Knowledge, practices, and training outcomes regarding antimicrobial stewardship among Patent Medicine Vendors in Abia State-Nigeria

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Abstract

Background: Patent medicine vendors (PMVs) have become a major source of medicines in Nigeria, especially for acute conditions. Although they are prohibited from selling antibiotics, PMVs stock, and dispense antibiotics in communities. They are often the closest source of these medications to the populace. A basic knowledge of proper antimicrobial use is required for safe practice with them.

Objective: To explore the antimicrobial related knowledge and practices of patent medicine vendors in Abia State.

Materials and Methods: This study was a cross-sectional, before-and-after study of patent medicine dealers across different parts of Abia State. The design was chosen to provide an overview of the antibiotics-related knowledge as well as impact of a continuing education intervention. Data collection involved surveys that were combined with quizzes and deployed during workshops. Analysis involved descriptive statistics, chi-square test and ANOVA.

Results: A total of 133 individuals participated in the workshops. Their highest levels of education were secondary school (n=99), tertiary healthcare (n=26) and tertiary non-healthcare (n=8). Participants' average age was 47.51 (±11.82) years with about 17.82 (±11.02) years in practice. Metronidazole was the most used antibiotics for diarrhoeal disease (52.1%) while Ceftriaxone or Cephalexin were the most used for urinary tract infection (23.1%). The average pretest score was 59.38% (±21.02%) and the average post-test score was 85.00% (±17.17%), p<0.001. Most participants expressed interest in taking further training as pharmacy technicians (91%, 121/133).

Conclusion: Study demonstrated that 90% (121/133) of PMVs had a desire to pursue formal training as pharmacy technicians. There was significant improvement in their knowledge about antibiotics stewardship following the intervention. There need to increase the number of training institutions for pharmacy technicians in Abia State.

Keywords: Patent Medicine Vendors, Antimicrobial Stewardship, Nigeria, Antibiotics resistance

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Introduction

Patent medicine vendors (PMVs) have become a major source of medicines in Nigeria, especially for acute conditions.[1] They often provide the first source of care for acute illnesses in the community.[2,3] This is partly due to their wide geographical spread and limited numbers of trained health workers in most Nigerian communities. Typically, the patent medicine vendors are largely secondary school graduates without formal knowledge of pharmacology or related healthcare fields. Majority learned their trades from 'mentors' who had been selling over-the-counter (OTC) medications for a longer period, often through an apprenticeship system. In Nigeria, PMVs are not required to have formal training in pharmacy, but they are regulated by the Pharmacy Council of Nigeria.[4] They are only permitted to sell a limited number of pre-packaged, over-the-counter medical products. However, PMVs are prohibited from selling antibiotics, prescription medications and from conducting invasive medical procedures.[5]

To meet the demand for their service in communities, PMVs often extend beyond the scope of their practice as defined by the Pharmacy Council of Nigeria, and venture into the sale of antibiotics and other prescription-only-medicines.[4–6] About 46% of Nigerians receive antibiotics without prescription often through patent medicine vendors.[5] Also, patent medicine vendors gave between 46% and 71% of children ≤5 years unprescribed antimicrobials for diarrhoea treatment and sore throat cases respectively. A typical Nigerian adult would receive about four drugs during each pharmaceutical encounter, with antibiotics constituting the largest proportion.[5]

The prevalent poor knowledge of medicine/hazards of self-medication among PMVs in Nigeria, and the concomitant high prevalence of inappropriate drug dispensing practices among them inform the need to improve their knowledge and practices related to antibiotics.[6–8] These findings show that there is need to educate people who prescribe and dispense drugs on antibiotics abuse, resistance and antimicrobials stewardship. Given that PMVs contribute significantly to health service provision in communities, extending appropriately tailored training programmes on antibiotics can probably influence how they engage in non-prescription sales.

This study sought to explore the antibiotics related knowledge and practices of patent medicine vendors in Abia State. It was part of a larger antimicrobial stewardship project that involved multidisciplinary groups, including doctors, nurses, pharmacists, community health workers, laboratory scientists and patent medicine vendors. The research objectives were to understand the current practice patterns of PMVs and to evaluate the impact of a workshop on their antibiotics-related knowledge.

Materials and Methods

Study design
This study was a cross-sectional, before-and-after study of patent medicine dealers across the three senatorial zones in Abia State. The design was chosen to provide an overview of the antibiotics-related knowledge as well as impact of a continuing education intervention.

