ORIGINAL RESEARCH

Assessing Knowledge about Antibiotic Resistance and the Prevalence of Self-Medication with Antibiotics among Community Pharmacy Clients in Lagos State.

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ABSTRACT

Background: Knowledgeable self-medication has its advantages, however, without adequate information, it can be dangerous and harmful. Self-medication with antibiotics (SMA) is common in Nigeria and has led to increased cases of drug resistance, threatening the future relevance of antibiotics.
Objectives: To determine the prevalence of SMA among walk-in patients in pharmacies in Lagos state, assessing their level of knowledge about antibiotics, antibiotic resistance, and conditions for use.
Methods: The research involved three community pharmacies in Ikeja, Apapa, and Agege areas of Lagos representing high, medium, and low-income areas, respectively. Willing participants above 15 years of age were administered a questionnaire with questions aimed at assessing how often they engage in SMA and their familiarity with factors causing antibiotic resistance. Data collected was analyzed using descriptive statistics and results were presented in tables. Chi-square was used to determine levels of association between variables with P-values significant at < 0.05 at 95% confidence interval.
Results: Among the respondents, 35.1% indulged in SMA while 64.5% purchased their antibiotic medications through a healthcare professional's recommendation. Over two-thirds of the respondents had basic knowledge of antibiotic use with a similar fraction being familiar with the existence of antibiotic resistance and factors that contribute to its development.
Conclusion: A majority of the respondents were knowledgeable regarding antibiotic use and factors that could lead to antibiotic resistance however, many of them still practiced self-medication with antibiotics. Health promotional activities are encouraged for further enlightenment of the public so as to reduce the widespread prevalence of this challenge.

Keywords: Self-medication with antibiotics; Healthcare professionals (HCPs); Community pharmacies; Knowledge and Practice; Antibiotics use and misuse; Antibiotic resistance

INTRODUCTION

Antibiotics are drugs employed in managing and treating bacterial infections and are obtained from natural sources or synthetic sources[1]. As cost-effective interventions, they have been used successfully for many years making the management of infectious diseases easier thereby decreasing morbidity and mortality[2] but as their success grew, so

also came the associated challenge of resistance (antibiotic resistance). Antimicrobial resistance occurs when bacteria, viruses, fungi, and parasites change over time and no longer respond to medicines making infections hard to treat and increasing the risk of disease spread, severe illness, and death[3]. The development of antimicrobial resistance (AMR) recorded both in the hospital and community settings[3-5] has rendered ineffective some standard treatments with antimicrobials, complicating patient management and increasing patient morbidity and mortality[6,7].

Globally, antimicrobial drug resistance causes an estimated 700,000 deaths each year. If current trends continue, it is projected that, by 2050, AMR could result in over 10 million deaths per year and over 100 trillion USD in lost output globally[5]. Part of the activities of the Global Action Plan (GAP) to tackle the growing challenge of antimicrobial resistance is to improve global awareness and understanding of AMR through effective communication, education, and training[8].

Regarding antibiotics, the World Health Organization (WHO) coordinated a global campaign to raise awareness of antibiotic resistance and encourage best practices among the public, policymakers, health, and agriculture professionals, to avoid the further emergence and spread of bacterial resistance. On this note, the WHO issued guidelines to the public to help curb the rising danger of antibacterial resistance among which include the following[4]:

i) Only use antibiotics when prescribed by a certified health professional.
ii) Never demand antibiotics when your health worker says you don't need them.
iii) Always follow your health worker's advice when using antibiotics.
iv) Never share or use left-over antibiotics.
v) Prevent infection by practicing safe sex, washing hands regularly, preparing food hygienically, avoid close contact with sick people.

Many of these guidelines laid down by the WHO to reduce the spread of antibiotic resistance have been and are still being violated all over the world thereby worsening the situation daily. The guidelines violated include[8]:

- misuse and overuse of antibiotics
- use of left-over antibiotics
- wrongful prescription and dispensing of antibiotics by healthcare professionals
- Poor infection prevention and control.

