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Antibiotic Self-Medication and Inappropriate Use Among Outpatients at a Tertiary Hospital in South-East Nigeria: Implications for Antimicrobial Stewardship and Resistance Control

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Abstract

Background

Antimicrobial self-medication (ASM) contributes substantially to inappropriate antimicrobial use and antimicrobial resistance (AMR), particularly in low- and middle-income countries. This study assessed the prevalence, patterns, predictors, knowledge, and attitudes regarding ASM among outpatients attending a tertiary hospital.

Methods

An analytical cross-sectional study was conducted among 440 outpatients attending Alex Ekwueme Federal University Teaching Hospital, Abakaliki, Nigeria. Data was collected using a semi-structured interviewer-administered questionnaire. Descriptive statistics, Chi-square tests, and multivariable logistic regression were used for analysis at a 95% confidence level and $p < 0.05$.

Results

The mean age of respondents was 37.96 ± 11.78 years, and 54.3% were males. Antimicrobial use within the preceding six months was 83.6%, while 92.5% had practised ASM. Pharmacies and patent medicine vendors were the major sources of antimicrobial agents. Antimalarial agents, ciprofloxacin, ampicillin, and amoxicillin were the most used agents, mainly for fever, cough, headache, and sore throat. Although 57.3% demonstrated good knowledge, only 25.0% recognized that AMR can spread between people, and 20.0% considered the use of leftover antimicrobial agents appropriate. Long waiting times/delays (58.6%) and financial barriers (27.0%) were the main healthcare-access challenges. Respondents with secondary education were more likely to self-medicate (AOR = 5.575; 95% CI: 1.29–24.05), whereas those with excellent knowledge were less likely to do so (AOR = 0.230; 95% CI: 0.07–0.80).

Conclusion

ASM was highly prevalent and was influenced by healthcare-system barriers, non-prescription access to antimicrobial agents, and knowledge gaps. Strengthening antimicrobial stewardship education, enforcement of prescription-only policies, and healthcare access are essential to curb inappropriate antimicrobial use and AMR.

Clinical Trial Registration

Clinical trial number: Not applicable. This study was an observational cross-sectional survey and did not involve a clinical trial or any intervention requiring trial registration.

INTRODUCTION

Antimicrobial resistance (AMR) is one of the most serious global public health threats, reducing the effectiveness of treatment for infectious diseases and increasing morbidity, mortality, and healthcare costs [1]. The World Health Organisation (WHO) estimated that bacterial AMR caused 1.27 million attributable deaths and contributed to 4.95 million deaths globally in 2019 [2, 3]. Recent projections further suggest that AMR could account for 1.91 million attributable deaths annually by 2050 if current trends continue [4]. These findings highlight the urgent need to reduce inappropriate antimicrobial use, particularly the use of antimicrobial agents without prescription.

Antimicrobial self-medication (ASM), defined as the use of antimicrobial agents without professional prescription or supervision [5], is a major contributor to inappropriate antimicrobial use and AMR [6]. It includes obtaining antimicrobial agents over the counter, reusing old prescriptions, sharing medications, and using leftover drugs from previous illnesses [7]. Such practices promote incorrect drug selection, inappropriate dosing, incomplete treatment, and unnecessary antimicrobial exposure, all of which contribute to the emergence and spread of resistant organisms [8]. The WHO has identified misuse and overuse of antimicrobial agents as major drivers of AMR globally [9].

Globally, ASM is highly prevalent, especially in low- and middle-income countries (LMICs) where regulation of antimicrobial sales is often weak [10]. A recent systematic review reported a pooled prevalence of 43.0% for antibiotic self-medication among adults, with the highest prevalence occurring in sub-Saharan Africa [11]. Several studies from LMICs have shown that antimicrobial agents are commonly purchased without prescription from community pharmacies and informal medicine vendors [12–15]. Easy access to antimicrobial agents through pharmacies and informal drug vendors, financial barriers to healthcare, long hospital waiting times, and previous successful use of antimicrobial agents are among the major factors driving the practice in many developing countries [14, 16, 17].

In Nigeria, ASM remains widespread [18–20], despite efforts to strengthen antimicrobial stewardship and AMR control [21]. Nigeria launched a National Action Plan on Antimicrobial Resistance to improve antimicrobial stewardship, surveillance, and rational antimicrobial use [22]; however, implementation challenges persist. Over-the-counter access to antimicrobial agents, poor awareness regarding AMR, weak regulation of prescription-only medicines, and healthcare access challenges continue to support inappropriate antimicrobial use [20, 23, 24]. Hospital outpatient populations are particularly important in understanding ASM because many patients initiate antimicrobial use before seeking formal medical care [25].

As a major tertiary referral centre in South-East Nigeria, Alex Ekwueme Federal University Teaching Hospital Abakaliki (AEFUTHA) serves a large outpatient population from Ebonyi State and neighbouring states. However, there is limited facility-based evidence regarding the patterns, predictors, and drivers of antimicrobial self-medication among outpatients in this setting. This study therefore assessed

antimicrobial self-medication among outpatients attending the tertiary hospital, with emphasis on patterns of use, predictors, knowledge and attitudes regarding antimicrobial use and resistance, and discussed the implications for antimicrobial stewardship and resistance control.

METHODS

The study was conducted at AEFUTHA, a major tertiary referral and teaching hospital located in Abakaliki, Ebonyi State, South-East Nigeria. The hospital is affiliated with Alex Ekwueme Federal University. AEFUTHA provides comprehensive inpatient, outpatient, emergency, and specialist healthcare services and serves as a referral centre for patients from Ebonyi State and neighbouring states in the South-East and South-South regions of Nigeria. In addition to healthcare delivery, the hospital supports the training of medical students, resident doctors, nurses, and other health professionals and actively participates in clinical research. The hospital also implements infection prevention and control measures and antimicrobial stewardship activities aimed at promoting the rational use of antimicrobial agents.

Study Design and Population

The study was conducted using an analytical cross-sectional design. The study population consisted of adult outpatients attending the General Outpatient Department (GOPD) Clinic at AEFUTHA.

Inclusion and Exclusion Criteria

The study included outpatients attending GOPD clinic at the AEFUTHA during the period of data collection. Only adults aged 18 years and above who provided written informed consent after being adequately informed about the study were included. Critically ill patients were excluded from the study.

Sample Size Determination

A sample size 420, including anticipated10% non-response rate, was calculated using the single population proportion formula $n = Z^2 p(1-p)/d^2$, where $Z = 1.96$ at 95% confidence level, $d = 0.05$, and $p = 0.468$, based on a previous study among adult outpatients in Nigeria that reported a prevalence of 46.8% for ASM [25]. However, a total of 440 participants were interviewed.

