, or e-pharmacies[8].

Despite its potential benefits in terms of convenience and cost-effectiveness, the establishment of online pharmacies is not without its drawbacks. Some of these drawbacks include the illegal sales of prescription-only medication, misleading drug information, sales of substandard medications and an increased number of

fraudulent websites and dishonest vendors[9, 10]. The World Health Organization (WHO) estimates that over 50% of drugs gotten over the internet are fake[11]. The poorly regulated establishment of online pharmacies represents another significant drawback associated with these healthcare platforms[12].

The uncontrolled proliferation of unregistered electronic pharmacies and e-commerce platforms selling pharmaceutical products in Nigeria has given rise to a state of chaos[13]. In response to this, the Pharmacy Council of Nigeria (PCN) has undertaken the initiative of formulating and releasing the Online Pharmacy Regulation laws in June 2021, aimed at effectively monitoring and overseeing these internet-based healthcare vendors[14].

The Online Pharmacy Regulations consist of four parts[14]. Part I (Regulation and Licensing) comprises sections on Registration/Authority; Application for Registration of Online Pharmacy; Names and Qualifications of Superintendent Pharmacists and other Professionals; Licensing of Online Pharmacy; Removal of Premises License; Change or Variation of License; Suspension, Revocation, Withdrawal or Cancellation of License; Closure of Facility, and Compliance with Information and Communication Technology Laws. Part II (Inspection, Monitoring, and Enforcement) has a single section on the Inspection, Monitoring, and Enforcement of Online Pharmacy. Part III (Operation of Online Pharmacy) includes sections on Operations, Communication; Dispensing Prescription-Only-Medicines; Dispensing Over-the-Counter Drugs (OTC); Advertisement; Patient Information; Storage and Delivery of Drugs. Part IV (General Provisions) comprises sections on Registered Internet Pharmaceutical Service Providers; Penalties for Late Payment of Practicing Fees and Fees for Registration; Payment of Inspection Fees; The PCN Emblem; Offences and Penalties; Interpretation; and Citation.

A comprehensive understanding of the regulations governing the establishment of online pharmacies is crucial for community pharmacists who aspire to operate internet-based pharmacy services. This knowledge can play a pivotal role in addressing the escalating concerns surrounding the proliferation of unregulated online pharmacies. However, there is a paucity of available research in Nigeria examining the extent to which community pharmacists possess a clear understanding of the regulations that govern the establishment of online pharmacies[15]. Consequently, this study sought to assess the knowledge and perceptions of online pharmacy regulations and services among community pharmacists in Nigeria, utilizing two Nigerian states as a case study.

II. Methods

This study was conducted among community pharmacists in two Nigerian states, Enugu and Lagos between February 2022 to April 2022. A total of 168 community pharmacists (both male and females) participated in this study.

Study Design: Cross-sectional study

Study Location: This was conducted among community pharmacists in two Nigerian states, Enugu and Lagos.

Study Duration: February 2022 to April 2022.

Sample size: 223 community pharmacists. However, only 168 community pharmacists provided consent and were conveniently sampled.

Sample size calculation: The total population of community pharmacists in the two States was obtained from the Association of Community Pharmacists of Nigeria (ACPN), Enugu State, and ACPN, Lagos State. Lagos State has the highest number of community pharmacists in the country. ACPN in the State comprises different zones. Two zones in Lagos State were conveniently selected for the study. The required sample size was calculated using the Raosoft® sample size calculator, with a 5% margin of error, at a 95% confidence interval, assuming a 50% response rate. There were 200 community pharmacists in Enugu State and 327 community pharmacists in the two zones of ACPN Lagos State. With a total population of 527, a minimum recommended sample size of 223 was calculated. Community pharmacists who fell within the eligibility criteria and were willing to participate in the study were included. Convenience sampling was employed.

Ethical approval

The study protocol was approved by the Health Research and Ethics Committee (HREC) of the University of Nigeria Teaching Hospital (UNTH), Ituku-Ozalla on the 9th of February, 2022. (NHREC/05/01/2008B-FWA0000245 8-1RB00002323). Respondents provided consent (written and verbal) to participate in the study.

Eligibility criteria

Community pharmacists practicing in the two States who provided consent and were willing to participate in the study.

