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Original Research Article

Prevalence and pattern of self-medication with antibiotics among residents of Abia State, Southeastern Nigeria: a call for action

Chidinma I. Amuzie*, Ugochukwu U. Onyeonoro, Uche N. Nwamoh, Andrew Ukegbu, Kalu U. Kalu, Michael O. Izuka

Department of Community Medicine, Federal Medical Centre, Umuahia, Abia State, Nigeria

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***Correspondence:**
Dr. Chidinma I. Amuzie,
E-mail: ihuoma1712@yahoo.com

ABSTRACT

Background: Antibiotic self-medication occurs worldwide, and it is a major driver of antibiotic misuse and antimicrobial resistance. In developing countries like Nigeria, antibiotics are frequently sold as over-the-counter medications. There is a need to explore this pattern, aiding stakeholders in informed decision-making. We assessed the prevalence and pattern of antibiotic self-medication among the residents of Abia State.
Methods: A cross-sectional study was conducted among eligible adults in the State with respondents selected using the multistage sampling technique. An interviewer-administered questionnaire was used to obtain information from the respondents. Data analysis was done using SPSS version 26 and the level of significance was set at 5%.
Results: A total of 1,491 respondents were surveyed. The mean age was 34.7±13.1 years and females constituted 55.7%. The overall prevalence of antibiotic self-medication was 46.5% (95%CI: 43.9-49.1). The majority of the respondents took self-medication for cough (48.6%) and ampicillin/cloxacillin was the major antibiotic used (30.1%). The reason for antibiotic self-medication mostly reported was the perception of minor illness (62.7%). Most (52.4%) of the respondents got the antibiotics from pharmacies without prescriptions. The predictors of antibiotic self-medication included residence (aOR=2.44, 95% CI: 1.12-5.30), retention of previous prescriptions (aOR=10.98, 95% CI: 4.40-27.47), storage of leftover antibiotics (aOR=4.13, 95% CI: 1.79-9.54) and perceived susceptibility of antibiotic self-medication (aOR=4.96, 95% CI: 1.71-14.39).
Conclusions: Close to half of the residents practiced antibiotic self-medication with its pattern identified. We recommend tailored strategies including appropriate health education and enforcement of regulatory policies to promote community antibiotic stewardship.

Keywords: Antibiotic, Antimicrobial resistance, General population, Nigeria, Prescriptions, Prevalence, Self-medication

INTRODUCTION

World Health Organization (WHO) defined self-medication as the selection and use of medicine by individuals to treat self-recognized symptoms or illnesses. Antibiotic self-medication (ASM) occurs all over the world, contributing to antibiotic misuse and antimicrobial resistance (AMR).[1] In low- to middle-income countries (LMICs) like Nigeria, antibiotics are frequently sold as over-the-counter (OTC) medications.[2] It is known that suboptimal regulatory systems account for the availability of antibiotics as over-the-counter drugs.[3] Furthermore, the lax regulation proliferates the existence of fake drugs which are eventually available for the end users.[2]

Antibiotic self-medication is one of the direct pathways to AMR, a known global health problem of public health importance, and rates as one of the top 10 global health

threats.[4] This accounts for the elevated risk of failure to treat bacterial infections which are usually communicable diseases in origin.[5] The propagation of antibiotic-resistant bacteria increases the burden of community-acquired infections. Globally, the misuse of antibiotics poses a serious risk to infectious disease control and public health.[1] ASM has been associated with adverse drug reactions due to overuse of antibiotics and dependence.[6] Additionally, it has also been predicted that the adverse effects due to drug resistance could account for an additional ten million deaths per annum by the year 2050 if no panacea is instituted.[5]

Furthermore, ASM contributes to the impediments in seeking health care which increases the disease burden and deaths accrued from antibacterial resistance infections.[7] Some infections have been left untreatable with the existing antimicrobials due to the rising trend of AMR.[8] Antibiotic resistance provides the window for persistence in the recurrence of infections, with frequent hospital visits and longer stays on admission due to missed, delayed, or wrong diagnosis and incorrect management of an infectious disease.[2] Consequently, global projections suggest that AMR could affect the Sustainable Development Goals (SDGs), driving an estimated 24 million people into extreme poverty and exacerbating global economic inequality by 2030.[9]

Several determinants of ASM have been documented, such as sociodemographic factors, socioeconomic, health service-related factors, and health-seeking behaviour patterns.[10,11] This study would provide the baseline data for subsequent monitoring and evaluation of strategies geared towards the control of ASM in the State. Additionally, there is paucity of data in Nigeria on the use of Health Belief Model (HBM) to assess the health-related behaviours of people to ASM. This current study adapted the HBM to further understand the perception of the study respondents on the risks of ASM. We, therefore, assessed the prevalence and pattern of antibiotic self-medication among the residents of Abia State.