Study setting and participants
The study was conducted in Abia State, Nigeria. Participants were drawn from the three senatorial districts of the State, with a workshop conducted in each district. The leadership of the various associations of patent medicine dealers (e.g. the National Association of Patent and Proprietary Medicine Dealers -NAPPMED) in each of the 17 local government areas of the State were requested to mobilize their members, through the Directorate of Pharmaceutical Services, Abia State Ministry of Health.

Sample size and recruitment
A minimum sample size of 105 was required to identify a small correlation between participation in the course and objective improvements in knowledge regarding antimicrobials stewardship ($r=0.027$, with power of 80% and alpha of 0.05). Individuals who received the course advertisement, self-volunteered to participate in the course, hence a purposive sampling methodology was used.

Participants were informed about the use of their responses for research purposes, and of their right to withdraw. This study was approved by Abia State Human Research Ethics Board (July 8, 2019).

Data collection

Data was collected using surveys that were combined with quizzes and deployed during the workshop. The first survey/quiz combination (pretest) was deployed at the point of course registration. Following this, participants were exposed to the course materials. Lessons were presented by practicing pharmacists in Abia State. They covered the following areas: basic management of pharmaceuticals, rational use of antibiotics and pharmacy business during COVID-19. At the end of the interactive presentations, participants were given an opportunity to discuss more concerns regarding their trade as it relates to antibiotics and regulations. Prior to the close of the workshops, the post-test was deployed.

All the quizzes were available in both electronic and paper formats. Individuals who could not complete the electronic versions were given printed copies, and their responses were later entered into the electronic version by research support staff. The quiz questions were tested by patent medicine dealers in a different location from where the study was conducted to check for clarity and suitability. The quizzes were set up as auto-grading, meaning that participants would see their score after submission. The questions were set up to randomly alter the answer options for each participant, such that no two individuals had the same order of answers. The questions, which covered the workshop content, were set up in a way that answer options varied between participants. A total of 10 points were allocated to the pretest and the post-test, respectively. Some of the questions did not have point values (e.g. questions regarding demographics or practice pattern).

Variables

The primary outcome variable was the difference in knowledge scores between the pretest and post-tests. Other variables explored sociodemographic characteristics (e.g. age, sex, level of education, formal health-related training) and self-reported practice pattern (e.g. counseling on handwashing or antibiotics use). Data was also collected regarding preferred antibiotics for common conditions (e.g. respiratory tract infections, urinary tract infections, wound infections, and resistant malaria). Using the Abia antibiotics guidelines, their responses regarding preferred antibiotics for common conditions were re-classified as appropriate (1) and inappropriate (2) use of antibiotics. Participants were classified based on their highest level of education, into secondary (i.e. having not more than secondary school level of education); tertiary-healthcare (i.e. having post-secondary education in a healthcare discipline, e.g. pharmacy technician) and tertiary -non healthcare (i.e. having post-secondary education in a non-healthcare discipline, e.g. History and International Relations).

Data analysis

Demographic data were summarized using frequencies and percentages and were presented as tables and charts. The data regarding practice patterns across the three workshop locations and categories of participants were compared using Chi-square test, while test scores were compared using the analysis of variance (ANOVA). Spearman's correlation coefficient was used to compute the relationship between change in scores (post-test minus pretest) and antibiotics choices during course evaluation. The level of significance (p-value) was set at 0.05.

Results

Demographics

A total of 133 individuals comprising 76 males and 57 females, participated in the workshops, at three locations across Abia State. The participants were sub-classified based on their highest level of education into, secondary school, tertiary healthcare (e.g. pharmacy technician or community health worker) and tertiary non-healthcare (e.g. diploma in Mathematics). Their average age was 47 ($\pm$10) years while their average years in practice was about 15 years. Table 1 shows the baseline characteristics of the participants in terms of highest level of education against sex, location, age, and average years in practice.