The case of resistance to specific antibiotics is also a challenge in Nigeria as was shown by a study carried out in 2009[9]. These resistance cases include the reported emergence of community-associated methicillin-resistant *Staphylococcus aureus* in southwest Nigeria and the rapid evolution of fluoroquinolone-resistant *Escherichia coli* in a Nigerian community[10]. High antibiotic resistance rates among common Gram-positive and Gram-negative isolates from various clinical specimens in a tertiary hospital in Nigeria were also reported in yet another literature[11].

Inadequate knowledge of the correct application of antibiotics is a common cause for misuse which ultimately leads to a high possibility of resistance being developed[9]. Previous studies aimed at determining the prevalence of self-medication with antibiotics (SMA) in different areas in Nigeria revealed that the prevalence rate was between 67-85%. These studies include one conducted in a Nigerian university where the prevalence was 67%, another among infants being treated for colic in Lagos state with 67.7% prevalence[12] and 85% and 79% respectively among patients attending general outpatients and dental clinics in Owo[10].

The use of medication without the guidance or recommendation of a healthcare practitioner is known as self-medication. It is a common practice globally and an unhealthy one and occurs in situations where individuals believe they are knowledgeable enough to diagnose and manage their disease conditions[13]. According to the World Health Organization, self-medication is the use of pharmaceutical or medicinal products by the consumer to treat self-recognized disorders or symptoms, the intermittent or continued use of a medication previously prescribed by a physician for chronic or recurring disease or symptom, or

the use of medication recommended by lay sources or health workers not entitled to prescribe medicine[4]. Self-medication with antibiotics is common in developing countries and it is seen among educated and uneducated individuals[7,14]. Factors that have been recorded as being responsible for self-medication with antibiotics include economic deprivation, lack of access to very standard healthcare facilities, and availability and easy accessibility to prescription drugs over-the-counter[9]. This burden rests on the healthcare professionals as they are expected to educate the public on the dangers of self-medication amongst which are increased incidence of drug resistance, increased cost of medical services, and higher risk of morbidity and mortality. The antibiotic resistance crisis is not just a concern related to the healthcare industry, but the emerging crisis, if not controlled, can be potentially harmful to a country's economic growth as well[7]. The aim of this study is to determine the prevalence of self-medication with antibiotics and determine knowledge about antibiotics and antibiotic resistance among clients in community pharmacies in Lagos.

METHODS

Study location

This study was carried out in 3 different pharmacies in Ikeja, Apapa, and Agege areas of Lagos state representing high, medium, and low-income density areas of the state. Lagos State is an administrative division and arguably the most economically important state in Nigeria containing the nation's largest urban area. It is essentially a Yoruba-speaking state with socio-cultural activities that do attract people from all works of life.

As of 2016, the population of Lagos state was 21 million and there are 20 local governments in the state of which Ikeja, Apapa, and Agege have a population of 648,720, 522,384, and 1,033,064 respectively[15].

Study sites and design

This was a descriptive cross-sectional study. It was conducted in three conveniently chosen pharmacies that experience high customer/patient traffic and are: Ikeja (Alpha pharmacy); Apapa (Remedia pharmacy), and Agege (Boluke Pharmacy).

Study population

Clients above the age of 15 years that purchased antibiotics from the pharmacy upon visitation during the time this research was conducted. The rationale behind the selection of individuals 15 years and beyond was based on the united nations minimum age characterization for a youth[16].

Sampling size

The sample size was determined thus;

To calculate the sample size (n), the following equation was applied:

$n= z^2pq/d^2$

where:

z= z statistic for a level of confidence (1.96)

P= Expected proportion (30%= 0.3)

q= (1-P= 0.7)

d= Precision (0.05)

Inputting these values into the equation gave an n value of 322.7 which is the sample size expected based on a prevalence rate of 30%. This value was subsequently inputted into the formula below to determine the minimum sample size required for this research.