Data collection

The study instrument was a 44-item structured, self-administered questionnaire. Clinical Pharmacists of the Department of Clinical Pharmacy and Pharmacy Management, University of Nigeria Nsukka (UNN) scrutinized the items of the questionnaire, making suggestions for its improvement. A pilot study was conducted with six community pharmacists in Nsukka, Enugu, who were excluded from the main study. Data from the pilot study were excluded from the main study. The pilot study provided information about the average time to fill the questionnaire as well as possible questions that had to be expunged or rephrased, to eliminate ambiguities. The final version of the questionnaire was used for the main study.

The questionnaire comprised five sections. The first section focused on demographic details. The second section requested information on internet use. The third section assessed awareness about online pharmacies. The fourth section explored the community pharmacists' knowledge of the PCN online pharmacy regulations. The fifth domain section focused on community pharmacists' perceptions of online pharmacies. The respondents were approached to fill out the questionnaire at the Association of Community Pharmacists of Nigeria (ACPN) meeting which was held in March 2022 (Enugu) and April 2022 (Lagos).

Data analysis

Data were analysed using the IBM SPSS Version 25.0. Descriptive statistics, such as frequency, percentages, mean, and standard deviation, were used to summarize data. Inferential statistics such as Pearson's Chi-Square test was used to test the association between variables, with statistical significance set as $P < 0.05$.
The total knowledge score was the sum of the correct options for the items testing knowledge of PCN online pharmacy regulations, with a maximum total knowledge score of 14. Knowledge was categorized as *good* or *poor* such that *good knowledge* of PCN online pharmacy regulations referred to those with total knowledge scores ≥ 9 (the median score).

The total perception score was the sum of the scores for the different items, with a maximum total perception score of 48. The perception was categorized as *favourable* or *unfavourable* such that *favourable perception* of online pharmacy regulations referred to those with a total perception score ≥ 32 (the median score).

III. Results

One hundred and sixty-eight (168) questionnaires were completed by the community pharmacists in the two States: Lagos (n = 123, 73.2%) and Enugu (n = 45, 26.8%). Incompletely-filled questionnaires were excluded. The participation rate was poor for the two States, as it was 37.6% for Lagos (123/327) and 22.5% (45/200) for Enugu. Majority of the respondents were between 26 to 45 years old (n = 122, 72.6%), male (n = 103, 61.3%), owned community pharmacies (n = 108, 64.3%), and had between five to ten years of community pharmacy experience (n = 79, 47.0%). See Table 1.

Table 1: Demographic details, N = 168

Variables	n (%)
Location	
Enugu	45 (26.8)
Lagos	123 (73.2)
Age (in years)	
≤ 25	2 (1.2)
26 – 35	75 (44.6)
36 – 45	47 (28.0)
46 – 55	28 (16.7)
56 – 65	10 (6.0)
> 65	6 (3.6)
Gender	
Male	103 (61.3)
Female	65 (38.7)
Number of years after graduation	
< 5	16 (9.5)
5 – 10	72 (42.9)
11 – 20	41 (24.4)
> 20	39 (23.2)
Community pharmacy experience (in years)	
< 5	39 (23.2)
5 – 10	79 (47.0)
11 – 20	34 (20.2)
> 20	16 (9.5)
Additional qualifications	
MSc/MPharm [Yes]	49 (29.2)

MPH [Yes]	11 (6.5)
MBA [Yes]	23 (13.7)
FPCPharm [Yes]	12 (7.1)
PhD [Yes]	4 (2.4)
Others [Yes]	23 (13.7)
I own a community pharmacy [Yes]	108 (64.3)
The community pharmacy where I work runs an official website [Yes]	26 (15.5)
Frequency of website updates	
Weekly	3 (1.8)
Monthly	8 (4.8)
Yearly	9 (5.4)
Never	1 (6)
No website	147 (87.5)

MSc/MPharm = Master of Science/Master of Pharmacy; MPH = Master of Public Health; MBA = Master of Business Administration; FPCPharm = Fellow of West Africa Postgraduate College of Pharmacists; PhD = Doctor of Philosophy