Sampling Technique

A clinic-based systematic sampling technique was employed in the GOPD of AEFUTHA. The sampling frame comprised eligible patients attending the clinic during the study period, and the average daily attendance was obtained from the clinic records. The sampling interval (*k*) was calculated by dividing the number of eligible patients seen over the three months preceding the survey by 420, as data collection was planned over a three-month period. The value of *k* was kept constant throughout the

study period. On each clinic day, balloting was used to select the first participant from the eligible patients present, after which every k^{th} eligible patient was recruited until the required sample size was achieved.

Data Collection Tool

Data were collected using a semi-structured interviewer-administered questionnaire designed in KoboToolbox, an open-source electronic data collection platform for secure digital data capture and storage. The questionnaire was divided into sections covering socio-demographic characteristics, prevalence and patterns of antimicrobial agent use, knowledge and attitudes regarding antibiotic use and resistance, and sources of antibiotics. An open-ended question was included to explore the challenges patients encountered before deciding to self-medicate with antimicrobial agents.

Data Collection

All interviews were conducted in either English or Igbo language, depending on the respondent's preferred language. The researchers read out each question to the respondents and provided explanations where necessary to ensure clarity and uniform understanding. For questions with predefined response options, the available choices were clearly read out and explained to participants, who then selected the most appropriate response. Data collection was conducted on different days of the week and across clinic sessions between 5 February and 4 May 2026.

Measurement of Variables

The dependent variable was ASM. This was measured as a binary outcome (Yes/No). The independent variables included sociodemographic characteristics and knowledge of antimicrobial use and resistance. Sociodemographic variables included age, sex, marital status, religion, educational level, employment status, occupation, average monthly income, and state of residence.

Knowledge was assessed using six (6) questions with response options of "True," "False," and "Don't know." Each correct response was scored one (1), while incorrect and "Don't know" responses were scored zero (0). The total knowledge ranged from 0 to 6, which was converted to a percentage score. Knowledge levels were categorised as poor (< 50%), good (50–69%), and excellent (≥ 70%), based on Bloom cut-off criteria [26].

Attitude was assessed using four (4) Likert-scale questions with responses ranging from "Strongly disagree" to "Strongly agree." For analysis, "Strongly disagree" and "Disagree" were merged as "Disagree," while "Agree" and "Strongly agree" were merged as "Agree." Neutral responses were retained as a separate category.

Sources of antimicrobial agents were categorised as pharmacy, patent medicine vendors, leftover medications, or friends/relatives. Pattern of use included indication for use, types of symptoms treated, and frequency of antimicrobial consumption.

Data Analysis

Data from KoboToolbox were exported to Microsoft Excel and analysed using IBM SPSS Statistics version 25. Data were cleaned, coded, recoded where necessary, and relevant variables computed prior to analysis. Charts were generated using Microsoft Excel.

Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarise sociodemographic characteristics, prevalence and patterns of antimicrobial use and self-medication, sources of antimicrobial agents, illnesses/symptoms treated, knowledge, and attitudes. Bar and pie charts were used for selected variables.

Responses to the open-ended question on challenges to healthcare access before self-medication were analysed thematically. Similar responses were grouped into major themes and presented using frequencies and percentages. As multiple responses were allowed, percentages exceeded 100%.

Bivariate analysis was performed using Chi-square tests to assess associations between categorical variables and antimicrobial self-medication. Variables with $p < 0.20$ were entered into multivariable logistic regression to control for confounding. Adjusted odds ratios (AORs) with 95% confidence intervals were reported, and statistical significance was set at $p < 0.05$.

RESULTS

A total of 440 outpatients participated in the study, with a mean age of 37.96 ± 11.78 years. The respondents were predominantly within the economically active age group, as 42.7% were aged 31–40 years, while 27.0% were aged 30 years or younger. Males constituted slightly more than half of the respondents (54.3%). Most participants were married (63.9%) and had attained tertiary education (51.8%), whereas only 8.0% had primary education. Christianity was the predominant religion (98.2%). Most respondents (84.3%) were residents of Ebonyi State, while the remaining participants were from neighbouring states including Enugu (6.6%), Abia (4.8%), Cross River (3.0%), and other states (1.3%). In terms of employment characteristics, nearly half of the respondents were self-employed (45.9%), while trading (26.6%), civil service (24.3%), and artisan work (23.6%) were the most reported occupations. Additionally, almost half of the respondents (46.8%) earned less than ₦100,000 (USD72.7) monthly (Table 1).

Table 1
Sociodemographic characteristics of Outpatients at Alex Ekwueme Federal University Teaching Hospital Abakaliki, Nigeria

VARIABLES	FREQUENCY N = 440	PERCENT
Age in years		
≤ 30	119	27.0
31–40	188	42.7
41–50	62	14.1
≥ 51	71	16.1
Mean age ± Standard Deviation	37.96 ± 11.78*	-
Sex		
Male	239	54.3
Female	201	45.7
Marital status		
Married	281	63.9
Single	147	33.4
Widowed	12	2.7
Completed level of education		
Primary or less	35	8.0
Secondary	177	40.2
Tertiary	228	51.8
Religion		
Christianity	432	98.2
Others*	8	1.9
State of Residence		
Ebonyi	371	84.3
Enugu	29	6.6

*African Traditional Religion, Islam; **Doctors, nurses, lawyers, and other highly skilled occupations requiring specialized professional training

VARIABLES	FREQUENCY N = 440	PERCENT
Age in years		
Abia	21	4.8
Cross River	13	3.0
Others	6	1.3
Employment Status		
Employed	180	40.9
Self-employed	202	45.9
Unemployed	58	13.2
Occupation		
Trading	117	26.6
Civil servant	107	24.3
Artisan	104	23.6
Farming	25	5.7
Professional**	25	5.7
Retired	17	3.9
Unemployed/student	43	9.8
Others	2	0.5
Monthly income in naira		
<₦100,000	206	46.8
₦100,000 – ₦149,000	145	33.0
≥₦150,000	27	6.1
Undisclosed	62	14.1
*African Traditional Religion, Islam; **Doctors, nurses, lawyers, and other highly skilled occupations requiring specialized professional training		

Use of antimicrobial agents was common among the respondents, with 368 (83.6%) reporting use within the six months preceding the survey. Among these respondents, repeated antimicrobial use was frequent, with over one-third (36.4%) reporting use on two occasions within the six-month period, while 13.3% reported use on three occasions. Overall, 407 respondents (92.5%) reported ever self-medicating

with antimicrobial agents without a doctor’s prescription. Among self-medicated respondents, the practice occurred predominantly on an intermittent basis, as 51.1% reported sometimes engaging in antimicrobial self-medication, while 19.4% reported always practising it. Notably, most respondents who self-medicated reported completing the full course of antimicrobial agents during use (93.4%). Furthermore, 60.9% sought medical care when symptoms failed to improve after self-medication, and 91.6% had previously received advice from healthcare providers on the proper use of antimicrobial agents (Table 2).

