Pharmacy Education (2025) 25(1) 422 - 433
https://doi.org/10.46542/pe.2025.251.422433

RESEARCH ARTICLE

Implementation of Point-of-Care Testing (POCT) in community pharmacies in Enugu State, Nigeria: A cross-sectional study

Juliet Obianuju Dingwoke, Ifeoma Joy Onuzulike, Kenneth Chukwuebuka Egwu, Precious Chioma Duru, Chizubelu Callistus Ezeanolue, Favour Ezinne Onyekwere, Peace Ifeyinwa Agu, Geraldine Chidiogo Nweke, Emmanuel Chinonso Onyia, Oluchukwu Ogechi Ajibo, Oluchi Mary-Precious Muoghara, Simeon Chinedu Onoduagu, Malachy Chinonso Ngwu, Maureen Nwafor, Ezekiel Chidera Eze

Department of Pharmacy, University of Nigeria Teaching Hospital, Ituku-Ozalla, Enugu State, Nigeria

Keywords
Community pharmacy
Diagnostic test
Healthcare delivery
LMIC
Pharmaceutical service
Point-of-care testing

Correspondence
Juliet Obianuju Dingwoke
University of Nigeria Teaching Hospital
Ituku-Ozalla
Enugu State
Nigeria
dinjulieto@gmail.com

Abstract

Background: Pharmacists, especially those in community settings, are well-positioned to offer Point-of-Care Testing (POCT). The information obtained can help pharmacists in disease and medication therapy management. However, POCT implementation in Nigeria remains limited. **Objective:** This study aimed to evaluate the implementation of POCT services by community pharmacies in Enugu State. **Methods:** A randomised cross-sectional study was conducted using a self-administered, pretested questionnaire. Data were analysed using SPSS version 20 with descriptive and inferential statistics at a *p*-value < 0.05. **Results:** A response rate of 92% was achieved. The mean weighted average (MWA) indicated that the practice score was high for blood pressure (MWA 3.68) and blood glucose (MWA 3.09) screenings, while it was low for body mass index (MWA 1.47), HIV (MWA 1.21), and malaria (MWA 1.62) tests. The availability of POCT devices, test kits, and physical space requirements (MWA 3.45), as well as knowledge and skills in performing POCT (MWA 3.34), were the primary factors influencing POCT management. Demographic variables were not significantly associated with the practice of POCT (*p*-value > 0.05). **Conclusion:** The study revealed a poor level of POCT practice in community pharmacies, highlighting the need for improvement and expansion of services to support efficient pharmaceutical care delivery.

Introduction

Point-of-care testing (POCT) refers to a wide range of clinical testing services performed at or near the site of patient care (Ihekoronye *et al.,* 2023). These tests are often conducted by qualified staff near the patient, and the results are provided to the patient during the same clinic visit to aid in clinical decision-making and triage (Schols *et al.,* 2018). POCT is essential in advancing public health safety, especially in low- and middle-income countries (LMICs) like Nigeria, where access to robust diagnostic tools is limited. It enhances patient access to urgent care through rapid diagnosis (Albasri *et al*., 2020). In this region, it is commonly used for blood glucose estimation, urinalysis, blood gas analysis, pregnancy and ovulation detection, lipid profiling (cholesterol, triglycerides, high-density lipoproteins), cardiac and renal biomarkers, anticoagulant therapy monitoring, and alcohol/toxicology screening (Onovughakpo-Sakpa *et al*., 2015). POCT is also employed in medication monitoring, chronic disease management (such as hypertension and diabetes mellitus), and screening for certain communicable diseases (Hutchings & Shiamptanis, 2022). Results obtained from POCT can guide medication dosage adjustments, such as in cases of elevated blood glucose

or bilirubin levels, and in anticoagulation therapy (Ogar *et al*., 2019).

When properly conducted and accurately interpreted, POCT offers key advantages. It is simple to perform, requires no sample processing or transportation to conventional laboratories, uses minimal sample volumes, and delivers rapid results, all of which improve patient care (Ihekoronye *et al*., 2023). Further benefits include that sample collection does not require a specialist (Bolodeoku *et al*., 2016), and the service is accessible and cost-effective (Onovughakpo-Sakpa *et al*., 2015). For instance, Helicobacter pylori screening has been shown to reduce endoscopy referrals, resulting in cost savings for patients (Tin *et al*., 2023). POCT is often conducted by non-laboratory professionals such as nurses, doctors, midwives, respiratory therapists, anaesthesia assistants, and patients (Akande, 2018). It is carried out using portable and handheld devices, including blood glucose meters and diagnostic kits.