Table 2 shows that majority of the respondents claimed to have good to excellent knowledge of Information and Communication Technology (ICT) (n = 145, 86.3%). Almost all respondents had access to internet-enabled devices (n = 167, 99.4%). More than two-thirds of the respondents had plans to register an online pharmacy (n = 121, 72.0%),

Table 2: Internet use information, N = 168

Variables	n (%)
Self-rated knowledge of ICT	
Excellent	19 (11.3)
Very good	60 (35.7)
Good	66 (39.3)
Fair	20 (11.9)
Poor	3 (1.8)
Access to internet-enabled mobile phones/devices [Yes]	167 (99.4)
Active on social media [Yes]	163 (97.0)
Shop online [Yes]	134 (79.8)
Previously made an online drug requisition [Yes]	105 (62.5)
Filled an online prescription [Yes]	58 (34.5)
Intend to register an online pharmacy [Yes]	121 (72.0)

Table 3 shows that more than half of the respondents claimed to be aware of the Pharmacy Council of Nigeria (PCN) online pharmacy regulations (n = 108, 64.3%). The major source of information about the PCN online pharmacy regulations was the Association of Community Pharmacists of Nigeria (ACPN) group (n = 95, 56.5%). More than four-fifths of the respondents knew that online pharmacies in Nigeria must be registered with PCN (n = 143, 85.1%). Only a fifth of them knew that the Council's inspection of online pharmacies should include access to the backend of the website or platform (n = 36, 21.4%). A little above half of the respondents had *good knowledge* of PCN online pharmacy regulations (n = 91, 54.2%).

Table 3: Awareness and knowledge of Pharmacy Council of Nigeria (PCN) online pharmacy regulations, N = 168

Variables	n (%)
Awareness about the PCN online pharmacy regulations	
Yes	108 (64.3)
No	60 (35.7)
Sources of information about PCN online pharmacy regulations	
ACPN Group [Yes]	95 (56.5)
PSN Group [Yes]	42 (25.0)
PCN Updates/Website [Yes]	55 (32.7)
Others [Yes]	2 (1.2)
Knowledge of PCN online pharmacy regulations [Correct Option]	
1. Online pharmacies in Nigeria must be registered with PCN [True]	143 (85.1)
2. The name and qualification of the Superintendent Pharmacist for an online pharmacy must be available online [True]	131 (78.0)
3. The physical address of the online pharmacy must be visible online [True]	134 (79.8)
4. Registered online pharmacy sites shall be eligible for the Council Registered Online Pharmacy Sites Emblem (ROPSE) [True]	110 (65.5)
5. Online Pharmacy license shall expire on the 31st day of December of every year and be due for renewal on the 1st day of January of the following year [True]	133 (79.2)
6. Every online pharmacy shall comply with relevant laws relating to ICT in Nigeria [True]	134 (79.8)
7. Council's inspection of online pharmacies does not include access to the backend of the website or platform [False]	36 (21.4)

8. Prescription-Only-Medicines cannot be dispensed from online pharmacies [False]	47 (28.0)
9. Dangerous drugs as contained in the Dangerous Drugs Act (CAP. 9, 1935) can be dispensed from online pharmacies [False]	89 (53.0)
10. Only OTC medications can be advertised publicly [True]	133 (79.2)
11. Online pharmacies do not need to verify the identity of the patient and prescriber to maintain their privacy [False]	92 (54.8)
12. Online pharmacies should provide systems for safe and secure delivery of all medications [True]	150 (89.3)
13. Late renewal of license for registered online pharmacies is after 31st March every year and shall attract late payment fees of 50% of the applicable fee in addition to paying the prescribed renewal fee [False]	12 (7.1)
14. Pharmacists can register more than one online pharmacy [False]	53 (31.5)

Table 4 shows that less than half of the respondents agreed that online pharmacies reduce significant interactions with healthcare professionals and put clients at risk (n = 65, 38.7%). About three-quarters of the respondents agreed that online pharmacies could be useful during communicable disease outbreaks (n = 125, 74.4%). More than half of the respondents believed that online pharmacies could increase the risks of security breaches and malicious use of client data (n = 101, 60.1%). slightly above half of the respondents had *favorable perceptions* of online pharmacy (n = 91, 54.2%).