METHODS

Study design and setting

This was a descriptive cross-sectional study conducted from April to May 2023 in the selected Local Government Areas (LGAs) of Abia State. Abia State is one of the States in the southeastern geopolitical zone of Nigeria. There are seventeen LGAs and three senatorial zones in the state. The 2023 projected total population for the State was 4,457,560. There are many wholesale and retail pharmacies predominantly in the urban and semi-urban LGAs. In addition, many outlets of patent medicine stores abound across the LGAs in the State. The access to formal health services is poor in the state. The professional body, Pharmacy Council of Nigeria (PCN) has a regulatory committee in the state with the mandate to oversee the enforcement of stipulated policies against drug abuse and misuse.

Study population

These were adults at least 18 years of age residing in Abia state. The inclusion criteria included being a resident in the study area (who had at least lived for 6 months before the survey). Respondents who were healthcare workers or in a profession related to medicine and those with severe illnesses that could interfere with the interviewing process were excluded.

Sample size determination

Estimation of sample size was done using the sample size formula, $N=(Z\alpha+Z\beta)^2pq/d^2$ for descriptive cross-sectional studies. N is the sample size, Zα and Zβ are the standard normal deviates for the level of significance and power of a study respectively. The 'p' represents the prevalence of Self-medication with antibiotics (55.3%) from a previous study in Ethiopia.[12] This was manually computed, and a minimum sample size of 1,454 was determined at a confidence level of 95%, a non-response rate of 20%, a power of 80%, and a design effect of 2.0.

Sampling technique

A total of 1,491 respondents were interviewed over a two-month period. A multistage sampling technique was used to recruit the respondents into the study. In the first stage, the LGAs were listed and stratified by the Senatorial Zones. Using simple random sampling, two LGAs were selected from each of the Senatorial Zones. Stage two, all the wards in each of the LGA sampled in the first stage were listed and 2 wards were selected in each LGA, using a simple random sampling technique. This gave a total of 12 wards that were used for this study. In stage three, two enumeration areas (EAs), were selected from the list of EAs in each selected ward, by simple random sampling, giving a total of 24 EAs. These EAs served as clusters. the list of households in each cluster was obtained, updated, and enumerated. The sampling was proportionate to the total number of households in each EA. The random number list was generated using OpenEpi software. In each household, one eligible respondent was selected for the study, in cases where more than one eligible respondent existed, simple random sampling was used to select one of them. These processes were repeated until the required sample size was attained for each EA.

Operational definitions

Antibiotic self-medication: is defined as the intake of antibiotics to treat self-diagnosed health conditions without consulting a qualified health care professional (HCP) and without any medical supervision.

Pattern of antibiotics self-medication: The processes of how respondents requested and obtained antibiotics for self-medication, to use without a written prescription from a qualified HCP.

Data collection tool and methods

A pre-tested, semi-structured interviewer-administered questionnaire was used. The questionnaire for this study was adapted from similar studies.[13,14] It was validated using the face and content validity techniques by 2 research experts in the Department of Community Medicine, Federal Medical Centre Umuahia, Abia State. Cronbach's alpha (α) was applied to measure the internal consistency and reliability of the questionnaire. The overall Cronbach's alpha index was 0.90. The questionnaire had four sections, Section A contains the sociodemographic characteristics of the respondents, such as age, sex, educational level, marital status, religion, denomination, occupation, and average monthly income. Section B contained questions to determine the awareness, prevalence of ASM, knowledge of antibiotics and antibiotic resistance. Section C addressed questions that focused on previous experiences with antibiotic self-medication such as symptoms resulting in self-medication, antibiotics frequently used, reasons for self-medicating, source of information and source of drugs. Section D constituted questions on the HBM model, behavioural and health service-related factors. The HBM had five domains. The HBM-derived items were used to measure the respondents' perceptions of ASM and the use of prescribed-only antibiotics. For this study, the domains were defined as follows:

Perceived susceptibility: This refers to a person's subjective perception of the risk of engaging in antibiotic self-medication.

Perceived severity: This refers to a person's feelings about the seriousness of engaging in antibiotic self-medication.

Perceived benefits: This refers to a person's perception of the effectiveness of using prescription-only antibiotics.

Perceived barriers: This refers to a person's perception of the barriers to using prescription-only antibiotics.

Self-efficacy: This refers to the level of a person's confidence in his or her ability to successfully disengage from ASM and adopt the use of prescription-only antibiotics.

A pretest was done in Aba South LGA (a non-sampled LGA) using 5% of the sample questionnaires. The result of the pretest was used to improve the clarity and wording of the questionnaire and the logical sequence of the questions.

A total of twelve research assistants were recruited for this study and they administered the questionnaires to the respondents. The research assistants were trained by the principal investigator on the ethics and interviewing process of the research. The estimated time for an interview section was twenty minutes.