In Nigeria, community pharmacies play a vital role in the healthcare system, providing essential access to health services within the community. They typically operate within the private sector and are overseen by registered pharmacists (Maureen *et al*., 2024). Some of the services offered by community pharmacists in Nigeria include treating minor illnesses, medication counselling and management, health education, immunisation, family planning, and POCTs.

Due to their pharmacotherapeutic knowledge, skills, and medication expertise, as well as their location within communities, they provide essential support to patients with cardiovascular diseases, diabetes, asthma, chronic obstructive pulmonary disease, and other prevailing chronic conditions in the country. Additionally, community pharmacists are among the most accessible healthcare professionals and are therefore well-positioned to conduct, oversee, and interpret POCTs (Eze *et al*., 2023). Unlike hospitals and larger healthcare facilities, which often face overcrowding, POCT services provided in community pharmacies offer patients timely and non-invasive testing, such as blood glucose and blood pressure monitoring, as well as screening for conditions like malaria or influenza (Chigurupati, 2025). Therefore, community pharmacies play a crucial role in addressing the shortage of healthcare services in rural communities (Maureen *et al.,* 2024).

As pharmacy practice evolves towards a pharmaceutical care model, where pharmacists are increasingly focused on patient-centred services, the implementation of POCT in community pharmacies becomes essential (Koski & Klepser, 2017). In Nigeria, the dual burden of communicable and non-communicable diseases remains a significant public health challenge, with many conditions going undiagnosed until complications arise (Eze *et al*., 2023). For instance, the country is malaria-endemic, placing the entire population at risk. It accounts for 27% of global malaria cases, the highest burden both in Africa and globally (Shekarau *et al*., 2024). Hypertension is also widespread, with prevalence estimates ranging from 22% to 44% (Ogungbe *et al*., 2024). In response to these challenges, community pharmacies have become an increasingly vital component of Nigeria's healthcare system (Maureen *et al*., 2024), with POCT services playing a key role in this development.

The use of point-of-care testing (POCT) in Nigeria is rapidly expanding, with tests increasingly being conducted in pharmacies and, in some cases, by patients or their caregivers. The implementation of POCT in community pharmacies is regulated by the Pharmacy Council of Nigeria (PCN); however, the guidelines and the scope of permissible services are poorly defined and inadequately implemented. A study by Jtn and colleagues (2023) highlighted the poor implementation of POCT services by community pharmacies in LMICs, contributing to increased mortality associated with numerous diseases in the region. Aje & Davies' (2017) study on the implementation of POCT by community pharmacies in Ibadan, Nigeria, revealed that only a minority of community pharmacies implement POCT, and they also observed poor documentation among pharmacies conducting POCTs.

Enugu State faces a growing demand for healthcare services, placing considerable strain on its existing medical infrastructure (Abugu & Ezeodili, 2024). Public health facilities in the state are challenged by overcrowding, insufficient funding, and a shortage of medical personnel, all of which impede the delivery of quality healthcare. In addition, there has been a noticeable rise in non-communicable diseases such as hypertension and diabetes, alongside ongoing outbreaks of communicable diseases including cholera, typhoid, and malaria. The extent of POCT implementation by community pharmacies in Enugu State has largely remained unexplored, thereby limiting the development of targeted interventions. Available information indicates that no studies have yet examined the implementation of POCT services by community pharmacies in Enugu State, nor explored the type of services offered. Although similar studies have been conducted in other regions of Nigeria, their findings may not be directly applicable to Enugu State due to cultural and societal differences. Most existing research has focused on the western and southern regions of the country, where healthcare dynamics may differ significantly. In Enugu State, the implementation

of POCT may be influenced by financial constraints and diverse cultural perceptions, which could affect uptake and utilisation. This paucity of research informed the need for this study to determine the extent of point-of-care testing by community pharmacies in the state. This study, therefore, aimed to evaluate the implementation of POCT services by community pharmacies in Enugu State, identify factors affecting their use, and provide recommendations to improve the delivery of pharmaceutical care.

Methods

Study design

This study was a cross-sectional survey carried out using a pre-tested, self-administered questionnaire. It was conducted among community pharmacies in Enugu State from August 1st to 31st, 2024.