$Nf= n/ \{1+ (n/N)\}$

n is the value gotten from above, 322.7, while N is the population size, 3600. Inputting these into the formula gives an Nf (minimum sample size) value of 296. Hence, the sample size for this study is 296. This total sample size was divided among the three (3) pharmacies to give an average of 98 persons per pharmacy. There was however a deficit in Apapa but the number was made up by recruiting more participants in Agege.

Sampling technique and data collection method

Data was collected through a self-administered questionnaire which had three sections for extracting data on demographic characteristics, prevalence and pattern of self-medication with antibiotics, knowledge and belief about antibiotics.

The sampling technique employed was convenience sampling as the participants were approached randomly and the questionnaire was administered to those that showed interest in the study.

Statistical analysis

Data were entered into SPSS (Statistical Software for Social Sciences) version 26.0, then analyzed descriptively and inferentially using chi-square test where applicable to test for possible associations between variables. A *p*-value less than 0.05 was adopted as the level of significance. The results were presented in tables containing frequencies and percentages.

Inclusion and Exclusion criteria

Clients above the age of 15 years of age that walked into the pharmacy to purchase antibiotics. Clients that met the inclusion criteria but refuse to participate were excluded.

Ethical considerations

Ethical approval was obtained from the Health Research and Ethics committee of the Lagos University Teaching Hospital, Idi-araba. Acceptance to fill the questionnaire was taken as consent. Filled questionnaires were kept appropriately and only used for the purposes of the study. Patient identifiers such as names and addresses were not collected.

RESULTS

The age range of 25-44 years was the most common with 206 respondents (69.6%). More of the respondents were male (61.8%), married (61.1%), and of the Yoruba tribe (52.7%). The occupational distribution of the respondents showed that almost one-third of the respondents were professionals in different fields, closely followed by skilled and non-skilled labour with a representation of 24.0% and 25.75% respectively (Table 1).

Table 2 below shows that the prevalence of self-medication with antibiotics was 35.1%. This took into account respondents who admitted they used leftover antibiotics, collected antibiotics for use from family and friends, and who purchased antibiotics without input from healthcare professionals. About 192 of the respondents reported that they only purchased antibiotics based on recommendations from healthcare professionals and this accounted for 64.5% of all cases of antibiotics used.

Table 1: Demographic information

Variables	Agege (n=103) Frequency (%)	Ikeja (n=99) Frequency (%)	Apapa (n=94) Frequency (%)	Total (n=296) Frequency (%)
Age (years)				
15-24	8 (7.8)	5 (5.1)	5 (5.3)	18 (6.1)
25-34	44 (42.7)	43 (43.4)	36 (38.3)	123 (41.6)
35-44	26 (25.2)	35 (35.4)	22 (23.4)	83 (28.0)
45-54	15 (14.1)	6 (6.1)	19 (20.2)	40 (13.5)
55-64	10 (9.1)	10 (10.1)	11 (11.7)	31 (10.5)
Gender				
Male	67 (65.0)	49 (49.5)	67 (71.3)	183 (61.8)
Female	36 (35.0)	50 (50.5)	26 (27.7)	112 (37.8)
No response	0 (0.0)	0 (0.0)	1 (1.1)	1 (0.3)
Religion				
Christianity	79 (76.7)	80 (80.8)	78 (83.0)	237 (80.1)
Islam	24 (23.3)	16 (16.2)	11 (11.7)	51 (17.2)
Others	0 (0.0)	3 (3.0)	4 (4.3)	72.4)
Ethnicity				
Igbo	8 (7.8)	31 (31.0)	32 (34.0)	71 (24.0)