Table 2
Prevalence and Pattern of Antimicrobial Self-Medication Among Outpatients at Alex Ekwueme Federal University Teaching Hospital Abakaliki, Nigeria

VARIABLES	FREQUENCY N = 440	PERCENT
Used antimicrobial agents within six months preceding survey		
No	46	10.5
Not sure	26	5.9
Yes	368	83.6
Number of times antimicrobials were used within six months preceding survey	**N = 368**	
More than four times	6	1.6
Four times	7	1.9
Three times	49	13.3
Twice	194	36.4
Once	112	30.4
Ever self-medicated with antimicrobial agents	**N = 440**	
No	22	5.0
Not sure	11	2.5
Yes	407	92.5
Frequency of self-medication with antimicrobial agents	**n = 407**	
Always	79	19.4
Often	48	11.8
Rarely	72	17.7
Sometimes	208	51.1
Completion of full course of antimicrobial agents during self-medication		
No	11	2.7
Not sure	16	3.9
Yes	380	93.4

VARIABLES	FREQUENCY N = 440	PERCENT
Used antimicrobial agents within six months preceding survey		
Sought medical care when symptoms did not improve after self-medication		
No	159	39.1
Yes	248	60.9
Ever been advised by a healthcare provider about the proper use of antimicrobial agents	**N = 440**	
Yes	403	91.6
No	37	8.4

Pharmacies were overwhelmingly the major source of antimicrobial agents used during self-medication, reported by 98.5% of respondents, while patent medicine stores and friends/family members were identified as sources by 40.8% and 22.9% of respondents, respectively (Fig. 1).

Antimalarials were the most used antimicrobial agents for self-medication, reported by 93.9% of respondents. Among antibacterial agents, fluoroquinolones were the most frequently used class, with ciprofloxacin being the most common (67.6%). This was followed by penicillins, including ampicillin (55.8%), ampicillin-cloxacillin (48.4%), and amoxicillin (44.2%). Use of broader-spectrum agents such as amoxicillin-clavulanic acid (22.9%) and cephalosporins – including cefuroxime (8.4%) and cefixime (3.9%) – was also observed. Macrolides (azithromycin 13.5%, erythromycin 9.6%, clarithromycin 3.4%) and tetracyclines (tetracycline 17.0%, doxycycline 2.7%) were less commonly reported. Other notable agents included metronidazole (26.5%), gentamicin (7.4%), and ofloxacin (1.2%) (Fig. 2).

The illnesses and symptoms most treated through antimicrobial self-medication were fever (95.1%), cough (53.3%), headache (51.4%), sore throat/throat pain (47.2%), loose stools (45.5%), abdominal pain (44.0%), and joint/body pain (43.0%). Respiratory-related symptoms, including cold/flu symptoms, were also frequently reported (38.8%), whereas urinary symptoms, vaginal discharge, ear pain, and red eye were less commonly treated with antimicrobial self-medication (Fig. 3).

Assessment of knowledge regarding antimicrobial use and resistance showed that most respondents correctly identified that antibiotics are effective against bacterial infections (83.9%) and that overuse of antimicrobial agents can reduce their effectiveness in the future (69.1%). Slightly above half of the respondents (52.0%) correctly recognised that failure to complete a prescribed antimicrobial course could contribute to AMR. However, substantial knowledge gaps were observed in other areas. Less than half of the respondents (48.0%) correctly identified that antiviral agents are used for viral infections, while only one-quarter (25.0%) were aware that antimicrobial resistance can spread between people.

Additionally, 20.0% incorrectly believed that using leftover antimicrobial agents for another illness was appropriate (Table 3). Overall, more than half of the respondents (57.3%) demonstrated good knowledge of antimicrobial use, misuse, and resistance, while 24.1% had poor knowledge and 18.6% demonstrated excellent knowledge levels (Fig. 4).

Table 3
Knowledge of Antimicrobial Use and Resistance Among Outpatients at Alex Ekwueme Federal University Teaching Hospital Abakaliki, Nigeria

VARIABLES	FREQUENCY N = 440	PERCENT
Antibiotics can cure infections caused by bacteria		
Don't know	48	10.9
False	23	5.2
True (correct response)	369	83.9
Antiviral agents can cure infections caused by viruses		
Don't know	190	43.2
False	39	8.9
True (correct response)	211	48.0
Overusing antimicrobial agents can make them less effective in the future		
Don't know	92	20.9
False	44	10.0
True (correct response)	304	69.1
Not completing a course of prescribed antimicrobial agent can cause resistance		
Don't know	148	33.6
False	63	14.3
True (correct response)	229	52.0
Using leftover antimicrobial agents for new treatment is appropriate		
Don't know	103	23.4
False (correct response)	249	56.6
True	88	20.0
Antimicrobial resistance can spread between people		
Don't know	250	56.8
False	80	18.2
True (correct response)	110	25.0

Regarding attitudes toward antimicrobial use, most respondents (87.7%) agreed that antimicrobial agents should only be used when prescribed by a doctor. Despite this, 60.0% reported preferring to use antimicrobial agents whenever they felt sick to recover quickly. Furthermore, 43.4% agreed that they would stop taking antimicrobial agents once they felt better, while 35.0% considered it acceptable to share antimicrobial agents with individuals experiencing similar symptoms (Table 4).

Table 4
Attitudes Toward Antimicrobial Use and Self-Medication Among Outpatients at Alex Ekwueme Federal University Teaching Hospital Abakaliki, Nigeria

VARIABLES	**FREQUENCY, n (%)** **N = 440**		
	Disagree	**Neutral**	**Agree**
Antimicrobial agents should only be used when prescribed by a doctor	19 (4.3)	35 (8.0)	386 (87.7)
I prefer to use antimicrobials whenever I feel sick	76 (17.3)	100 (22.7)	264 (60.0)
I would stop taking antimicrobials once I feel better	134 (30.5)	115 (26.1)	191 (43.4)
It is acceptable to share antimicrobials with others who have similar symptoms	184 (41.8)	102 (23.2)	154 (35.0)

Thematic analysis of responses to the open-ended question on challenges encountered in accessing proper healthcare before self-medicating with antimicrobial agents revealed that long waiting times and delays in healthcare facilities constituted the most frequently reported barrier, accounting for 258 mentions (58.6%). Respondents commonly described prolonged waiting periods, stressful queues, and delays in hospital processes as major obstacles to timely healthcare access. Financial barriers were the second most reported challenge, with 119 mentions (27.0%). Other reported barriers included distance and travel burden (5.5%), previous unpleasant hospital experiences or poor hospital management (3.0%), stress or emotional burden associated with accessing care (1.8%), and unavailability of some investigations or specialized services locally (1.6%). Interestingly, 7.7% of respondents reported experiencing no challenges in accessing healthcare prior to antimicrobial use (Table 5).