Study setting

The study was set out in Enugu State. The state has 17 local government areas and is situated in the Southeast geopolitical zone of Nigeria, bordered to the north by Benue and Kogi States, Ebonyi State to the east and southeast, Abia State to the south, and Anambra State to the west. It has a population of approximately 4.6 million people and 263 registered community pharmacies as of 30th June 2024. While the state is home to various healthcare facilities, including teaching hospitals, specialist hospitals, and community healthcare centres, these resources are considered insufficient (Nwoka *et al*., 2022). Laboratory services offered by these facilities are often inadequate due to overcrowding, prompting patients to seek diagnosis and long-term management for minor ailments at nearby community pharmacies, where they can access better quality healthcare and counselling services.

Selection criteria

The inclusion criteria for participants in this study included: 1) Community pharmacists and pharmacy technicians working in community pharmacies in Enugu, 2) those who showed evidence of current license, and 3) those who gave consent to participate. Participants were excluded if they: 1) did not have a valid license, 2) were not working in community pharmacies in Enugu State.

Sample size determination

The sample size was calculated from the population size using the Taro Yamane formula. An overage of 10 % was added to make up for possible non-respondents.

$$n = N/1 + N(e)^2$$

where:

n = required sample size (unknown)

N = number of community pharmacies

e = maximum acceptable error margin at 5 % degree of freedom (95 % chances of being right).

Here,

N = 263 community pharmacies

e = 0.05

$$n = {}^{263}/_{1 + 263(0.05)^2}$$

$$n = {}^{263}/_{1 + 263(0.0025)}$$

$$n = {}^{263}/_{1 + 0.6575}$$

$$n = {}^{263}/_{1.6575}$$

$$n = 158.67\ approximately\ 159.$$

For 10% attrition;

$${}^{10}/_{100}\ x\ 159 = 15.9$$

159 + 15.9 = 174.9 approximately 175.

Using the Taro Yamane formula above, a sample size of 159 community pharmacies was obtained. To account for a 10% attrition, 16 pharmacies were added to obtain a final sample size of 175. Thus, 175 questionnaires were distributed to pharmacists who met the inclusion criteria.

Sampling technique

A systematic sampling technique was used to select the 175 community pharmacies. A list of all pharmacy premises in Enugu was employed. The first pharmacy was selected randomly, and a sampling interval of two was applied. Subsequent pharmacies were selected by picking the second name after every two names counted from the list, until the desired sample size was reached.

$$Sampling\ interval\ (k)\ =\ N\ /n = \frac{263}{175}$$

K = 1.50, which is approximately 2.

Pilot testing and content validation

The data collection instrument was assessed by researchers with expertise in the subject area to ensure

that the questionnaire items aligned with the study objectives and to establish both face and content validity. The reliability of the instrument was ensured through a pre-test on 20 community pharmacists randomly selected from the state, and the obtained feedback informed the modification of some questions to suit the purpose of the study. The reliability of the instrument was assessed using Cronbach's alpha, with a coefficient of 0.83, indicating good internal consistency and confirming that the questionnaire items reliably measure the intended construct.

Study instrument

The questionnaire used for this study was adopted from previous studies done by Adje and colleagues (2016) and Ihekoronye and colleagues (2023). The questionnaires were slightly adjusted by removing certain sections, such as the frequency of referrals, average number of POCT services per month, and modifying other parts to fit the context of our study. The self-administered questionnaire consisted of 26 questions exploring various aspects of POCTs in a community pharmacy setting, arranged into four sections (Appendix A). Section A consisted of six questions, which highlighted social demographic information of the participants, while Section B explored the frequency of practice of POCT Services among the participating community pharmacies using a 5-point Likert scale (always, often, sometimes, rarely, never). Section C consisted of seven questions on factors affecting the management of POCTs, and the participants were assessed on a 5-point Likert scale ranging from '*strongly agree*', '*agree*', '*neutral*', '*disagree*', or '*strongly disagree*'. Section D consisted of four questions on the frequency of deployment of relevant management practices in providing POCT services, with the participants being assessed using a 5-point Likert scale ranging from "*always*", "*often*", "*sometimes*", "*rarely*" or '*never*'.

Measurement of variables

Frequency of practice of POCT services

Participants were asked how often they implemented specific tests in their pharmacies. This was done to determine the frequency of practice for various POCT services on a 5-point Likert scale. The responses were categorised and expressed as frequencies and percentages. Furthermore, the calculation of mean weighted average (MWA) and rank for each POCT service was done to assess the relative frequency of practice for each test. MWA was calculated by assigning a numerical value (weight) to each response category (Always = 4, Often = 3, Sometimes = 2, Rarely = 1, and Never = 0) and then multiplying each value by its frequency. The products were summed and then divided by the total number of participants. This resulted in an MWA score ranging from 0 to 4 for each variable.

$$\text{MWA} = \frac{\sum(Wi * Xi)}{n}$$

Where Wi = the corresponding weight of each value

Xi = frequency of each response category for a particular question

n = total number of participants

The results were used to rank the frequency of practice and ultimately determine the practice score. "*Good*" practice score was categorised as MWA of 2 and above, while "*Poor*" practice score was categorised as mean weighted average below 2. Higher MWA indicates more frequent practice of a particular test.