Measurement of variables: The dependent variable was Antibiotic self-medication. This variable was measured using the question; 'Before this survey, have you taken antibiotics in the last six months without a prescriber's prescription'? A score of 1 was given to 'yes' and 0 to 'no'. The independent variables included socio-demographic/economic factors, knowledge of antibiotic resistance, experiences with self-medication, health-seeking behavioural factors, perceptions of ASM (Health Belief Model) and health service-related factors.

A total of ten questions were used to assess the level of knowledge of antibiotics and antibiotic resistance. A correct response was scored '1' and an incorrect question was scored '0' giving the total minimal and maximal scores as 0 and 10 points respectively. Scores above the average point were categorized as 'high knowledge' and scores below the average were categorized as 'low knowledge'.

The responses to the HBM were rated on a Likert scale that included 'strongly disagree', 'disagree', 'uncertain', 'agree' and 'strongly agree', scoring 1 to 5 respectively. The minimal and maximal total scores differed for each domain and the average score served as the cutoff value for the recoding of the variable into high and low categories.

Statistical analysis

Data coding, entry, cleaning, and analysis were done using the IBM SPSS version 26 statistical program for Windows. Frequency tables and proportions were generated. Binary logistic regression was used to test for associations between the independent variables and antibiotic self-medication. P values <0.05 were considered significant. Multivariable logistic regression was used to determine the independent predictors of antibiotic self-medication. Factors that fit into the regression model were those with P values <0.2 at the level of bivariate analysis. The adjusted odds ratios and 95% confidence intervals were obtained at a significance level of 5%.

Approval for this study was obtained from the Ethics and Research Committee of the Federal Medical Centre, Umuahia. Respondents' privacy and confidentiality were maintained. Data security was assured by storing the data on a passworded computer only accessible to the principal investigator.

RESULTS

The mean age of the respondents was 34.7±13.1 years with 18-29 years being the predominant age group.

Females constituted 55.7% with more respondents living in urban areas 864 (57.9%). A greater proportion of the respondents had attained tertiary education 819 (54.9%) and were married 730 (49.0%). Almost all were Christians 1,418 (95.1%). A greater proportion of the respondents were unskilled workers (40%) with the prevalent monthly income category (50.7%) of <₦ 50,000. The prevalence of ASM was 46.5% (95%CI: 43.9-49.1) among all the respondents with 267 (17.9%) of the respondents having experienced adverse drug reactions (ADR) following ASM. Among these respondents, only 57 (21.3%) of respondents had major ADR requiring hospitalizations (Table 1).

The urban residents were more likely to engage in ASM compared to the rural residents (OR = 1.41, 95% CI:1.15-1.73). skilled (OR= 0.52, 95% CI: 0.33-0.81) and unskilled workers (OR= 0.64, 95% CI: 0.419-0.98) were 48% and 36% less likely to engage in ASM compared to the unemployed workers respectively. Similarly, respondents in the <₦ 50,000 (OR= 0.58, 95% CI: 0.38 - 0.89) and ₦50,000-100,000 (OR= 0.50, 95% CI:0.31-0.79) income categories were less likely to practice ASM compared to respondents with no income (Table 2).

Respondents who practice the storage of leftover antibiotics (OR = 4.72, 95% CI: 3.68-6.07) and the retention of previous prescriptions (OR = 6.98, 95% CI: 5.34-9.13) had higher odds of ASM compared to their counterparts. For the HBM model, respondents with high perceived susceptibility to ASM (OR=2.19, 95% CI:1.65-2.90) and high perceived barriers to accessing prescribed antibiotics (OR= 1.69, 95% CI:1.33-2.14) were more likely to indulge in ASM. However, respondents with high perceived self-efficacy to the uptake of prescribed antibiotics were 48% less likely to engage in ASM. (OR= 0.52, 95% CI: 0.36-0.76). Respondents who said that antibiotics were regularly non-available in the health facilities also had higher odds of ASM. (OR= 1.35, 95% CI: 1.06-1.72) (Table 3).

The multivariate logistic model identified residence (aOR= 2.44, 95% CI: 1.12-5.30), retention of previous prescriptions for future use (aOR= 10.98, 95% CI: 4.40 - 27.47), storage of leftover antibiotics (aOR= 4.13, 95% CI: 1.79-9.54) and perceived susceptibility of ASM (aOR= 4.96, 95% CI: 1.71-14.39) as the independent predictors of ASM among the respondents in this study (Table 4).

The most common self-reported illness for practicing ASM was cough (48.6%) followed by typhoid fever (41.0%) (Figure 1).

The main reported reason for practicing antibiotic self-medication was the perception of mild illness (62.7%) and easy access to antibiotics (49.9%) (Figure 2).

Table 1: Socio-demographic characteristics of respondents in Abia State (n=1491).