Table 4: Perceptions of online pharmacy, N = 168

Variables		**n (%)**		
	SD	**D**	**A**	**SA**
1. The internet is increasingly being used as a source of health and drug-related information	22 (13.1)	12 (7.1)	64 (38.1)	70 (41.7)
2. Medicines purchased over the internet from sites that conceal their physical addresses should not be trusted	24 (14.3)	17 (10.1)	59 (35.1)	68 (40.5)
3. $^{+}$ Online pharmacies reduce significant interactions with healthcare professionals and put clients at risks	30 (17.9)	73 (43.5)	44 (26.2)	21 (12.5)
4. $^{+}$ Online pharmacies pose the risk of clients receiving counterfeit and substandard medications	26 (15.5)	50 (29.8)	73 (43.5)	19 (11.3)
5. Online pharmacies afford clients with more privacy than the traditional Physician or Pharmacist visit	31 (18.5)	29 (17.3)	78 (46.4)	30 (17.9)
6. Online pharmacies could be useful during communicable disease outbreaks e.g., the COVID-19 pandemic	27 (16.1)	16 (9.5)	59 (35.1)	66 (39.3)
7. Online pharmacies can provide an avenue for tracking and strengthening pharmacovigilance activities	29 (17.3)	35 (20.8)	69 (41.1)	35 (20.8)
8. $^{+}$ Online pharmacies provide channels for illegal dispensing of prescription-only-medicines	24(14.3)	50 (29.8)	75 (44.6)	19 (11.3)
9. $^{+}$ It is impossible to determine whether an online pharmacy is legitimate or not	35 (20.8)	71 (42.3)	48 (28.6)	14 (8.3)
10. Obtaining medicines from online pharmacies is more convenient than traditional community pharmacies	30 (17.9)	53 (31.5)	59 (35.1)	26 (15.5)
11. $^{+}$ Online pharmacies could increase the risks of security breaches and malicious use of client data	26 (15.5)	41 (24.4)	80 (47.6)	21 (12.5)
12. $^{+}$ With online pharmacies, there is no assurance of temperature control either at the storage points or during transport	27 (16.1)	43 (25.6)	75 (44.6)	23 (13.7)

Strongly Disagree (coded as '1'); Disagree (coded as '2'); Agree (coded as '3'); Strongly agree (coded as '4').
$^{+}$ Reversed Items such that: Strongly Disagree (coded as '4'); Disagree (coded as '3'); Agree (coded as '2'); Strongly agree (coded as '1').
The total perception score was the sum of the scores for the different items with a maximum total perception score of 48.
The perception was categorised as *favourable* or *unfavourable,* such that *favourable perceptions* of online pharmacy referred to those with total perception score ≥ 32 (the median score).
Slightly above half of the respondents had *favourable perceptions* of online pharmacy (n = 91; 54.2%).

Table 5 shows that a larger proportion of respondents with a Master of Public Health (MPH) (n = 11, 100.0%) had good knowledge of PCN online pharmacy regulations compared to those who did not (n = 80, 51.1%) (χ^2 = 9.960, P = 0.002). A larger proportion of respondents whose community pharmacies owned official websites (n = 20, 76.9%) had good knowledge of PCN online pharmacy regulations compared to those who did not (n = 71, 50.0%) (χ^2 = 6.416, P = 0.011), Table 5. Respondents who had doctorate degrees (Ph.D.) (n = 4, 100.0%) had more unfavorable perceptions of online pharmacies compared to those who did not have a Ph.D. (n = 73, 44.5%) (χ^2 = 4.843, P = 0.028). A larger proportion of respondents who were active on social media (n = 91, 55.8%) had a favourable perception of online pharmacies compared to those who were not (n = 0, 0.0%) (χ^2 = 6.090, P = 0.014). Respondents who shop online (n = 78, 58.2%) had a more favorable perception of online pharmacies compared to those who do not (n = 13, 38.2%) (χ^2 = 4.358, P = 0.037). The majority of respondents who had intent to register an online pharmacy (n = 84, 69.4%) were aware of the PCN online pharmacy regulations compared to those who did not intend to (n = 24, 51.4%) (χ^2 = 4.969, P = 0.026).