Table 5
Thematic Analysis of Challenges Faced in Accessing Proper Healthcare Before Self-Medicating with Antimicrobials Among Outpatients at Alex Ekwueme Federal University Teaching Hospital Abakaliki, Nigeria

THEME (CHALLENGE CATEGORY)	FREQUENCY (N = 440)	PERCENTAGE (%) *
Long waiting times/delays	258	58.6
Cost of care/financial barriers	119	27.0
No challenges	34	7.7
Distance to health facility/travel burden	24	5.5
Previous ugly experience or bad hospital management	13	3.0
Stress/emotional burden/lack of empowerment	8	1.8
Unavailable investigations/limited local services	7	1.6
Pharmacy supply issues	1	0.2
Other miscellaneous challenges	30	6.8

*Multiple responses were allowed; therefore, frequencies and percentages exceed the total number of respondents and 100%, respectively.

At bivariate analysis, level of education ($p = 0.003$), employment status ($p = 0.002$), monthly income ($p < 0.001$), and knowledge of antimicrobial use and resistance ($p = 0.006$) were significantly associated with antimicrobial self-medication. However, following adjustment in the multivariable logistic regression model, only secondary level of education and excellent knowledge of antimicrobial use and resistance remained significant predictors of antimicrobial self-medication. Respondents with secondary education were over five times more likely to self-medicate with antimicrobial agents compared with those with primary education or less (AOR = 5.575; 95% CI: 1.29–24.05; $p = 0.021$). In contrast, respondents with excellent knowledge of antimicrobial use and resistance were significantly less likely to self-medicate compared with those with poor knowledge (AOR = 0.230; 95% CI: 0.07–0.80; $p = 0.021$) (Table 6).

Table 6
Factor Associated with Antimicrobial Self-Medication Among Outpatients at Alex Ekwueme Federal University Teaching Hospital Abakaliki, Nigeria

VARIABLES	EVER SELF-MEDICATED WITH ANTIMICROBIAL AGENT		BIVARIATE ANALYSIS		MULTIVARIATE ANALYSIS		
	No n = 33	Yes n = 407	Test Statistic (χ^2)	p-value	AOR	95% CI for AOR	p-value
Age in years							
≤ 30	9 (7.6)	110 (92.4)	5.808	**0.121**	1.00	Ref	
31–40	11 (5.9)	177 (94.1)			0.611	0.19–1.94	0.403
41–50	3 (4.8)	59 (95.2)			1.164	0.23–5.46	0.848
≥ 51	10 (14.1)	61 (85.9)			0.727	0.20–2.59	0.622
Sex							
Male	15 (6.3)	224 (93.7)	1.130	0.288			
Female	18 (9.0)	183 (91.0)					
Marital status							
Married	23 (8.2)	258 (91.8)	0.526	0.468			
Not married	10 (6.3)	149 (93.7)					
Religion							
Christianity	32 (7.4)	400 (92.6)	0.294	0.588			
Others	1 (12.5)	7 (87.5)					
Completed education							
Primary or less	7 (20.0)	28 (80.0)			1.00	Ref	
Secondary	7 (4.0)	170 (96.0)	11.318	**0.003***	5.575	1.29–24.05	**0.021***
Tertiary	19 (8.3)	209 (91.7)			3.095	0.79–12.18	0.106

AOR = Adjusted Odds Ratio; CI = Confidence Interval; *Statistically significant at $p < 0.05$; Ref = Reference

VARIABLES	EVER SELF-MEDICATED WITH ANTIMICROBIAL AGENT		BIVARIATE ANALYSIS		MULTIVARIATE ANALYSIS		
	No **n = 33**	**Yes** **n = 407**	**Test Statistic (χ^2)**	**p-value**	**AOR**	**95% CI for AOR**	**p-value**
Employment status							
Employed	11 (6.1)	169 (93.9)	16.937	**0.002***	1.00	Ref	
Self-employed	10 (5.0)	192 (95.0)			0.929	0.34–2.53	0.885
Unemployed	12 (20.7)	46 (79.3)			1.162	0.10–14.2	0.906
Monthly income in naira (₦)							
< 100,000	9 (4.4)	197 (95.6)	20.450	**< 0.001***	1.00	Ref	
100,000–149,000	8 (5.5)	137 (94.5)			0.897	0.31–2.60	0.842
≥ 150,000	3 (11.1)	24 (88.9)			0.557	0.12–2.58	0.454
Undisclosed	13 (21.0)	49 (79.0)			0.155	0.01–1.76	0.132
Knowledge of antimicrobial use and resistance							
Poor	6 (5.7)	100 (94.3)	10.139	**0.006***	1.00	Ref	
Good	14 (5.6)	238 (94.4)			0.626	0.20–1.96	0.420
Excellent	13 (15.9)	69 (84.1)			0.230	0.07–0.80	**0.021***

AOR = Adjusted Odds Ratio; CI = Confidence Interval; *Statistically significant at $p < 0.05$; Ref = Reference

DISCUSSION

This study assessed antimicrobial self-medication and inappropriate antimicrobial use among outpatients attending a tertiary hospital in South-East Nigeria, with emphasis on prevalence, patterns of use, knowledge and attitudes regarding antimicrobial use and resistance, and factors associated with the practice. The findings demonstrate a very high burden of antimicrobial self-medication, widespread

use of broad-spectrum antimicrobial agents without prescription, important gaps in AMR knowledge, and persistent healthcare-system barriers that may encourage inappropriate antimicrobial use. These findings have important implications for antimicrobial stewardship, AMR control, and regulation of antimicrobial agents in Nigeria and similar settings.

The prevalence of antimicrobial stewardship observed in this study was remarkably high, with more than nine out of every ten respondents reporting previous use of the agents without a doctor's prescription. This finding exceeds prevalence estimates reported in several previous Nigerian studies among community members, university students, and hospital attendees [18, 25, 27], and is substantially higher than the pooled prevalence of 43.0% reported in a recent global systematic review [11]. However, the finding is consistent with reports from many LMICs where antimicrobial agents are easily accessible without prescription and healthcare access barriers persist [14, 28, 29]. The extremely high prevalence observed in this study may reflect weak enforcement of regulations governing prescription-only medicines, widespread availability of antimicrobial agents through community pharmacies and patent medicine vendors, previous successful experiences with self-medication, and delays associated with accessing formal healthcare services, all of which have been reported in previous studies [14, 23, 30].

The implications of this finding for antimicrobial stewardship and AMR control are substantial. High rates of ASM increase the likelihood of inappropriate drug selection, suboptimal dosing, unnecessary antimicrobial exposure, and delayed diagnosis of serious illnesses [5, 8], all of which contribute to the emergence and spread of resistant organisms. In addition, widespread self-medication undermines institutional and national antimicrobial stewardship efforts aimed at promoting rational antimicrobial use. These findings underscore the need for stronger regulation of antimicrobial dispensing practices in Nigeria, particularly enforcement of prescription-only policies for antibiotics and other antimicrobial agents. Public awareness campaigns on the dangers of inappropriate antimicrobial use should also be strengthened.