Variables	Frequency	Percentage (%)
Age (years)		
18-29	612	41.0
30-39	449	30.1
40+	430	28.8
Mean±SD	34.7±13.1	
Sex		
Female	830	55.7
Male	661	44.3
Residence		
Rural	627	42.1
Urban	864	57.9
Educational status		
No formal education	57	3.8
Primary	98	6.6
Secondary	517	34.7
Tertiary	819	54.9
Marital status (n=1490)		
Single	639	42.9
married	730	49.0
Separated	42	2.8
Others	20	1.3
Widowed	59	4.0
Religion		
Christianity	1418	95.1
Islam	23	1.5
Africa traditional	32	2.1
Others	18	1.2
Denomination (n=1418)		
Catholic	601	42.4
Orthodox	211	14.9
Pentecostal	539	38.0
Others	67	4.7
Occupational status (n=1456)		
Skilled	402	27.0
Self-employed	349	23.4
Unskilled	597	40.0
Not employed	108	7.2
Average monthly income (Naira ₦) (n=883)		
<50,000	448	50.7
50,000-100,000	255	28.9
>100,000	72	8.2
No income	108	12.2

The most prevalent antibiotic used for self-medication (SM) was ampicillin/cloxacillin (30.1%), this was followed by amoxicillin (25.2%) and the least used was cefixime (4.2%) (Figure 3).

The most common source of antibiotics without prescription was the pharmacies (52.4%) (Figure 4).

Table 2: Socio-demographic factors associated with antibiotic self-medication.

Variable	Antibiotic self-medication		COR (95%CI)	*P value
	Yes N (%)	No N (%)		
Residence				
Urban	433 (50.1)	431 (49.9)	1.41 (1.15 – 1.73)	0.001
Rural	261 (41.6)	366 (58.4)	1	
Age (years)				
18-29	263 (43.0)	349 (57.0)	1.15 (0.90-1.48)	0.258
30-39	231 (51.4)	218 (48.6)	0.82 (0.63- 1.07)	0.144
>40	200 (46.5)	230 953.5)	1	
Sex				
Female	400 (48.2)	430 (51.8)	1.16 (0.95-1.43)	0.153
Male	294 (44.5)	367 (55.5)	1	
Educational status				
Below tertiary	310 (46.1)	362 (53.9)	0.97 (0.79-1.19)	0.771
Tertiary	384 (46.9)	435 (53.1)	1	
Marital status (1470)				
Single	273 (42.7)	366 (57.3)	1.08 (0.71-1.64)	0.730
Currently married	371 (50.8)	359 (49.2)	0.78 (0.51-1.18)	0.239
Widowed/separated	45 (44.6)	56 (55.4)	1	
Denomination (1351)				
Catholic	252 (41.9)	349 (58.1)	0.71 (0.57-0.88)	0.002
Non-Catholics	379 (50.5)	371 (49.5)	1	
Occupational status (n=1456)				
Skilled	213 (53.0)	189 (47.0)	0.52 (0.33-0.81)	0.004
Self-employed	143 (41.0)	206 (59.0)	0.85 (0.54-1.32)	0.466
Unskilled	286 (47.9)	311 (52.1)	0.64 (0.42-0.98)	0.038
Not employed	40 (37.0)	68 (63.0)	1	
Monthly income (Naira ₦)				
<50,000	228 (50.4)	222 (49.6)	0.58 (0.38-0.89)	0.013
50,000-100,000	138 (54.1)	117 (45.9)	0.50 (0.31-0.79)	0.003
>100,000	32 (44.4)	40 (55.6)	0.74 (0.40-1.35)	0.321
No income	40 (37.0)	68 (63.0)	1	

*Statistically significant

Table 3: Behavioural and health service-related factors associated with self-medication of antibiotics.

Variable	Antibiotic self-medication		COR (95%CI)	*P value
	Yes N (%)	No N (%)		
Knowledge of ASM				
Good	597 (48.1)	644 (51.9)	1.46 (1.11-1.93)	0.007
Poor	97 (38.8)	153 (61.2)	1	
Discontinue therapy with symptom regression (n=1304)				
Yes	413 (53.8)	355 (46.2)	1.67 (1.34-2.09)	<0.001
No	220 (41.0)	316 (59.0)	1	
Visit hospital for severe illness only (n=1315)				
Yes	356 (54.7)	295 (45.3)	1.60 (1.28-1.98)	<0.001
No	286 (43.1)	378 (56.9)	1	
Do not read antibiotic information handout (n=1309)				
Yes	429 (52.8)	384 (47.2)	1.47 (1.18-1.84)	0.001
No	214 (43.2)	282 (56.8)	1	
Encourage family member(s) to take non-prescribed antibiotic (n=1328)				
Yes	521 (53.6)	452 (46.4)	2.07 (1.61-2.66)	<0.001
No	127 (35.8)	228 (64.2)	1	
Perception of ASM (n=1316)				

Continued.