Table 1. Baseline characteristics of participants

Attribute	Secondary (n=99)	Tertiary (n=26) (healthcare)	Tertiary (n=8) (non-healthcare)	Total (n=133)	p-value

Sex
  Female
  Male
	
	34 (59.6%)
	65 (85.5%)
		
		20 (35.1%)
		6 (7.9%)
			
			3 (5.3%)
			5 (6.6%)
				
				57
				76
					<0.001

Location of participant
  Aba (Abia South)
  Umuahia (Abia Central)
  Ahaba Imenyi (Abia North)
	
	28 (66.7%)
	34 (82.9%)
	37 (74.0%)
		
		11 (26.2%)
		4 (9.8%)
		11 (22.0%)
			
			3 (7.1%)
			3 (7.3%)
			2 (4.0%)
				
				42
				41
				50
					0.36

Average age (±SD)	47.51 (±11.82)	46.13 (±10.19)	45.00 (±10.71)		0.79
Average years in practice (±SD)	17.82(11.02)	14.52 (9.28)	19.00 (6.60)		0.39

Antimicrobials-related practice patterns
Participants' patterns of antimicrobial use in practice were explored using self-reported data. At the start of the workshop, 52.10% of participants preferred to use Metronidazole for diarrhoeal disease, 33.61% used Amoxicillin/Clavulanic or Amoxicillin for malaria, and 23.53% used Ceftriaxone or Cephalexin for treatment of skin infections. Table 2 shows the most preferred antibiotics based on disease classification, for all participants.

Table 2. Preferred antibiotics by disease classification

Preferred antibiotics	Diarrhoea	URTI	Malaria	STI	UTI	Skin
Metronidazole	52.10%	3.36%	8.40%	10.08%	10.08%	15.97%
Amoxicillin/Clavulanic or Amoxicillin	31.93%	27.73%	33.61%	8.40%	9.24%	10.92%
Ceftriaxone or Cephalexin	3.36%	19.33%	11.76%	47.90%	33.61%	23.53%
Ciprofloxacin or Ofloxacin	5.88%	22.69%	18.49%	24.37%	23.53%	15.97%
None of the above	6.72%	26.89%	27.73%	9.24%	23.53%	33.61%
Key: Diarrhoea (gastrointestinal disease) URTI (upper respiratory tract infection) Malaria (malaria, including resistant malaria) STI (sexually transmitted infections) UTI (urinary tract infections Skin (wound and skin infections, e.g. furuncles)						

Overall, about 17% of all patent medicine dealers treated malaria with antibiotics, and urinary tract infection was the most common indication (50%) for dispensing antibiotics for PMVs with non-healthcare tertiary education. Figure 1 shows a comparison of the most common reasons why PMV dispensed antibiotics in Abia State in relation to levels of education.
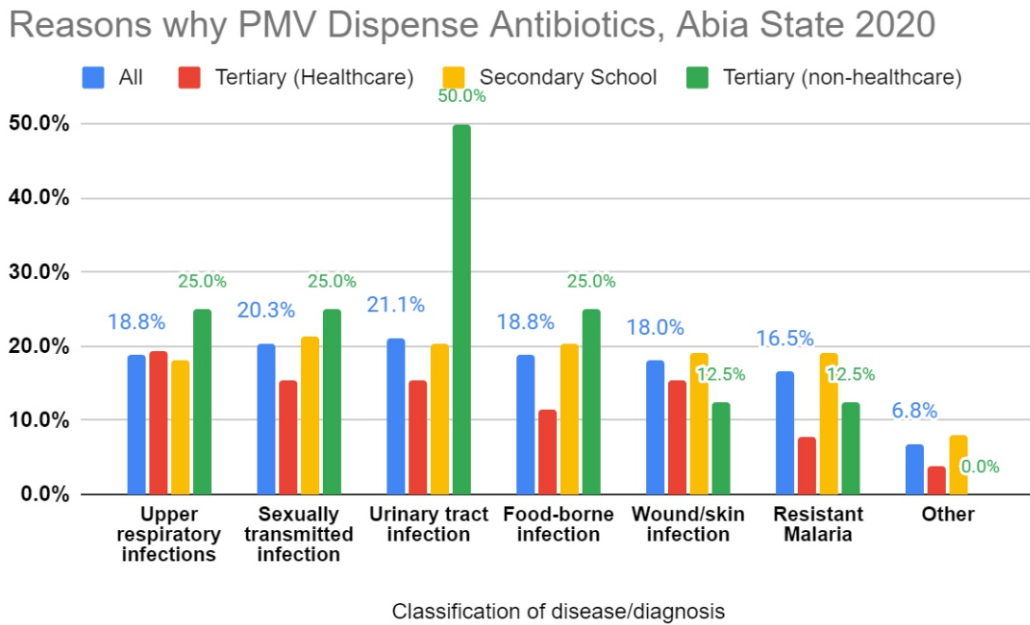
Figure 1 Common reasons why PMV dispense antibiotics