Repeated antimicrobial use within a relatively short period was also common among respondents, with many participants reporting antimicrobial use on multiple occasions within the preceding six months. This suggests frequent and possibly inappropriate exposure to antimicrobial agents within the community. Frequent antimicrobial exposure exerts selective pressure on microorganisms and accelerates the development of resistance [2, 4, 10]. Previous Nigerian studies have documented high rates of ASM among community members, students, and hospital attendees [18–20, 31]. Similar findings have also been reported in studies from other African settings where recurrent empirical use of antimicrobial agents is common, particularly for febrile and respiratory illnesses [14, 28, 29]. The high frequency of antimicrobial use observed in this study may reflect the high burden of infectious diseases in the setting, but it may also indicate poor adherence to antimicrobial stewardship principles and limited access to diagnostic testing prior to treatment initiation.

Nearly all respondents who practised self-medication obtained antimicrobial agents from pharmacies, while a substantial proportion also obtained them from patent medicine vendors. This finding is

consistent with reports from Nigeria and other LMICs where community pharmacies and informal medicine vendors are major sources of non-prescription antimicrobial agents [12, 13, 15]. The finding highlights persistent regulatory gaps in the control of antimicrobial dispensing practices in Nigeria. Although many antimicrobial agents are classified as prescription-only medicines, enforcement remains weak, allowing unrestricted access to these agents within the community [23, 24]. Strengthening pharmacy regulation, improving inspection and monitoring systems, and implementing stricter penalties for unauthorised antimicrobial sales may help reduce inappropriate community access to antimicrobial agents.

Antimalarial agents were the most common self-medicated antimicrobial agents in this study, while fluoroquinolones and penicillins were the most frequently used antibiotic classes. The high use of antimalarial agents likely reflects the endemicity of malaria in Nigeria and the tendency for febrile illnesses to be presumptively treated as malaria without laboratory confirmation. However, the extensive use of broad-spectrum antibiotics such as ciprofloxacin, ampicillin, amoxicillin, and amoxicillin-clavulanic acid is concerning. Similar patterns have been reported in previous Nigerian studies [18–20], as well as studies from other African countries [14, 28, 29]. Broad-spectrum antimicrobial agents are particularly important from an antimicrobial stewardship perspective because their inappropriate use may accelerate resistance development across multiple bacterial species [2, 4, 10]. Fluoroquinolones, in particular, are considered critically important antimicrobials, and increasing resistance to this class has serious implications for the treatment of severe bacterial infections [3, 17].

The illnesses and symptoms most treated through self-medication were fever, cough, headache, sore throat, and gastrointestinal symptoms. These findings suggest that antimicrobial agents are frequently used empirically for undifferentiated febrile and respiratory illnesses, many of which may be viral in origin and therefore unlikely to benefit from antibiotic therapy [32, 33]. Similar findings have been documented in previous studies in Nigeria and other LMICs [14, 18, 20]. The widespread use of antimicrobial agents for respiratory symptoms and influenza-like illnesses raises important concerns regarding irrational antibiotic use and inappropriate public perceptions regarding the effectiveness of antimicrobial agents for viral illnesses. These findings support the need for targeted antimicrobial stewardship interventions that prioritize rational use of antimalarials and restrict inappropriate use of broad-spectrum antibiotics, particularly fluoroquinolones and penicillins. In addition, public education on when antibiotics are indicated, routine laboratory confirmation before treatment of febrile illnesses, when feasible, and stricter regulation of non-prescription access to these agents should be strengthened to reduce the selection pressure driving antimicrobial resistance.

Knowledge regarding antimicrobial use and resistance was mixed among respondents. Although many respondents demonstrated awareness that antibiotics are effective against bacterial infections and that antimicrobial overuse can reduce drug effectiveness, substantial knowledge gaps persisted regarding AMR transmission and appropriate antimicrobial use practices. Only one-quarter of respondents were aware that AMR can spread between individuals. Similar knowledge gaps have been documented in

previous Nigerian and international studies [11, 19, 34]. Poor understanding of AMR transmission may reduce public support for infection prevention measures and rational antimicrobial use. The persistence of misconceptions regarding the use of leftover antimicrobial agents further suggests inadequate public education regarding antimicrobial stewardship principles.

Despite these knowledge gaps, most respondents demonstrated good overall knowledge scores. Interestingly, respondents with excellent knowledge of antimicrobial use and resistance were significantly less likely to self-medicate with antimicrobial agents after adjustment for confounding variables. This finding supports the role of knowledge and awareness in promoting appropriate antimicrobial use behaviors and is consistent with findings from previous studies showing that better knowledge is associated with a lower likelihood of inappropriate antimicrobial use [10, 14, 16]. The finding highlights the importance of strengthening public education and antimicrobial stewardship awareness campaigns within communities and healthcare settings.

The study also revealed contradictory attitudes regarding antimicrobial use. Although most respondents agreed that antimicrobial agents should only be used when prescribed by a doctor, many also reported preferring to use antimicrobial agents whenever they felt sick to recover quickly, while others admitted they would discontinue treatment once symptoms improved or share antimicrobial agents with others experiencing similar symptoms. These findings suggest that awareness alone may not necessarily translate into appropriate antimicrobial use behaviour. Similar discrepancies between knowledge and practice have been reported in previous antimicrobial stewardship studies [8, 10, 14]. Behavioural change interventions, in addition to knowledge-based education, may therefore be required to improve antimicrobial use practices.

Healthcare-system barriers emerged prominently in the thematic analysis of challenges encountered before self-medication. Long waiting times and delays in healthcare facilities were the most frequently reported barriers, followed by financial constraints. These findings suggest that self-medication may partly represent an adaptive response to weaknesses within the healthcare system. Similar findings have been reported in studies from other LMIC settings where healthcare access barriers drive inappropriate community antimicrobial use [18, 20, 35]. Studies from Nigeria and other sub-Saharan African countries have consistently shown that difficulties in accessing timely and affordable healthcare encourage patients to seek antimicrobial agents directly from community pharmacies and informal medicine vendors rather than formal healthcare facilities [18, 19]. Long waiting times, high consultation costs, and poor patient experiences may encourage patients to bypass formal healthcare services and obtain antimicrobial agents directly from pharmacies and patent medicine vendors [18, 20, 35]. Similar observations have been reported in previous Nigerian studies where delays in healthcare delivery and out-of-pocket healthcare expenditures significantly influenced self-medication practices [18, 19, 35]. These findings have important implications for antimicrobial stewardship because efforts to reduce inappropriate antimicrobial use may be less effective if healthcare access barriers are not simultaneously addressed. Addressing these system-level challenges through improved healthcare

efficiency, reduced waiting times, expansion of health insurance coverage, and strengthening of primary healthcare services may therefore form an important component of antimicrobial stewardship interventions in Nigeria.