Variable	Antibiotic self-medication		COR (95%CI)	*P value
	Yes N (%)	No N (%)		
Not acceptable	190 (51.4)	180 (48.6)	0.72 (0.56-0.93)	0.011
Acceptable	175 (56.8)	133 (43.2)	0.58 (0.44-0.76)	<0.001
Good	275 (43.1)	363 (56.9)	1	
Storage of leftover Antibiotics (n=1343)				
Yes	337 (74.4)	116 (25.6)	4.72 (3.68-6.07)	<0.001
No	339 (38.1)	551 (61.9)	1	
Retention of previous prescriptions for future use (n=1339)				
Yes	352 (79.6)	90 (20.4)	6.98 (5.34-9.13)	<0.001
No	322 (35.9)	575 (64.1)	1	
Perceived susceptibility of ASM				
High	581 (50.7)	564 (49.3)	2.19 (1.65-2.90)	<0.001
Low	86 (32.0)	183 (68.0)	1	
Perceived severity of ASM				
High	64 (39.9)	95 (60.1)	0.73 (0.52-1.02)	0.054
Low	601 (48.0)	651 (52.0)	1	
Perceived benefits of prescribed antibiotics (n=1406)				
High	597 (47.3)	666 (52.7)	1.10 (0.78-1.57)	0.568
Low	64 (44.8)	79 (55.2)	1	
Perceived barriers to prescribed medications (n=1397)				
High	507 (50.6)	495 (49.4)	1.69 (1.33-2.14)	<0.001
Low	149 (37.7)	246 (62.3)	1	
Self-efficacy/ Cues to action (n=1394)				
High	45 (32.9)	92 (67.1)	0.52 (0.36-0.76)	0.001
low	609 (48.5)	648 (51.5)	1	
High cost of medical care compared to ASM				
Yes	412 (53.7)	355 (46.3)	1.87 (1.40-2.48)	<0.001
No	99 (38.4)	159 (61.6)	1	
Difficulty of geographical access to HFs				
Yes	332 (51.6)	311 (48.4)	1.55 (1.23-1.95)	<0.001
No	225 (40.8)	327 (59.2)	1	
Long waiting queues and undue protocol in HFs (n=1082)				
Yes	322 (49.0)	336 (51.0)	1.03 (0.81-1.32)	0.791
No	204 (48.1)	220 (51.9)	1	
Bad attitude of health workers to patients				
Agree	357 (46.7)	407 (53.3)	1.08 (0.83-1.39)	0.572
Disagree	154 (44.9)	189 (55.1)	1	
Regular non-availability of antibiotics in HFs				
Agree	248 (50.6)	242 (49.4)	1.35 (1.06-1.72)	0.014
Disagree	255 (43.2)	336 (56.8)	1	
Have no trust/confidence with the prescribers in HFs				
Yes	413 (48.7)	435 (51.3)	1.23 (0.84-1.80)	0.283
No	54 (43.5)	70 (56.5)	1	

*Statistically significant

Table 4: Predictors of ASM among all participants in Abia State.

Variables	AOR	(95%CI)	*P value
Age group (years)			
18-29	1.07	0.47-2.49	0.844
30-39	0.67	0.31-1.55	0.374
>40	1		
Sex			
Male	0.97	0.49-1.89	0.906
Female	1		

Continued.

Variables	AOR	(95%CI)	*P value
Residence			
Urban	2.44	1.12-5.30	0.025
Rural	1		
Denomination			
Catholic	0.73	0.37-1.41	0.339
Non-catholic	1		
Income (Naira)			
<50,000	0.47	0.16-1.44	0.187
50,000-100,000	0.46	0.14-1.50	0.200
>100,000	2.56	0.50-13.14	0.260
No income	1		
Storage of previous prescriptions for future use			
Yes	10.98	4.40-27.47	<0.001
No	1		
Discontinue therapy with symptom regression			
Yes	1.24	0.59-2.61	0.566
No	1		
Visit hospital for severe illness only			
Yes	1.51	0.70-3.28	0.295
No	1		
Encourage family member(s) to take non-prescribed antibiotic			
Yes	1.08	0.48-2.44	0.848
No	1		
Do not read antibiotic information handout			
Yes	1.22	0.60-2.45	0.587
No	1		
Perception of ASM			
Not acceptable	0.79	0.36-1.74	0.564
Acceptable	0.81	0.33-2.00	0.652
Good	1		
Storage of leftover Antibiotics			
Yes	4.13	1.79-9.54	0.001
No	1		
Perceived susceptibility of ASM			
High	4.96	1.71-14.39	0.003
Low	1		
Perceived severity of ASM			
High	0.59	0.20-1.74	0.340
Low	1		
Perceived barriers to prescribed medications			
High	1.42	0.62-3.25	0.403
Low	1		
Self-efficacy/cues to action			
High	0.60	0.19-1.83	0.365
Low	1		
Regular non-availability of antibiotics in HFs			
Agree	1.78	0.88-3.62	0.109
Disagree	1		
High cost of medical care compared to ASM			
Yes	1.02	0.44-2.36	0.967
No	1		
Difficulty of geographical access to HFs			
Yes	1.20	0.54-2.69	0.651
No	1		