Association of demographic variables with practice of POCT

Section A of the questionnaire collected data about the socio-demographics of the participants. Chi-square tests were conducted for each variable to analyse the relationship between socio-demographics and the quality of practice (categorised as good or poor practice). A significance level of $p < 0.05$ was set for all statistical tests.

Factors affecting the management of POCT service

Participants were asked to indicate their level of agreement with several statements related to various aspects of POCT service to determine the factors affecting its management. A weighted average score was determined by assigning numerical values to each response category (Strongly Agree = 4, Agree = 3, Neutral = 2, Disagree = 1, Strongly Disagree = 0), and then computing the mean weighted average for each variable. The factors examined were ranked according to their mean weighted average to assess their relative influence on the management of POCT services.

Frequency of deployment of relevant management practices in providing the POCT services

The frequency of deployment of relevant management practices in the provision of POCT services was assessed by asking participants to indicate how often they performed certain practices. A numerical value was assigned to each response category (Always = 4, Often = 3, Sometimes = 2, Rarely = 1 and Never = 0). The MWA for each management practice was calculated. The practices were ranked based on their MWA to

determine which were most frequently deployed in the provision of POCT services.

The 5-point Likert scale for the different sections were interpreted as follows: "*Always*"—offers the service at least once daily; "*Often*"—offers the service at least once every week; "*Sometimes*"—offers the service at least once every month; "*Rarely*"—offers the service at least once in several months; to "*Never*"—never offered the service.

Data collection

The study instrument was distributed to community pharmacists who met the selection criteria. The respondents were expected to complete and return the instrument to the researcher. The estimated time required to complete the questionnaire was approximately 15 minutes. Clarification was provided to respondents where necessary by the research team.

Data analysis

The collected questionnaires were coded and entered into IBM® SPSS Statistics software version 21 package (Chicago, IL, USA) for analysis. Categorical data were reported in frequencies and percentages. Continuous variables were computed using descriptive statistics. The relationship between demographic variables and the provision of POCT services was explored using the chi-square test. A *p-value* of ≤ 0.05 was regarded as significant.

Ethics approval

The respondents were provided with a detailed explanation of the study before obtaining their written consent to participate. They were assured of their liberty to withdraw from the study at any point without any consequences. Confidentiality, privacy, and anonymity were upheld in line with the Nuremberg Code and the Helsinki Declarations. The research was reviewed and endorsed by the Research and Ethics Committee of the University of Nigeria Teaching Hospital, Ituku-Ozalla (UNTH/HREC/2024/08/2066).

Results

A total of 263 community pharmacies in Enugu State were initially considered for participation in the study. After applying the eligibility criteria, 175 community pharmacies were selected for the study. Of the 175 questionnaires administered, 161 were returned, giving a response rate of 92%. The socio-demographic distribution of the respondents is presented in Table I.

Table I: Participants' socio-demographic characteristics (n = 161)

Variable	Frequency	Percent
Gender		
Male	92	57.1
Female	69	42.9
Location of pharmacy		
Urban	137	85.1
Rural	24	14.9
Level of education		
BPharm	114	70.8
PharmD	12	7.5
MPharm	15	9.3
MPH	2	1.2
FPCPharm	9	5.6
PhD	9	5.6
Participants' role in the pharmacy		
Pharmacist	150	93.2
Pharmacy technician	1	0.6
Manager	10	6.2
Years of practice		
< 1	32	19.9
1-5	74	46.0
6-10	35	21.7
11-15	11	6.8
16 and above	9	5.6
Work hours per week		
<20	40	29.8
20-40	68	42.2
40-60	34	21.1
>60	11	6.8

B Pharm = Bachelor of Pharmacy; Pharm D = Doctor of Pharmacy; M Pharm = Master of Pharmacy; MPH = Master of Public Health; FPCPharm = Fellow of the Pharmaceutical Society of Pharmacy; PhD = Doctor of Philosophy

A total of 57.1% of the respondents were males. There was an urban predominance (85.1 %) in the location of the surveyed pharmacies. The Bachelor of Pharmacy (B.Pharm) was the most common qualification among pharmacists (70.8 %). Table II reveals that there was no significant association between social demographic variables and the practice of POCT (*p* value < 0.05).