Hausa	10 (9.7)	13 (13.1)	12 (12.8)	35 (11.8)
Yoruba	77 (74.8)	43 (43.4)	36 (38.3)	156 (52.7)
Others	8 (7.8)	12 (12.1)	13 (13.8)	33 (11.1)
Marital status				
Single	35 (34.0)	34 (34.3)	30 (31.9)	99 (33.4)
Married	63 (61.2)	62 (62.6)	56 (59.6)	181 (61.1)
Divorced	5 (4.9)	2 (2.0)	6 (6.4)	13 (4.4)
Widowed	0 (0.0)	1 (1.0)	1 (1.1)	2 (0.7)
Occupation				
Professionals	27 (26.2)	38 (38.4)	32 (34.0)	97 (32.8)
Skilled labor	27 (26.2)	18 (18.2)	26 (27.7)	71 (24.0)
Non-skilled labor	28 (27.2)	29(29.3)	19 (20.2)	76 (25.7)
Applicant	5 (4.9)	2(2.0)	9 (9.6)	16 (5.4)
Student	15 (14.6)	10 (10.1)	5 (5.3)	30 (10.1)
Housewives	1 (1.0)	2 (2.0)	2 (2.1)	5 (1.7)
Level of Education				
Primary	8 (7.8)	3 (3.0)	11 (11.7)	22 (7.4)
Secondary	18 (17.5)	10 (10.0)	20 (21.3)	48 (16.2)
Tertiary	77 (74.8)	86 (86.9)	62 (66.0)	225 (76.0)
Average monthly income (in thousands)				
Below 30	25 (24.3)	13 (13.3)	22 (23.4)	60 (20.3)
30-60	35 (34.0)	22 (22.2)	33 (35.1)	90 (30.4)
61-100	11 (10.7)	18 (18.2)	7 (7.4)	36 (12.2)
Above 100	32 (31.1)	46 (45.6)	31 (33.0)	109 (36.8)

Table 2: Respondents report of source of antibiotic prescription

Source of antibiotic prescription	Agege (n=103) Frequency (%)	Ikeja (n=99) Frequency (%)	Apapa (n=94) Frequency (%)	Total (n=296) Frequency (%)
Non-HCP influenced	**27 (26.2)**	**35 (35.4)**	**41 (43.6)**	**103 (35.1)**
Self	15 (14.6)	21 (21.2)	8 (8.5)	44 (14.8)
Friends and Family	6 (5.8)	9 (9.1)	21 (22.3)	36 (12.4)
Leftovers	6 (5.8)	5 (5.1)	12 (12.8)	23 (7.9)
Healthcare providers (HCP)	**76 (73.8)**	**64 (64.6)**	**52 (55.3)**	**192 (64.5)**
Pharmacist	24 (23.3)	30 (30.3)	28 (29.8)	82 (27.8)
Physicians prescription	40 (38.8)	28 (28.3)	5 (5.3)	73 (24.1)
Nurse	7 (6.8)	2 (2.0)	2 (2.1)	11 (3.6)
Others	5 (4.9)	4 (4.0)	17 (18.1)	26 (9.0)

Table 3: Respondents' knowledge about antibiotic use

Variable	Frequency n= 296	Percentage n= 100%
What are antibiotics used for?		
Malaria	66	22.3
Bacterial infection	216	73.0
Headache	5	1.7
Pain	8	2.7
Are you aware that drug resistance is related to inappropriate antibiotic use?		
Yes	215	72.6
No	80	27.1

Table 3 above shows that about 73% of the respondents correctly answered that antibiotics are used for managing bacterial infections, 22.3% believed they were for malarial infection, and 72.6% of the respondents affirmed that they are aware that resistance can arise due to inappropriate antibiotic use.

The table below shows that about 76% of the respondents correctly identified the unnecessary consumption of antibiotics as a factor that contributes to antibiotic resistance, about 67% attributed it to the purchase of antibiotics outside professional recommendations while another 65% identified not completing the full course of treatment with antibiotics as another responsible factor (Table 4).