Table 5: Association between demographic information, awareness, knowledge of PCN online pharmacy regulations, and perception of online pharmacy, N = 168

Variables	Awareness		χ^2	P	Knowledge		χ^2	P	Perception		χ^2	P
	Yes	No			Good	Poor			Favourable	Unfavourable		
Location			0.492	0.483			3.532	0.060			1.393	0.238
Enugu	27 (60.0)	18 (40.0)			19 (42.2)	26 (57.8)			21 (46.7)	24 (53.3)		
Lagos	81 (65.9)	42 (43.1)			72 (58.5)	51 (41.5)			70 (56.9)	53 (43.1)		
Age (in years)			6.354	0.273			6.456	0.264			6.900	0.228
≤ 25	1 (50.0)	1 (50.0)			2 (100.0)	0 (0.0)			2 (100.0)	0 (0.0)		
26 – 35	42 (56.0)	33 (44.0)			37 (49.3)	38 (50.7)			37 (49.3)	38 (50.7)		
36 – 45	36 (76.6)	11 (23.4)			23 (48.6)	24 (51.1)			30 (63.8)	17 (36.2)		
46 – 55	19 (67.9)	9 (32.1)			20 (71.4)	8 (28.6)			13 (46.4)	15 (53.6)		
56 – 65	7 (70.0)	3 (30.0)			6 (60.0)	4 (40.0)			7 (70.0)	3 (30.0)		
> 65	3 (50.0)	3 (50.0)			3 (50.0)	3 (50.0)			2 (33.3)	4 (66.7)		
Gender			3.659	0.056			0.324	0.569			0.324	0.569
Male	72 (69.9)	31 (30.1)			54 (52.4)	49 (47.6)			54 (52.4)	49 (47.6)		
Female	36 (55.4)	29 (44.6)			37 (56.9)	28 (43.1)			37 (56.9)	28 (43.1)		
D3			4.644	0.200			6.591	0.086			0.569	0.904
< 5	10 (62.5)	6 (37.5)			12 (75.0)	4 (25.0)			9 (56.3)	7 (43.8)		
5 – 10	42 (58.3)	30 (25.7)			36 (50.0)	36 (50.0)			37 (51.4)	35 (48.6)		
11 – 20	32 (78.0)	9 (22.0)			18 (43.9)	23 (56.1)			24 (58.5)	17 (41.5)		
> 20	24 (61.5)	15 (38.5)			25 (64.1)	14 (35.9)			21 (53.8)	18 (46.2)		
D4			2.562	0.464			3.025	0.388			1.283	0.733
< 5	21 (53.8)	18 (46.2)			20 (51.3)	19 (48.7)			24 (61.5)	15 (38.5)		
5 – 10	54 (68.4)	25 (31.6)			39 (49.4)	40 (50.6)			41 (51.9)	38 (48.1)		
11 – 20	22 (64.7)	12 (35.3)			21 (61.8)	13 (38.2)			17 (50.0)	17 (50.0)		
> 20	11 (68.8)	5 (31.3)			11 (68.8)	5 (31.3)			9 (56.3)	7 (43.8)		

*P < 0.05 is statistically significant

D3 = Number of years after graduation; D4 = Community pharmacy experience (in years)

Table 5: Association between demographic information, awareness, knowledge of PCN online pharmacy regulations, and perception of online pharmacy, N = 168 (Continued)

Variables	Awareness		χ2	P	Knowledge		χ2	P	Perception		χ2	P
	Yes	No			Good	Poor			Favourable	Unfavourable		
I1			6.478	0.166			3.681	0.451			5.051	0.282
Excellent	14 (73.7)	5 (26.3)			10 (52.6)	9 (47.4)			12 (63.2)	7 (36.8)		
Very good	37 (61.7)	23 (38.3)			35 (58.3)	25 (41.7)			34 (56.7)	26 (43.3)		
Good	44 (66.7)	22 (33.3)			37 (56.1)	29 (43.9)			33 (50.0)	33 (50.0)		
Fair	13 (65.0)	7 (35.0)			7 (35.0)	13 (65.0)			12 (60.0)	8 (40.0)		
Poor	0 (0.0)	3 (100.0)			2 (66.7)	1 (33.3)			0 (0.0)	3 (100.0)		
I2			0.559	0.455			0.851	0.356			1.189	0.276
Yes	107 (64.1)	60 (35.9)			90 (53.9)	77 (46.1)			91 (54.2)	76 (45.5)		
No	1 (100.0)	0 (0.0)			1 (100.0)	0 (0.0)			0 (0.0)	1 (100.0)		
I3			0.041	0.839			1.385	0.239			6.090	0.014*