Table II: Association of demographic variables with practice of POCT

Variable	Poor practice n (%)	Good practice n (%)	χ^2 (df)	*p*-value
Gender			0.530	0.467
Male	44 (47.8)	48 (52.2)		
Female	37 (53.6)	32 (46.4)		
Location of pharmacy			0.001	0.974
Urban	69 (50.4)	68 (49.6)		
Rural	12 (50.0)	12 (50.0)		
Level of education			5.066	0.408
BPharm	61 (53.5)	53 (46.5)		
PharmD	4 (33.3)	8 (66.7)		
MPharm	8 (53.3)	7 (46.7)		
MPH	0 (0.0)	2 (100.0)		
FPCPharm	5 (55.6)	4 (44.4)		
PhD	3 (33.3)	6 (66.7)		
Participant's role in the pharmacy			2.834	0.242
Pharmacist	78 (52.0)	72 (48.0)		
Pharmacy technician	0 (0.0)	1 (100.0)		
Manager	3 (30.0)	7 (70.0)		
Years of practice			2.953	0.566
< 1	19 (59.4)	13 (40.6)		
1-5	34 (45.9)	40 (54.1)		
6-10	16 (45.7)	19 (54.3)		
11-15	6 (54.5)	5 (45.5)		
16 and above	6 (66.7)	3 (33.3)		
Work hours per week			1.771	0.621
<20	28 (58.3)	20 (41.7)		
20-40	32 (47.1)	36 (52.9)		
40-60	16 (47.1)	18 (52.9)		
>60	5 (45.5)	6 (54.5)		

Table III shows that the most commonly rendered services were blood pressure checks (MWA 3.68) and blood glucose level tests (MWA 3.09), whereas pregnancy tests (1.84), HIV tests (MWA 1.21), and blood cholesterol tests (MWA 0.68) were not commonly practised.

Table III: Frequency of POCT practice

Variable	Response, n (%)					[d] MWA	Rank
	Always	Often	Sometimes	Rarely	Never		
[a] BP Check	113 (70.2)	44 (27.3)	4 (2.5)	0 (0.0)	0 (0.0)	3.68	1
Blood glucose check	84 (52.2)	43 (26.7)	15 (9.3)	3 (1.9)	16 (9.9)	3.09	2
Pregnancy test	19 (11.8)	42 (26.1)	35 (21.7)	24 (14.9)	41 (25.5)	1.84	3
Malaria test	24 (14.9)	34 (21.1)	26 (16.1)	11 (6.8)	66 (41.0)	1.62	4
[b] BMI assessment	11 (6.8)	32 (19.9)	38 (23.6)	20 (12.4)	60 (37.3)	1.47	5
Typhoid test	16 (9.9)	25 (15.5)	23 (14.3)	14 (8.7)	83 (51.6)	1.24	6
[c] HIV test	13 (8.1)	17 (10.6)	33 (20.5)	26 (16.1)	72 (44.7)	1.21	7
Blood cholesterol check	4 (2.5)	12 (7.5)	17 (10.6)	24 (14.9)	104 (64.6)	0.68	8

[a] Blood pressure; [b] Body mass index; [c] Human immune-deficiency virus; [d] Mean weighted average

The availability of POCT devices, test kits, and physical space requirements (MWA 3.45) were the leading factors affecting the management of POCT services. Additionally, knowledge and skills in performing POCT services (MWA 3.34) were also significant factors. Concerns about legal liability for POCT-related errors had minimal influence on its practice (MWA 2.80), as shown in Table IV.

Table IV: Factors affecting POCT service management

SN	Variable	Response, n (%)					[a] MWA	Rank
		Strongly agree	Agree	Neutral	Disagree	Strongly disagree		
1	Availability of the POCT devices, test kits and physical space requirement	79 (49.1)	78 (48.4)	2 (1.2)	1 (0.6)	1 (0.6)	3.45	1
2	Knowledge and skills in performing POCT services	80 (49.7)	66 (41.0)	8 (5.0)	3 (1.9)	4 (2.5)	3.34	2
3	Patient knowledge and request for the POCT services	53 (32.9)	79 (49.1)	13 (8.1)	16 (9.9)	0 (0.0)	3.05	3
4	Regulatory support allowing pharmacists to provide POCT services	58 (36.0)	67 (41.6)	22 (13.7)	14 (8.7)	0 (0.0)	3.05	3
5	Financial constraints and payment structures influencing POCT adoption	51 (31.7)	68 (42.2)	27 (16.8)	10 (6.2)	5 (3.1)	2.93	5
6	Workload and availability to perform POCT services	48 (28.2)	74 (46.0)	18 (11.2)	21 (13.0)	0 (0.0)	2.93	5
7	Concerns about legal liability for POCT-related errors	42 (26.1)	63 (39.1)	40 (24.8)	13 (8.1)	3 (1.9)	2.80	7

[a] Mean weighted average

As depicted in Table V, accurately interpreting test results (75.2%) and preparing patients for testing (64.6%) were among the managerial practices consistently deployed by community pharmacists.