Antimicrobials-related knowledge
The scores from the pretest and post tests were compared using paired samples t-test. The average pretest score was 59.38% ($\pm$21.02%) and the average post-test score was 85.00% ($\pm$17.17%), p<0.001. The tertiary (healthcare) group had the highest scores in both the pre-test and post-test (63% and 90%, respectively). Figure 2 shows the test performance across the three groups of participants.
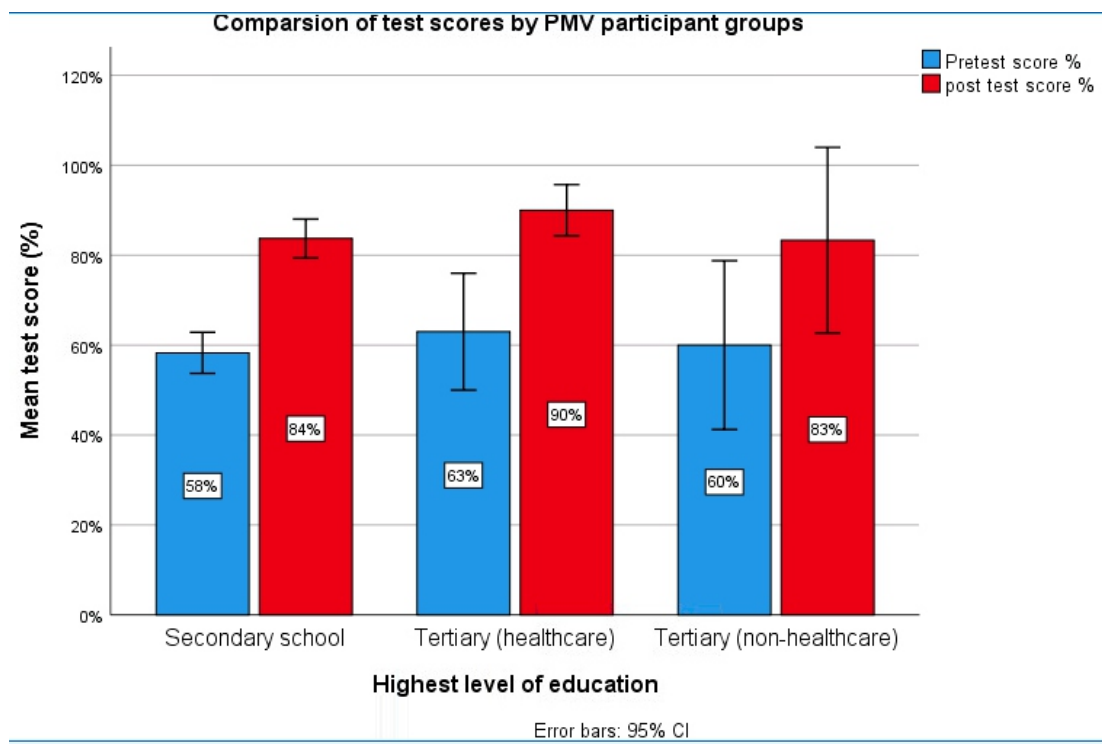