Yes	105 (64.4)	58 (35.6)			87 (53.4)	76 (46.6)			91 (55.8)	72 (44.2)		
No	3 (60.0)	2 (40.0)			4 (80.0)	1 (20.0)			0 (0.0)	5 (100.0)		
I4			1.311	0.252			0.051	0.822			4.358	0.037*
Yes	89 (66.4)	45 (33.6)			72 (53.7)	62 (46.3)			78 (58.2)	56 (41.8)		
No	19 (55.9)	15 (44.1)			19 (55.9)	15 (44.1)			13 (38.2)	21 (61.8)		
I5			0.028	0.868			0.078	0.780			3.838	0.050
Yes	68 (64.8)	37 (35.2)			56 (53.3)	49 (46.7)			63 (60.0)	42 (40.0)		
No	40 (63.5)	23 (36.5)			35 (55.6)	28 (44.4)			28 (44.4)	35 (55.6)		
I6			0.337	0.562			1.238	0.266			2.228	0.138
Yes	39 (67.2)	19 (32.8)			28 (48.3)	30 (51.7)			36 (62.1)	22 (37.9)		
No	69 (62.7)	41 (37.3)			63 (57.3)	47 (42.7)			55 (50.0)	55 (50.0)		
I7			4.969	0.026*			3.545	0.060			2.365	0.124
Yes	84 (69.4)	37 (30.6)			71 (58.7)	50 (41.3)			70 (57.9)	51 (42.1)		
No	24 (51.1)	23 (48.9)			20 (42.6)	27 (57.4)			21 (44.7)	26 (55.3)		

*P < 0.05 is statistically significant

I1 = Level of Information and Communication Technology (ICT) knowledge; I2 = I have access to internet-enabled mobile phones/devices; I3 = I am active on social media; I4 = I shop online; I5 = I have made an online drug requisition; I6 = I have filled an online prescription; I7 = I intend to register an online pharmacy

IV. Discussion

Our findings revealed that a majority of the respondents claimed to have good to excellent knowledge of Information and Communication Technology (ICT). More than half of the respondents claimed to be aware of the Pharmacy Council of Nigeria (PCN) online pharmacy regulations and their major source of information was the Association of Community Pharmacists of Nigeria (ACPN) group. Overall, slightly above half of the respondents had *good knowledge* of PCN online pharmacy regulations and *favourable perceptions* of online pharmacy. The study also revealed a significant association between some demographic variables, internet use information, awareness/knowledge of PCN online pharmacy regulations and perception of online pharmacy.

The majority of the respondents who participated in the study lived in Lagos and were male. The larger number of male respondents corresponds with a 2018 analysis of the pharmacy workforce capacity in Nigeria which revealed that there are more active male pharmacists in the country compared to females[16]. Lagos has the highest number of community pharmacists registered in one state, which also makes the larger number of respondents from that state a relatable result. The high number of community pharmacists in Lagos can be attributed to the cosmopolitan nature of the state which increases the possibility of better remunerations and available health resources[16]. This is similar to studies carried out in Sudan and Brazil where there was a marked increase in the number of pharmaceutical workers in urban areas and the private sector due to higher wages and resources available to make the work easier[17, 18].

A large number of the respondents had additional qualifications besides the Bachelor of Pharmacy (B.Pharm) degree which is the minimum required educational qualification to register a community pharmacy in Nigeria. This is in contrast to recent research amongst community pharmacists in Northern Nigeria where most of the respondents only had a B.Pharm degree[19]. This result can be attributed to the improved literacy level in most Southern States, as well as the high number of universities offering postgraduate studies in the region[20, 21].

Although a large number of the respondents in this study owned community pharmacies, only a few of these pharmacies hosted official websites. The slow adoption of online drug purchases in developing countries like Nigeria could be a reason for this trend[5]. Furthermore, the majority of the respondents in our study claimed to have good to excellent knowledge of ICT and almost all had access to internet-enabled devices. Given that the majority of the participants fell within the age bracket of 26 to 45 years, this outcome is expected due to the notable surge in ICT familiarity and accessibility among individuals within this age range[22]. This high level of internet literacy could have also contributed to the majority of the respondents being active on social media, shopping online, and having the intent to register online pharmacies in the future.