Table V: Frequency of deployment of relevant management practices in providing the POCT services

SN	Variable	Response, n (%)					[a] MWA	Rank
		Always	Often	Sometimes	Rarely	Never		
1	Ensuring accurate interpretation of test results	121 (75.2)	29 (18.0)	7 (4.3)	3 (1.9)	1 (0.6)	3.65	1
2	Preparing patients for testing, including obtaining informed consent	104 (64.6)	29 (18.0)	22 (13.7)	5 (3.1)	1 (0.6)	3.43	2
3	Implementing quality control measures to ensure the accuracy and reliability of test results	85 (52.8)	37 (23.0)	20 (12.4)	17 (10.6)	2 (1.2)	3.16	3
4	Establishment of a quality assurance program to monitor POCT performance	64 (39.8)	31 (19.3)	26 (16.1)	20 (12.4)	20 (12.4)	2.61	4

[a] Mean weighted average

Discussion

The implementation of POCT services among the surveyed community pharmacies was found to be suboptimal, with a mean practice score of 1.85. The findings of this study are further discussed under the following points:

The results show that most POCT services spanned blood pressure, glucose monitoring, and pregnancy tests. This is consistent with findings from similar studies conducted in Osun State and Ibadan, Nigeria, which identified blood pressure monitoring, weight measurement, and blood glucose testing as the predominant services provided by community pharmacists (Ihekoronye *et al.,* 2023; Aje & Davies, 2017). This can be attributed to the ready availability and ease of handling the kits or devices used in carrying out these services. In addition, they are common interventions in the management of non-communicable diseases, a prevalent challenge in the country. This study also revealed that blood cholesterol testing, HIV screening, typhoid diagnosis, and BMI assessment were among the least frequently offered POCT services by community pharmacies. These findings align with those of Adje *et al*. (2016) in Delta State, where pregnancy testing (4.7%), blood cholesterol checks (15.1%), and BMI assessments (31.4%) were identified as the least provided POCT services. The limited implementation of these services

in this study may be attributed to several factors. These include the high cost and limited availability of the necessary test kits, along with insufficient knowledge or training among community pharmacists on how to conduct these specific tests.

In addition, patient-related factors may contribute, for example, a lack of awareness regarding the availability or importance of BMI assessments, or the tendency for patients to self-medicate with antibiotics when experiencing symptoms suggestive of typhoid, thereby bypassing proper diagnostic testing. The observed poor implementation of HIV testing in the study was expected. Previous studies in Nigeria identified low community pharmacists' participation in HIV/AIDS services and attributed the barriers to lack of clinical tools, inadequate training, and insufficient collaboration with other healthcare professionals (Ekechukwu, 2019; Oseni & Erhun, 2021). Community pharmacies need to expand beyond traditional drug dispensing to render services aimed at enhancing and promoting the objectives of pharmaceutical care. The poor implementation of certain POCT services observed in this study has significant implications, as it may hinder efforts to identify and manage various health conditions in Enugu State. Consequently, many patients may remain unaware of their health status. It is important to highlight that diagnostic screening in community pharmacies is intended to enhance access to POCT services for the general public, particularly for individuals who may face barriers in reaching medical laboratories, such as transportation challenges (Adje *et al.,* 2016).

Factors affecting the implementation of POCT services varied, with prominent concerns including the availability of test kits, physical space, the knowledge and skills of pharmacists to implement them, and the willingness of patients to accept the services. This supports the findings of a scoping review by Ansu-Mensah et al. (2023). To address this, there is a need to broaden pharmacists' knowledge of POCT service provision, educate community members about the importance of POCT, and build trust between pharmacists and community members. Certification from a formal training course could reassure clients about the legitimacy of POCT service provision by pharmacists, as well as enhance pharmacists' confidence, particularly in LMICs (Jtn *et al*., 2023). Furthermore, legal concerns, especially regarding patients' information, workload, and the availability of pharmacists to perform POCT services, along with the regulatory framework authorising pharmacists' implementation of certain tests, were also identified as moderate barriers. This is consistent with the findings of a study in Wisconsin, United States (Gallimore *et al*., 2021). Although these challenges were more pronounced in the study, they could also shed light on the perceived challenges to POCT implementation between developed and developing countries. This disparity arises from financial constraints and importation hurdles for most materials. This underscores the need for prioritising local manufacturing and empowering local innovators to overcome inadequacies in POCT availability in LMICs.