Figure 2 Comparison of test scores by participant groups

At the end of the training, participants were asked to select the antibiotics which they would use for common conditions, as initially highlighted in Table 2. The differences in their choice of antibiotics was computed, by subtracting the percentages at the end of the course from those at the beginning of the course. Figure 3 shows the percentage change in preference for intended antibiotics use between the beginning of the workshop and at the end. Negative numbers indicate a reduction while positive number indicate an increase, in the percentage of intended use for each antibiotic according to disease classification.
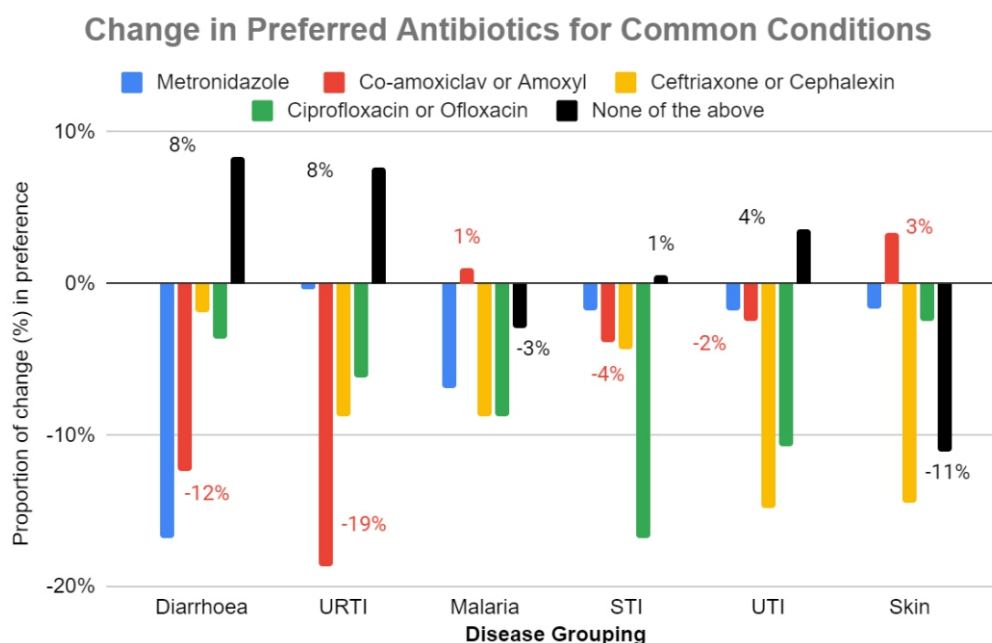

Figure 3 Changes in the intended use of antibiotics

Participants further expressed their intention to improve on antimicrobial stewardship through quality assurance (stock checking), their desire to join the antimicrobial stewardship network in Abia State and their plans to pursue a formal training in pharmacy technology. Almost 86% (114/133) of all PMVs expressed interest in joining the Abia Antimicrobial Stewardship network following the training. More than half of those with secondary level education (54.4%, 49/90) committed to performing weekly quality control checks on their stock. The tertiary (non-healthcare) group showed the most interest (100%) interest further training as pharmacy technicians. Table 3 shows the distribution of participants' perspectives regarding these areas.

Table 3: Socio-demographic characteristics of the discussants

Attribute	Secondary (n=90)	Tertiary (n=23) (Healthcare)	Tertiary (n=6) (non-healthcare)	Total (n=133)
Frequency of quality control checks				
Weekly	49 (54.4%)	13 (56.5%)	1 (16.7%)	63
Two weekly	6 (6.7%)	1 (4.3%)	0 (0.0%)	7
Monthly	35 (39.1%)	9 (39.1%)	5 (83.3%)	49
Interest in antimicrobial stewardship				
Yes	86 (95.6%)	22 (95.7%)	6 (100.0%)	114
No	1 (1.1%)	0 (0.0%)	0 (0.0%)	1
Maybe	3 (3.3%)	1 (4.3%)	0 (0.0%)	4
Interest in pharmacy technician training				
Yes	86 (96.0%)	18 (69.2%)	8 (100%)	121
No	4 (4.0%)	8 (30.8%	0 (0.0%)	12

Discussion

This study included 133 PMVs from across the three senatorial districts in Abia State, representing 12 out of the 17 local government areas in the State. Our study is novel as it is the first one to explore antibiotics-related practices and knowledge among patent medicine vendors in Abia State. PMVs often provide essential health services in many Nigerian communities, including access to antibiotics.8 Although the regulations governing the practice of patent medicine vendors does not permit them to deal on antibiotics[5], our data demonstrates that almost all the PMVs in the study dispense antibiotics, as evidenced by their pattern of preferred antibiotics use (see Table 2). The high rate of dispensing antibiotics found in this study is similar to that reported by Clarence et al[11], who conducted a population-based survey of antibiotics utilization in Benin City, Nigeria. Our study found that the most common reasons why PMVs dispensed antibiotics were classified as urinary tract infections (UTI, 21.1%), sexually transmitted infections (STI, 20.3%) and upper respiratory tract infections (URTI, 18.8%). These are also comparable to what has been reported in the extant literature.[6,10–12]