Educational level and knowledge regarding antimicrobial use and resistance remained significant predictors of antimicrobial self-medication. Respondents with secondary education were more likely to self-medicate, while those with excellent knowledge were less likely to engage in the practice. The association between education and antimicrobial self-medication has been inconsistently reported in the literature. While higher educational attainment is generally expected to promote rational medicine use, some studies have reported higher rates of self-medication among educated individuals, possibly due to increased confidence in self-diagnosis and drug selection [36]. A study among university graduates in Nigeria found that higher educational attainment did not necessarily translate into appropriate antimicrobial use, as many educated respondents still engaged in antibiotic self-medication and other inappropriate antimicrobial use behaviours [20].

Similarly, a study among undergraduate students in Northwest Nigeria found high levels of antibiotic self-medication despite relatively good educational exposure and awareness of AMR [19]. Comparable findings have also been reported in studies from other LMICs, where higher educational attainment was associated with a greater likelihood of antibiotic self-medication because educated individuals often perceived themselves as having sufficient knowledge to manage common illnesses independently

[37]. However, the protective effect of excellent antimicrobial knowledge observed in this study suggests that accurate knowledge of antimicrobial use and resistance, rather than formal educational attainment alone, may be more important in promoting appropriate antimicrobial use behaviours and reinforces the importance of targeted antimicrobial stewardship education and public awareness interventions.

Overall, the findings of this study highlight major gaps in antimicrobial stewardship implementation and regulation of antimicrobial access in Nigeria. The combination of widespread non-prescription antimicrobial access, inappropriate use of broad-spectrum antimicrobial agents, healthcare-system barriers, and persistent knowledge and behavioural gaps creates an environment that may accelerate AMR development within the community. Strengthening antimicrobial stewardship in Nigeria will require a multi-sectoral approach involving stricter regulation of antimicrobial sales, improved public education, strengthened pharmacy oversight, expanded diagnostic capacity, and healthcare-system reforms aimed at improving access to timely and affordable healthcare services.

LIMITATION OF THE STUDY

This study has some limitations. First, the cross-sectional design limits the ability to establish causal relationships between identified factors and antimicrobial self-medication practices. Second, the study relied on self-reported information, which may be subject to recall bias and reporting bias, particularly regarding past antimicrobial use and self-medication practices. Social desirability bias may also have

occurred, as some respondents may have underreported inappropriate antimicrobial use because of perceived expectations from healthcare workers or researchers.

In addition, the study was conducted in a single tertiary healthcare facility; therefore, the findings may not be fully generalizable to the wider community or other healthcare settings in Nigeria. Nevertheless, the study provides important facility-based evidence regarding antimicrobial self-medication and its implications for antimicrobial stewardship and resistance control in South-East Nigeria.

CONCLUSION

This study demonstrated a very high prevalence of antimicrobial self-medication among outpatients attending a tertiary hospital in South-East Nigeria, with pharmacies and patent medicine vendors serving as major sources of antimicrobial agents. Broad-spectrum antibiotics and antimalarial agents were commonly used without prescription, often for symptoms suggestive of self-limiting or potentially viral illnesses. Despite generally good overall knowledge regarding antimicrobial use and resistance, important misconceptions and inappropriate attitudes persisted. Long waiting times, financial barriers, and other healthcare-system challenges were major drivers of self-medication practices.

These findings highlight important gaps in antimicrobial stewardship implementation and regulation of antimicrobial access in Nigeria. Strengthening enforcement of prescription-only antimicrobial policies, improving regulation of pharmacies and patent medicine vendors, expanding public antimicrobial stewardship education, and addressing healthcare-system barriers are essential to reducing inappropriate antimicrobial use and mitigating AMR. The protective effect of excellent antimicrobial knowledge further underscores the importance of sustained public awareness and behavioural change interventions.
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Declarations

Ethics Approval

Ethical approval for this study was obtained from the Health Research Ethics Committee of the Alex Ekwueme Federal University Teaching Hospital, Abakaliki (AEFUTHA), Nigeria (Approval Number: AEFUTHA/REC/VOL 3/2026/631). The study was conducted in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from all participants before enrolment in the study.

Competing Interests

The authors declare that they have no competing interests.

Consent for Publication:

Not applicable

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Author Contribution

CKO conceived and designed the study, supervised data collection, performed the statistical analysis, interpreted the data, and drafted the manuscript. KCO, KCO, and DCO contributed to study design, data collection, data interpretation, and critical revision of the manuscript. OUO contributed to study design, manuscript review, and intellectual content. All authors read and approved of the final manuscript.