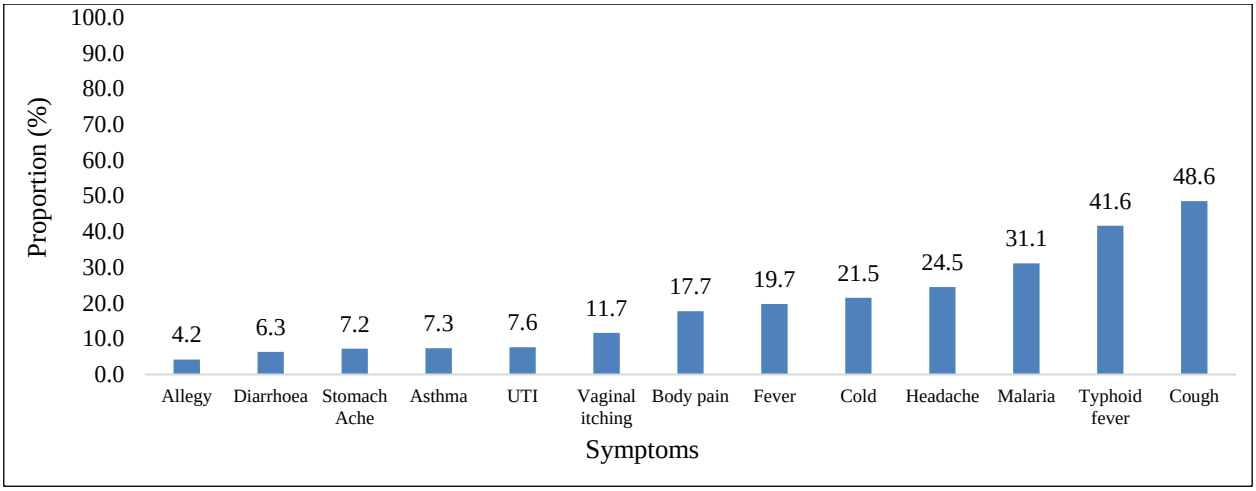

Figure 1: Symptoms and illness for antibiotic self-medication among respondents in Abia State (n=694).

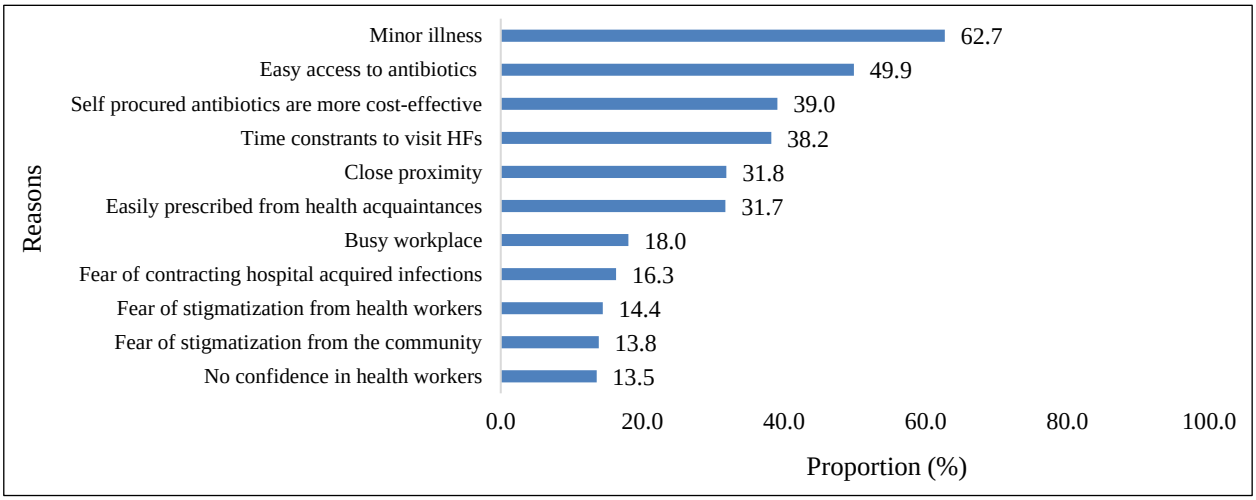

Figure 2: Reported reasons for practicing antibiotic self-medication among the respondents (n=694).