Table 4: Responses to knowledge on causes of antibiotics resistance

Causes of ABR	Frequency (n= 296)	Percentage
Using antibiotics when they are not necessary		
True	224	75.7
False	70	23.6
Not completing the full course of antibiotics		
True	192	64.9
False	102	34.5
Using antibiotics without physician prescription (self-medication)		
True	197	66.6
False	97	32.8
Take antibiotics before meal		
True	123	41.6
False	171	57.8
Using antibiotics in febrile illness		
True	141	47.6
False	153	51.7
Taking antibiotic with another drug		
True	104	35.1
False	190	64.2
Using the same antibiotics with a different brand		
True	124	41.9
False	170	57.4

Table 5 below presents outcome of tests for association between the respondent's knowledge of antibiotic use and their socio-demographic factors with gender and location only showing a significant relationship. Thus, respondents from Ikeja had significantly different results from respondents from other areas studied (p=0.015) and female respondents similarly had significantly different results than the males (p= 0.009).

Table 6 shows results of tests for significance aimed at determining possible relationship between respondents' knowledge of the causes of antibiotic resistance and their socio-demographic information. No statistically significant relationship was found for all variables.

Table 5: Association between respondent's knowledge of antibiotic use and their demographic information

Variables	Use of Antibiotics				Df	P – value
	Malaria n= 66 (22.4%)	Bact. Infec. n= 216 (73.2%)	Headache n= 5 (1.7%)	Pain n= 8 (2.7%)		
Location						
Ikeja	14 (14.1)	82 (82.8)	2 (2.0)	1 (1.0)	6	0.015**
Agege	20 (19.4)	79 (76.7)	1 (1.0)	3 (2.9)		
Apapa	32 (34.4)	55 (59.1)	2 (2.2)	4 (34.3)		
Age (years)						
15 – 24	8 (44.4)	8 (44.4)	1 (5.6)	5 (5.6)	12	0.124
25 – 34	31 (25.2)	87 (70.7)	2 (1.6)	3 (2.4)		
35 – 44	14 (16.9)	67 (80.7)	2 (2.4)	0 (0.0)		
45 – 54	69 (15.0)	32 (80.0)	0 (0.0)	2 (5.0)		
55 – 64	7 (22.6)	22 (71.0)	0 (0.0)	2 (6.2)		
Gender						
Male	46 (25.1)	124 (67.8)	5 (2.7)	8 (4.4)	3	0.009**
Female	20 (17.9)	92 (82.1)	0 (0.0)	0 (0.0)		
Occupation						
Professionals	19 (19.6)	27 (77.3)	1 (1.0)	2 (2.1)	15	0.716
Skilled labour	17 (23.9)	51 (71.8)	0 (0.0)	3 (4.2)		
Non-skilled labour	14 (184)	57 (75.0)	3 (3.9)	2 (2.6)		
Applicant	7 (43.8)	9 (56.2)	0 (0.0)	0 (0.0)		
Student	8 (26.7)	20 (66.7)	1 (3.3)	1 (3.3)		
Housewives	1 (20.0)	4 (80.0)	0 (0.0)	0 (0.0)		
Level of education						
Primary	9 (40.9)	11 (50.0)	0 (0.0)	2 (9.1)		
Secondary	8 (16.7)	35 (72.9)	3 (6.2)	2 (4.2)	9	0.774
Tertiary	49 (21.8)	35 (72.9)	3 (6.2)	4 (1.8)		
Average monthly income						
Below 30	17 (28.3)	39 (65.0)	2 (3.3)	2 (3.3)		
30 – 60	21 (23.3)	67 (74.4)	1 (1.1)	1 (1.1)	9	0.774
61 – 100	8 (22.22)	35 (72.9)	1 (2.8)	1 (2.8)		
Above 100	20 (18.3)	26 (72.2)	1 (0.9)	1 (0.9)		

Key: Bac. Inf. = Bacterial Infection

DISCUSSION

This study examined the prevalence of self-medication with antibiotics among the respondents by measuring the reported source of antibiotics and their sources of recommendation. From the study, it was discovered that approximately one-third of the study population self-medicated with antibiotics even though they had an appreciable knowledge of the role of self-medication in the development of antibiotic resistance. In a similar study, two-thirds of the respondents knew about the possibility of decreased efficacy with wrongful antibiotic use, yet they continued using antibiotics without medical advice and these were observed to occur across all education levels[13].