More than half of the respondents claimed to be aware of the Pharmacy Council of Nigeria (PCN) online pharmacy regulations, with most getting their information from the Association of Community Pharmacists of Nigeria (ACPN) group. The majority knew all online pharmacies must be registered with PCN. The fact that most of the respondents owned community pharmacies themselves and were aware registration was a mandatory requirement for their traditional retail pharmacy practice made this result relatable. Other

online pharmacy regulations related to license renewal, emblem visibility, over-the-counter (OTC) drug advertisement, and safe delivery of medications were similar to registration and licensing regulations of typical pharmaceutical premises[23]. This could have been attributed to most of the respondents knowing them. Overall, slightly above half of the respondents had a *good knowledge* of PCN online pharmacy regulations.

Most of the respondents agreed that the internet is increasingly being used as a source of health and drug-related information. This finding is supported by surveys conducted among community pharmacists in Croatia and consumers in Poland[24, 25]. Less than half of the respondents agreed that online pharmacies reduce significant interactions with healthcare professionals and put clients at risk. This corroborates with previous research works which postulate that these e-pharmacies could lead to an improvement in communication between the patient and the community pharmacists[15, 26].

The perception that online pharmacies pose a risk of clients receiving counterfeit and substandard medications is consistent with the findings reported by Smolka & Gronwald, as well as Sarkar[27, 28]. This concern carries significant implications, particularly considering that a substantial number of consumers in developing countries in Africa do not take measures to verify the authenticity of the drugs they consume[29]. During the Coronavirus pandemic, community pharmacists in China established remote/online pharmacy services to prevent human-to-human infections[30]. The efficacy of those remote services corroborates with the perception of the majority of the respondents who believed that online pharmacies could be useful during communicable disease outbreaks. Overall, slightly above half of the respondents had *favorable perceptions* of online pharmacy.

In the study, respondents whose community pharmacies owned official websites demonstrated better knowledge of PCN online pharmacy regulations compared to those without websites. This indicates that community pharmacists with online presence are more interested in adhering to the regulations. Respondents who were active on social media and engaged in online shopping had a more favorable perception of online pharmacies, consistent with previous research showing a link between digital literacy and readiness to adopt Health Information Technology (HIT)[31]. Those with intent to register an online pharmacy were more aware of the regulations compared to those without intent. Conversely, respondents without intent to register likely had less interest in the regulations. These findings emphasize the impact of website ownership, digital engagement, and intent to establish an online pharmacy on respondents' knowledge and perception of online pharmacy regulations.

This study had some limitations. The low response rate could be attributed to the busy schedules of community pharmacists. Respondents also expressed concerns about filling out multiple questionnaires from different researchers, which may have impacted data quality and participant fatigue. The study's geographical scope was limited to Lagos and Enugu, limiting the generalizability of the findings to other regions in the country. Additionally, the majority of respondents fell within the 26 – 35 range, potentially impacting the generalizability to different age groups. Furthermore, the use of self-administered questionnaires prevents examination of response changes over time and introduces the possibility of recall bias in participants' responses.

To improve awareness and understanding regarding the PCN online pharmacy regulations, it is recommended that the Council educates pharmacists in the 36 States and the Federal Capital Territory (Abuja) of the country. Education can be provided at the meetings of the Pharmaceutical Society of Nigeria (PSN) at the State and National levels. In addition, it can be introduced as a topic in the Forensic Pharmacy course for undergraduate pharmacy students. Online pharmacies need to be efficiently regulated by ensuring that only registered pharmacists who meet the criteria to open them are approved.

V. Conclusion

The study findings revealed that slightly over half of the respondents had good knowledge and perceptions of the Pharmacy Council of Nigeria (PCN) online pharmacy regulations. It indicates the need for enhanced sensitization efforts by PCN to ensure widespread awareness and understanding of the current regulatory framework governing online pharmacies. It also underscores the need to develop targeted interventions for improving regulatory compliance and consumer safety in online pharmacy practices.