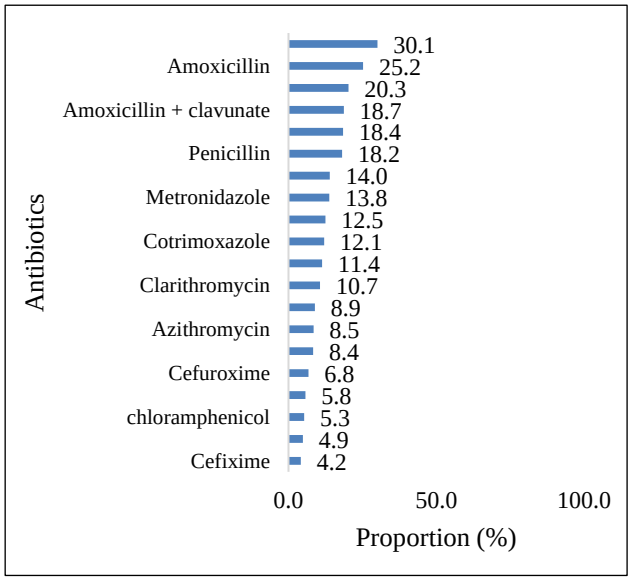

Figure 3: Antibiotics used for self-medication among respondents in Abia State (n=694).

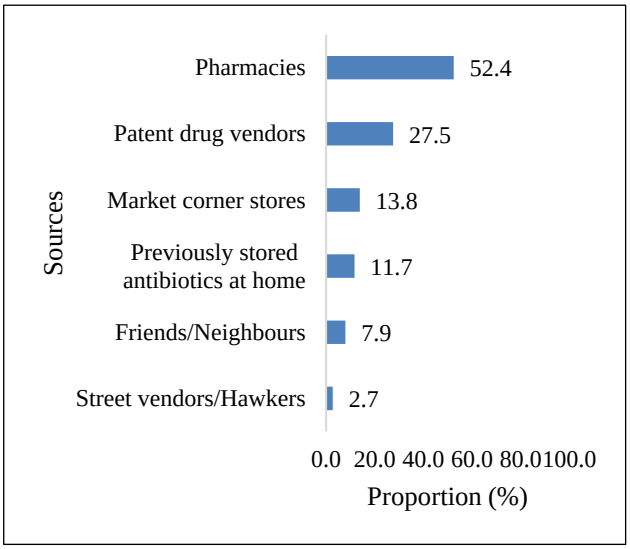

Figure 4: Sources of antibiotics used for self-medication among the respondents in Abia State (n=694).

DISCUSSION

This study was carried out to assess the prevalence and the pattern of ASM among the residents of Abia State. This study showed that close to half of the residents had practiced ASM with identifiable pattern and predictors.

The prevalence of ASM was moderately high. This is similar to studies in Pakistan (47.6%).[15] A recent study in Ghana reported a rate of 36% which is lower than the result of this study.[16] However, higher rates have been documented in previous Nigeria studies (93.9%, 63.3%).[17,18] The trend in reduction could be in part due to the successful implementation of interventions over the years. Also, variations in these figures could be due to different periods of recall that were used and probably due to variances in the population type studied.

The most prevalent illness was cough. This resonates with the findings of previous studies in Nigeria and Tanzania.[18-20] In contrast to the findings of this study, malaria has been cited as the most occurring illness eliciting the use of non-prescribed antibiotics.[21,22] Cough is a major symptom of respiratory tract infections, of which most are viral and would not respond to antibiotics. Cough is generally perceived as a mild illness, and this can lead to self-medication based on assumptions. The use of antibiotics as a catch-all remedy for many symptoms including cough is harmful and can lead to antibiotic resistance in the future. Awareness campaigns on changing their belief and thoughts on ASM, with the adoption of healthier living to avoid illness are of importance.

The predominant reason for ASM was the perception of minor illness followed by easy access to antibiotics. This is concurrent with previous studies conducted in Nigeria, Ethiopia and in the Asian region.[17,18,23,24] An individual's perception of illness affects his/her health-seeking behaviour.[25] Unfortunately, the users hardly read the drug pamphlet for instructions and the pharmacies do not counsel them on the risks of SM.[25] This also portrays the laxity of the regulation processes of antibiotic accessibility in Nigeria. The desire for immediate relief from symptoms and difficulty in accessing healthcare services may in part contribute to this burden.

The commonest antibiotic used for ASM in this study was ampicillin/cloxacillin followed by amoxicillin, both in the beta-lactam antibiotics group. This finding is consistent with other studies that reported that ampicillin/cloxacillin was the commonly used antibiotic for ASM.[21,26] However, it differs from the result of a study in Pakistan, where the ampicillin/cloxacillin combination was the least used.[27] Ampicillin/cloxacillin is commonly used due to its broad-spectrum activity against a wide range of bacterial infections. The beta-lactam group of antibiotics is also preferred because of their low cost, availability, widely known due to their long existence and they are well prescribed by healthcare workers.[17] The use of antibiotics should be evidence-based to prevent antibiotic resistance, inadequate treatment and masking of symptoms of more serious conditions.