Most of the antibiotics that were inappropriately (i.e. in relation to their scope of practice) dispensed by the PMVs are under the Watch and Reserve categories by the WHO.[9] Penicillin and quinolones were the two most used antibiotics for URTI and 'Malaria'; this pattern is similar to what has been reported in the literature for medical professionals at a Nigerian teaching hospital.[12,13] The pattern of use of antibiotics by the PMVs in this study is like that reported by Adamu et al in Kano,[7] where Co-amoxiclav was the most dispensed drug. Increased inappropriate access to antibiotics is one of the drivers of antibiotics resistance. This demonstrates that there is a need to improve the training provided to the patent medicine vendors as well as a need to better regulate access to antibiotics in Nigeria.[7,10]

The clinical competence and training of patent medicine dealers have become a source of concern in Nigeria.[7,8,14] Following the training workshop that focused on antibiotics resistance, the governance of patent medicine practice as well as the management of small pharmaceutical businesses in the face of COVID-19, participants demonstrated increased knowledge about these areas. There was a significant improvement in average knowledge scores, from 59.38% (±21.02%) in the pretest to 85.00% (±17.17%) in the post-test score, p<0.001. Subgroup analysis showed that participants with tertiary healthcare-related education made the greatest statistically significant improvement in knowledge scores 26% (90%-63%). The secondary education group gained 27% (84%-58%), while the tertiary non-healthcare group gained 23% (83%-60%). This improvement in knowledge also reflected in their choice of antibiotics for common conditions, as illustrated in Figure 3. For instance, regarding the management of upper respiratory tract infections, more participants chose not to give antibiotics (7.7% gain), while fewer participants chose to give Co-amoxiclav (18.7% loss). Patent medicine vendors who had been training in other places demonstrated improved competence.[14-16] This suggests that patent medicine dealers need to be engaged in periodic, well-structured training programs in order to enhance their competence.

Almost all the participants (96%, 114/119) were interested in joining a broader program regarding antimicrobial stewardship in the state (Table 3). Adamu et al[7] reported that PMVs who had no training related to antimicrobial stewardship were significantly more likely to sell antibiotics without prescription compared with those who had such training (OR = 2.07, 95% CI: 1.27–3.37) . This suggests that there is a need to further engage the patent medicine dealers in antibiotics stewardship efforts.[8] Our study, however, did not explore the nature of this potential engagement. Improved PMV training, enhanced regulation and public education are among the strategies that can be used to reduce the sale of antibiotics by PMV.[7]

Meanwhile, 90% (121/133) of participants indicated interest in pursuing formal training as pharmacy technicians. These were largely people with secondary school education (96%, 86/90) and those with non-healthcare tertiary education (100%, 8/8). Presently, there are only two colleges accredited by the Pharmacy Council of Nigeria (PCN) for the training of pharmacy technicians in

Abia State, with each school having an admission quota of 35 students per year. The PCN only approves two colleges for each state in Nigeria, except perhaps under special circumstances.[4] Considering the strong interest among participants for more training, it is recommended that more colleges should be approved for Abia State. It is also recommended that more training should be provided to PMVs to make their safer, while enhancing enforcement of governing regulations.

This study is limited by several factors. Its design was purely quantitative and did not consider the nuanced approach to antimicrobial stewardship among PMVs. A mixed methods design could strengthen the findings of our study. Due to restrictions on access to knowledge about antibiotics by the PCN, the workshop content was limited largely to antibiotics resistance and approaches to managing common illnesses which did not involve antibiotics. It is possible that if the training content was expanded to discuss more about the indications for and use of specific antibiotics, our findings (e.g. test performance) might have been different. There is need for further studies regarding the perspectives of patent medicine dealers on antimicrobial stewardship as well as the impact of expanded training programs for PMVs.

Conclusion

This study, which is part of a larger antimicrobial stewardship project, explored the practice patterns of patent medicine vendors in Abia State, as they relate to antibiotics. It demonstrated that most patent medicine vendors had only secondary level education, but had a strong desire to pursue formal training as pharmacy technicians. There was significant improvement in their knowledge about antibiotics stewardship following a series of one-day workshops across the State. Participants further demonstrated their improved knowledge through a change in their proposed practice pattern regarding choice of antibiotics. An increase in the number of training institutions for pharmacy technicians in Abia State, will potentially improve the knowledge and practice patterns of people who dispense antibiotics locally.

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