The implementation of quality control and institutionalisation of quality assurance programs to monitor performance is a significant challenge to POCT implementation among the community pharmacies. This could be attributed to the cost of maintaining these programs, inadequate staff to oversee such activities, and a lack of technical expertise. Though in this study, the implementation of quality control measures to ensure the accuracy and reliability of test results received high scores. This disagrees with a similar study, which revealed that the test instrument validation was poor (Adje *et al.,* 2016). The accuracy of POCT services in community pharmacies would be significantly enhanced if these pharmacies were well-equipped with quality control systems similar to those used in standard laboratories (Adje *et al.,* 2016). The importance of Pharmacy technicians in community pharmacy practice, where they can offer invaluable insights on system maintenance and quality assurance, should be acknowledged. The high score obtained on consent-seeking before POCT services reaffirms the pharmacists' knowledge in pharmacy practice and commitment to upholding the ethical execution of responsibilities. As emphasised by the UK General Pharmaceutical Council, community pharmacies require a workforce of highly trained workers to deliver safe and quality healthcare services to patients (Ihekoronye *et al.,* 2023).

Although PCN permits and oversees the implementation of POCT services by community pharmacies, the specific range of permissible services remains undefined. This contrasts with the situation in the United States, where the Clinical Laboratory Improvement Amendments of 1988 (CLIA) provide clear and detailed guidelines for the use of POCT (Akande, 2018). Under CLIA, community pharmacists can obtain a waiver to conduct certain POCT services (Chigurupati, 2025). There is, therefore, an urgent need to establish a robust legal and regulatory framework to guide and support the provision of POCT services by pharmacists in Enugu State and across Nigeria.

Unlike the previous study (Ihekoronye *et al.,* 2023), our study did not observe any significant association between the level of education, working hours, and the practice of POCT (p-value < 0.05). However, this could be attributed to the fact that the commonly

implemented POCT services (glucose level monitoring, blood pressure, and pregnancy tests) require basic pharmacy knowledge, which the respondents, being predominantly pharmacists with a Bachelor of Pharmacy degree, are expected to possess. Furthermore, most POCT procedures are designed to be simple, standardised, and require minimal technical skill. Effective service delivery often relies more on specific training and adherence to protocols than on formal academic qualifications. Advances in technology have also made POCT devices increasingly user-friendly and automated, reducing the likelihood of user error. While education may influence aspects such as patient counselling and interpretation of results, the basic execution of POCT is largely independent of educational background. The implementation of POCT services, such as blood pressure and glucose level screening, frequently identified in this study, may not be significantly affected by location, such as urban or rural areas, as these services are crucial for diagnosing and managing these health conditions prevalent in both regions. In addition, these procedures are standardised, easy to perform, and require minimal infrastructure. With adequate training and access to supplies, pharmacies in both settings can effectively deliver these services under the same regulatory framework.

Limitations

This study has some limitations that must be considered. First, the current documentation approach employed by the pharmacists was not examined. This could have provided information on the extent of pharmacists' incorporation of digital technology in their practice. Second, the pharmacists' attitude towards POCT services was not evaluated. Information from this could have been used to understand their willingness to receive more training, the perceived importance of POCT, and the push factor regarding their practice. Since this study involves self-reported data, it may be limited by response bias, where participants either overestimate or underreport the availability and usage of services. Furthermore, recall bias could affect the accuracy of the data, as participants may have difficulty accurately remembering or reporting their past experiences with POCT services. Furthermore, this study is a cross-sectional study; therefore, it is difficult to establish causal relationships. However, being the first study to evaluate POCT implementation by community pharmacists in Enugu State, this article has laid the basis for more research. Further research should adopt a mixed-methods approach, including qualitative interviews, to gain deeper insights into the barriers and facilitators of POCT implementation in the State. In addition, direct observation of POCT practices in selected pharmacies would improve data accuracy, while implementing a pilot program post-survey could test strategies to enhance POCT implementation.