Data Availability

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

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Figures

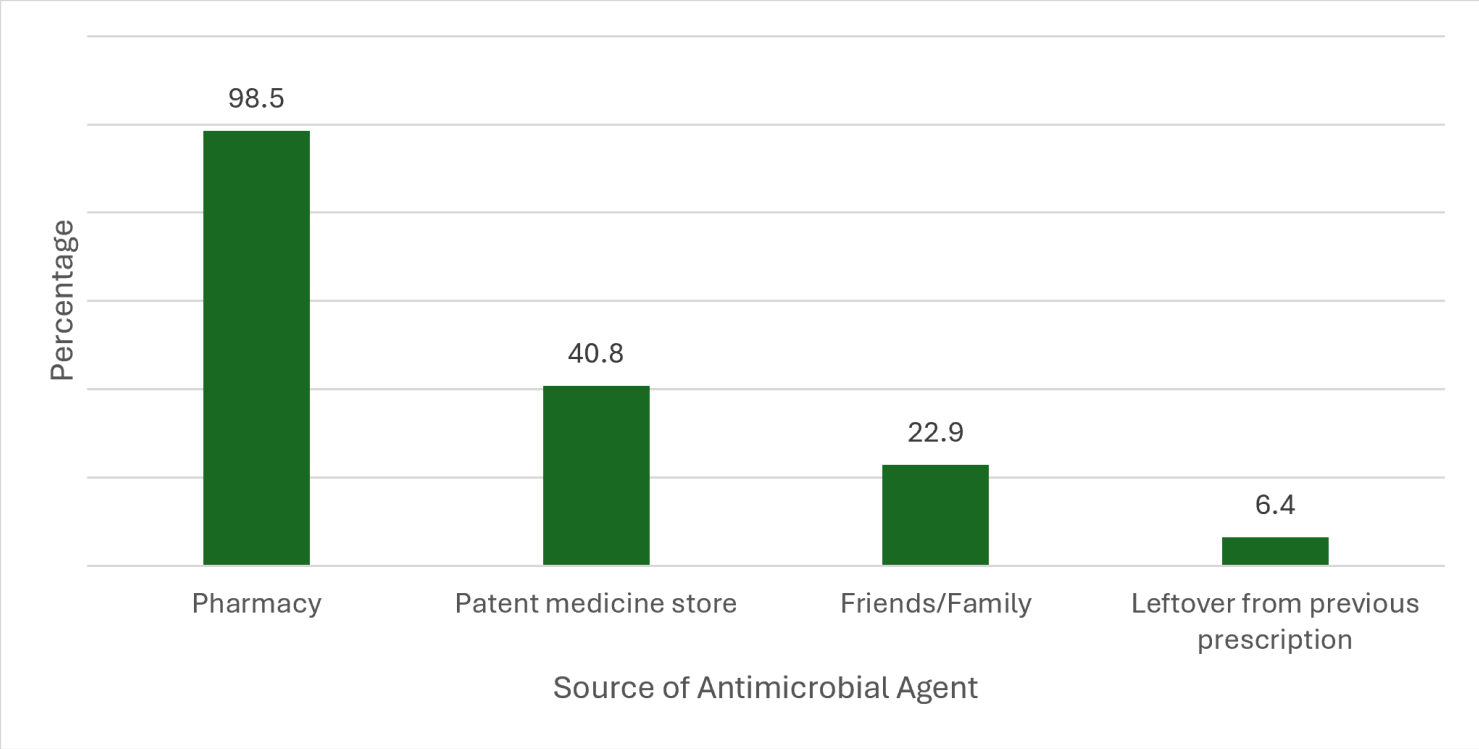


Figure 1

Sources of Antimicrobial Agents Used During Self-Medication Among Outpatients at Alex Ekwueme Federal University Teaching Hospital, Abakaliki, Nigeria (n=407)

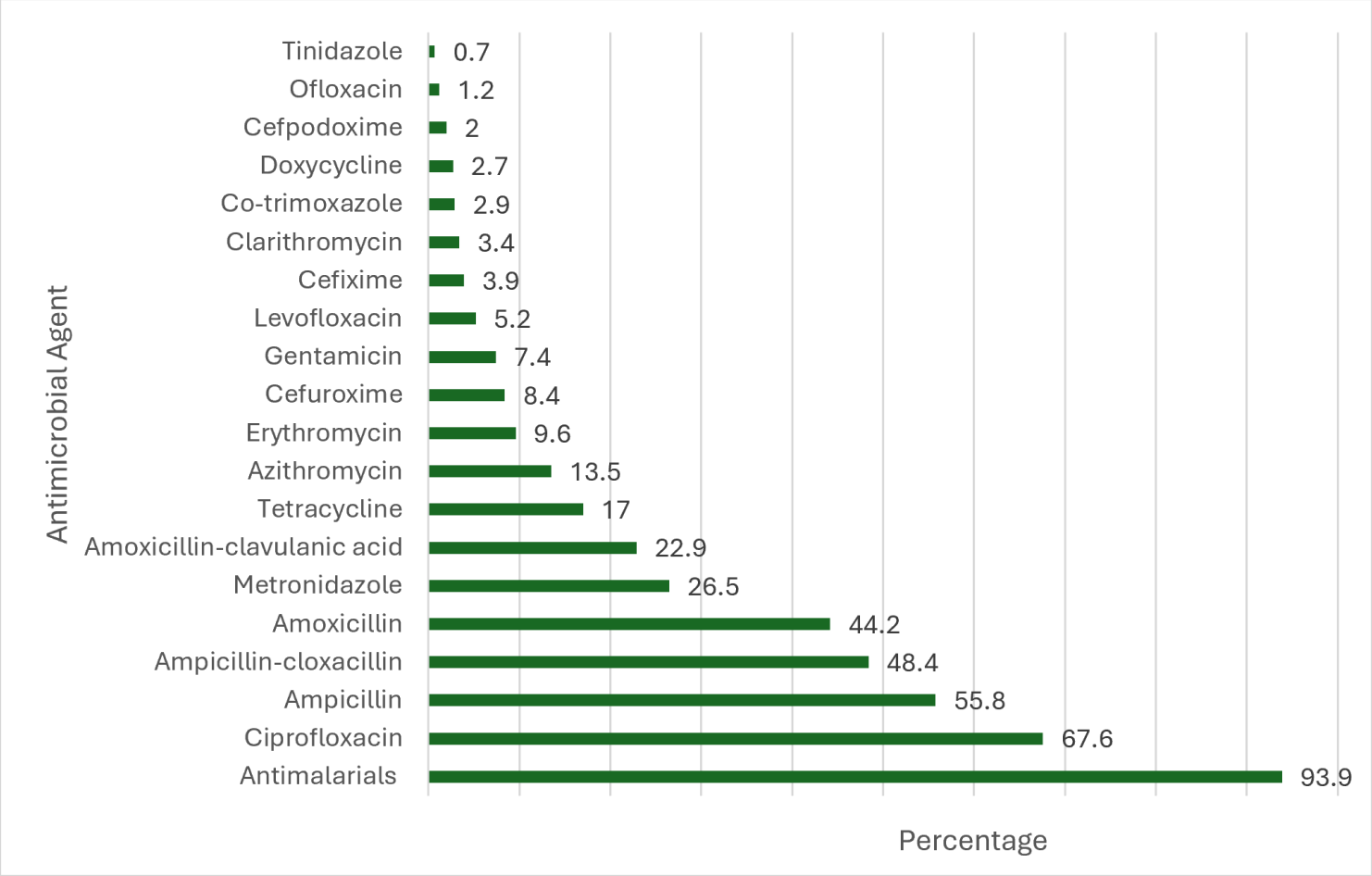


Figure 2

Antimicrobial Agents Used During Self-Medication Among Outpatients at Alex Ekwueme Federal University Teaching Hospital, Abakaliki, Nigeria (n=407; multiple responses were allowed)