This study observed that pharmacies were the most common source of antibiotics. These results are congruent with findings in Nigeria and other African countries where pharmacies were the most common source of antibiotics.[28,29,5,10] This finding is also concurrent to the finding in a systematic review conducted in six LMICs.[30] However, this is in contrast to previous studies in Northern and Southern Nigeria where the patent medicine stores were the commonest sources of antibiotics purchased without prescription.[13,31] In LMICs including Nigeria, the population has access to antibiotics in the form of OTC drugs.[30] This also reflects the quality of the healthcare system in Nigeria. Hence, there is a need to create new intervention strategies targeting the supply and demand perspectives to reduce these poor habits linked to ASM.

Residence was a predictor in this study, with urban participants more likely to be involved in ASM compared to rural participants. This is comparable to the findings of studies in Pakistan and Sri Lanka where urban and semi-urban dwellers had higher odds of ASM.[32,33] Urban areas often have a higher density of pharmacies and drugstores. This accessibility makes it easier for individuals to obtain OTC medications without a prescription. Additionally, urban dwellers may perceive self-medication as a quicker alternative for managing common health issues. They have easy internet access, empowering them to diagnose and treat their ailments without doctors' prescription.

Participants with high perceptions of the susceptibility of engaging in ASM, were more likely to engage in self-medication with antibiotics. This has been documented in similar studies.[34,35] In a study done in China other domains of the HBM model such as perceived barriers and perceived threats were found to be associated with ASM.[36] Perceived susceptibility is concerned with the belief about the probability of contracting a disease.[37] Individuals susceptible to illness may recognize the symptoms of the disease and believe that it can be based on their previous experiences. Also, factors such as distrust, fear and lack of confidence may contribute to avoidance in seeking professional help. It's advisable for individuals, especially those susceptible to illness, to consult with healthcare professionals for proper diagnosis and guidance on treatment options.

In this study, those who stored antibiotics for future use had higher odds of engaging in ASM. This is similar to the results of studies where participants who stored antibiotics for re-use were likely engaged in ASM.[34] People who purchase drugs through out-of-pocket (OOP) mechanisms are likely to have saved and stored medications including antibiotics, to avoid future expenses.[38] Leftover antibiotics are the consequences of not adhering to the regimen prescribed or having

prescribed medications exceeding the required doses.[39] Repeated treatment with antibiotic course results in the emergence of resistant strains. Additionally, leftover antibiotics can be stored inappropriately, reducing the drug's potency.[11] There is also a propensity to share or lend to family members and neighbours, encouraging self-medication practices.

Participants who had retained previous prescriptions were likely to have self-medicated with antibiotics. It is known that previous prescriptions contribute hugely to the sources of self-medication with antibiotics.[40] Some individuals may choose to self-medicate with previously prescribed medications to avoid the expenses associated with a new doctor's visit and obtaining a new prescription. Additionally, individuals who have been prescribed a medication in the past may become familiar with its effects and may believe they can use it safely without consulting a healthcare professional.

Key limitation of this study is this that we relied solely on self-reported responses and was prone to self-reported and recall bias. To mitigate this, recall time was shortened to six months and picture labels of various antibiotics were displayed to respondents during the interview. Also, this was a cross-sectional study, so temporality could not be ascertained. Nevertheless, the sample was representative of the general population aiding the generalizability of findings. Furthermore, the HBM provided insights into the perception of their health-seeking behaviours.

CONCLUSION

In this current study, ASM practice was moderately high among the residents. Cough and typhoid fever were the most reported symptom/illness for ASM practice. The predominant reason for ASM was the perception of minor illness followed by easy access to antibiotics. Amoxicillin/cloxacillin was the most common antibiotic used and the most prevalent source was the pharmacies without prescription. The predictors included the residence, having leftover antibiotics, retention of previous prescriptions and perceived susceptibility.

Recommendations

We recommend that stakeholders in the Ministry of Health, supporting partners and the regulating bodies conduct public awareness campaigns on the risks of ASM, intensify health educational strategies geared towards improving antibiotic stewardship in the communities and raise awareness of the dangers of ASM. Additionally, we suggest the practice of adherence counseling to clients while dispensing antibiotics and ensuring that the quantity dispensed corresponds to that prescribed. There is also a need to strengthen drug procurement regulatory policies through professional bodies such as PCN and Patent and Proprietary Medicine Vendors (PPMVs) to discourage easy accessibility to self-medicated antibiotics.

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