Conclusion

In conclusion, the implementation of POCT by community pharmacists in Enugu State was poor, with blood pressure, glucose monitoring, and pregnancy tests being the most frequently rendered services, whereas blood cholesterol, HIV, and typhoid tests were the lowest. The most prevalent factors affecting POCT implementation were the availability of POCT materials, test kits, and space requirements. These findings suggest that expanding POCT services in community pharmacies could improve access to essential diagnostic tests, particularly in underserved areas, enhancing early detection and management of health conditions. In addition, the study highlights the need for a clear regulatory framework to standardise and ensure the effective implementation of POCT services across pharmacies in Enugu State and Nigeria.

Recommendation

To improve POCT implementation in the state, the following actions are imperative.

The Enugu State Government should support local manufacturers in producing POCT test kits to address supply-chain challenges related to imported kits.

PCN should establish a quality assurance program to monitor and assess the performance of POCT services in community pharmacies.

PCN and other health professional bodies should collaborate to raise public awareness about the availability and importance of POCT services in community pharmacies as a means of bridging access to quality healthcare.

In addition, the council could collaborate with the Medical Laboratory Science Council of Nigeria to develop comprehensive guidelines for POCT implementation. Such collaboration would help ensure the standardisation and accurate regulation of services, thereby enhancing the quality and reliability of POCT in community pharmacy settings.

PCN should also update the pharmacy education curriculum to equip pharmacists with the knowledge and skills required for performing POCT services and to expand the range of services offered.

Source of funding

The authors declare that no funding or financial support was provided for this research.

Conflict of interest

The authors declare no competing interests.

Acknowledgement

None

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Appendix A: Self-administered questionnaire

Section A: Socio-demographic information

Please tick (√) the appropriate box by choosing one of the following:

Gender: Male ( ) Female ( )

Location of your pharmacy: Urban area ( ) , Rural area ( )

Highest Level of Educational Qualification: B. Pharm ( ), Pharm D ( ), M. Pharm ( ), MPH ( ), FPC Pharm ( ), Ph.D. ( )

Current role: Pharmacist ( ), Pharmacy Technician ( ), Manager ( )

Duration of community pharmacy practice: <1 years ( ), 1 - 5 years ( ), 6 - 10 years ( ), 11- 15 years ( ), > 16 years ( )

On average, how many hours per week do you work in the pharmacy? < 20 hours ( ), 20 – 40 hours ( ), 40 – 60 hours ( ), more than 60 hours ( ).

Section B: Frequency of practice of point-of-care testing services

Using the 5-point Likert scale ranging from "Always" – offering the service at least once daily; "*Often*" – offering the service at least once every week; "*Sometimes*" – offering the service at least once every month; "*Rarely*" – offering the service at least once a month; "Never" – never offering the service; choose the option that best reflects your opinion and respond by ticking (√).

How frequently do you implement POCTs in your pharmacy	Always	Often	Sometimes	Rarely	Never
BP check					
Blood glucose check					
Blood cholesterol check					
BMI assessment					
Pregnancy test					
HIV test					
Malaria test					
Typhoid test					
Others					

If you ticked yes in others, please specify those tests: _____

Section C: Factors affecting the management of POCT services

On a 5-point Likert scale ranging from "*Strongly agree*"- agree in every way; "*Agree*"- agree to some extent; "*Neutral*"- not sure; "*Disagree*"- disagree to some extent; "*Strongly disagree*"- disagree in every way; choose the option that best reflects your opinion and respond by ticking (√)

What are the factors affecting the management of POCTs in community pharmacies?	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Knowledge and skills in performing POCT services					
Availability of the POCT devices, test kits and physical space requirement					
Patient knowledge and request for the POCT services					
Workload and availability to perform POCT services					
Regulatory support allowing pharmacists to provide POCTs					
Concerns about legal liability for POCT-related errors					
Financial constraints and payment structures influencing POCT adoption					

Section D: Frequency of deployment of relevant management practices in providing point-of-care testing services

Using the 5-point Likert scale ranging from "*Always*" – deploys the function at least once daily; "*Often*" – deployed the function at least once every week; "*Sometimes*" – deployed the function at least once every month; "*Rarely*" – deployed the management function at least once in several months; "*Never*" – never implemented the management function; choose the option that best reflects your opinion and respond by ticking (√).

How frequently do you deploy these relevant management practices in providing the POCTs	Always	Often	Sometimes	Rarely	Never
Preparing patients for testing, including obtaining informed consent.					
Implementing quality control measures to ensure the accuracy and reliability of test results					
Ensuring accurate interpretation of test results					
Establishment of a quality assurance program to monitor POCT performance					

Pharmacy Education (2025) 25(1) 422 - 433
https://doi.org/10.46542/pe.2025.251.422433