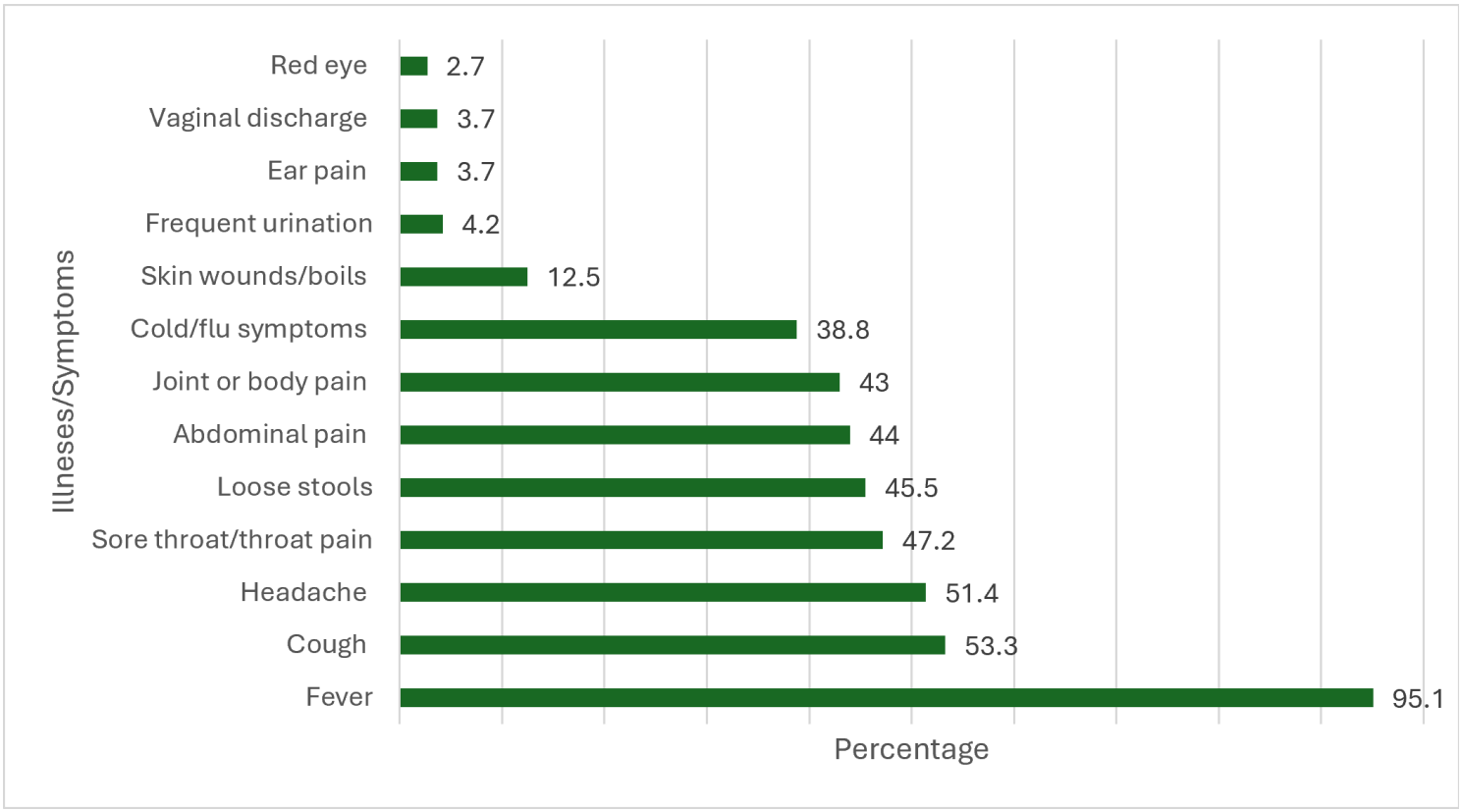


Figure 3

Illnesses and Symptoms Commonly Treated by Antimicrobial Self-Medication Among Outpatients at Alex Ekwueme Federal University Teaching Hospital Abakaliki, Nigeria (n=407; multiple responses were allowed)

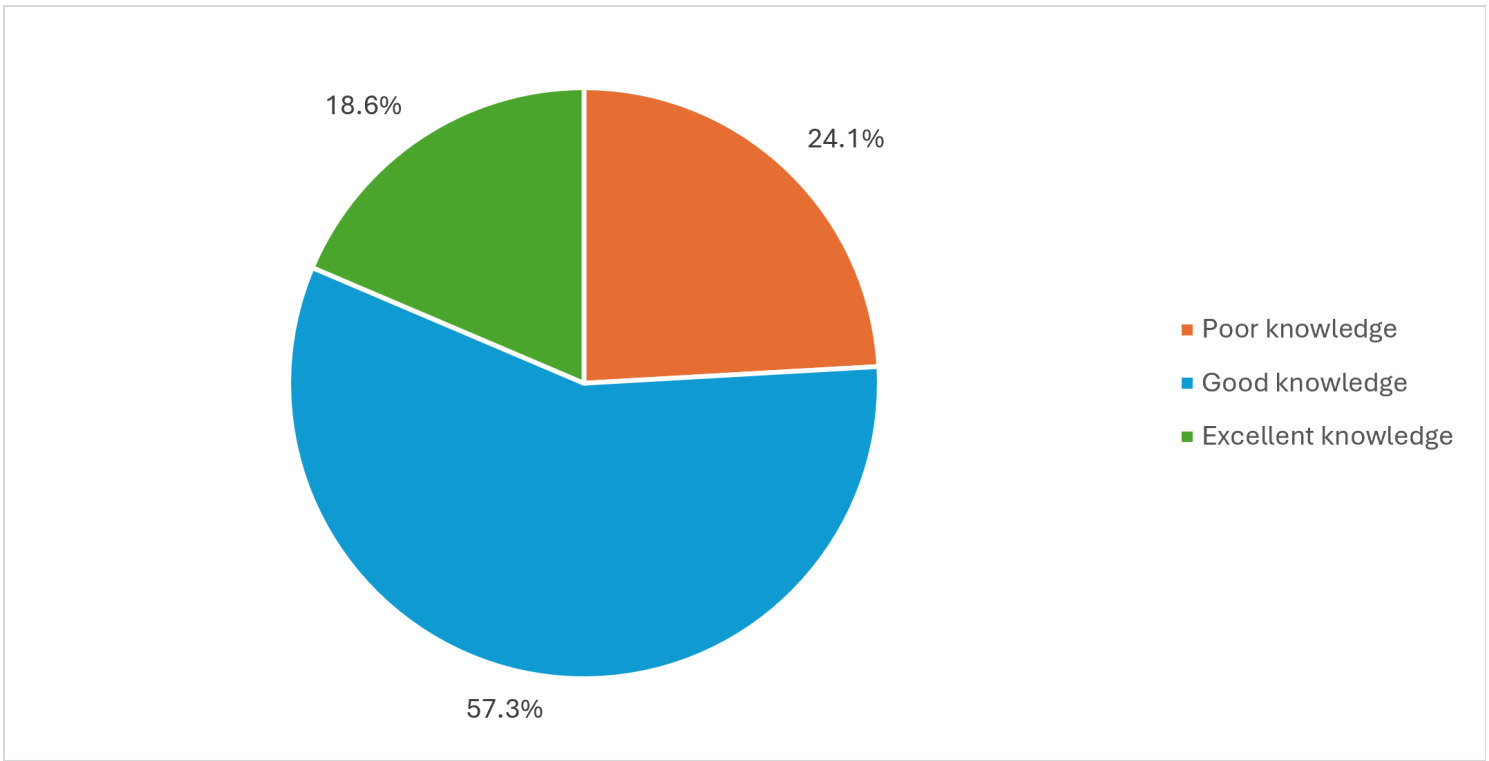


Figure 4

Overall Knowledge Level on Antimicrobial Use, Misuse, and Resistance Among Outpatients at Alex Ekwueme Federal University Teaching Hospital, Abakaliki, Nigeria