These show that strategies and policies need to be developed to clamp down on this wrong practice as sheer knowledge of the negative effects of antibiotic use alone is insufficient in dissuading patients from engaging in inappropriate antibiotic use.

Table 6: Association between respondent's knowledge of the causes of antibiotic resistance and their demographic information

Variables	Using antibiotics without HCP recommendation (self-medication)		df	*p*-value
	Yes n= 197 (67.0%)	No n= 97 (33.0%)		
Location				
Ikeja	71 (72.4)	27 (27.6)	2	0.079
Agege	72 (69.0)	31 (30.1)		
Apapa	54 (58.1)	39 (33.0)		
Age (years)				
15 – 24	10 (55.6)	8 (44.4)	4	0.766
25 – 34	85 (96.1)	38 (30.9)		
35 – 44	56 (68.3)	26 (31.7)		
45 – 54	27 (67.5	13 (32.5)		
55 – 54	19 (61.3)	12 (38.7)		
Gender				
Male	126 (69.2)	56 (30.8)	1	0.301
Female	71 (63.4)	41 (36.6)		
Occupation				
Professional	72 (74.2)	25 (25.8)	5	0.284
Skilled labour	48 (67.6)	23 (32.4)		
Non-skilled labour	43 (57.3)	32 (42.7)		
Applicant	12 (75.0)	4 (25.0)		
Student	19 (63.3)	11 (36.7)		
Housewives	3 (60.0)	2 (40.0)		
Level of education				
Primary school	18 (81.8)	4 (18.2)	2	0.075
Secondary school	26 (53.3)	21 (44.7)		
Tertiary	153 (68.0)	72 (32.0)		
Average Monthly Income				
Below 30	37 (61.7)	23 (38.3)	3	0.107
30 – 60	53 (59.6)	36 (40.4)		
61 – 100	26 (72.2)	10 (27.8)		
Above 100	81 (74.3)	28 (25.7)		

Research has shown that people under the age of 35 years have a higher tendency to purchase and use antibiotics and this is more common among the male gender. Such was observed in Cairo where the youths (18-40 years) had a higher rate of antibiotic use via self-medication and recommendation from friends/family[13,17]. A similar trend was observed from other references and these occurred regardless of the fact that most of the respondents had tertiary education and were professionals in their various areas of expertise[11,17,18]. A high level of consumption of antibiotics was identified among both educated and uneducated respondents hence a good target for education about the dangers of antimicrobial resistance and how their practices contribute to it.

A majority of the respondents had basic knowledge about conditions that necessitate the use of antibiotics including the concept and factors that contribute to the development of antibiotic resistance. This probably might be due to the efforts of healthcare professionals in educating the populace on rational drug use via various communication channels. Contrary to this, a study conducted in England in 2015 showed that the

respondents surveyed had high awareness of the existence of antibiotic resistance and that it was a global challenge however, only a few of them correctly answered specific questions regarding causative factors which indicated poor knowledge[19].

The prevalence of self-medication with antibiotics recorded in this study was relatively lower than in other studies conducted within and outside the shores of Nigeria[20-23]. This might be a result of many factors such as improved access to healthcare facilities and health professionals, and better enlightenment about the harmful effects that might result from the consumption of medications without expert advice. Other studies that reported similar and even much lower levels of prevalence attributed it to higher income and better education among other factors[24,25]. Nonetheless, much is yet to be done in the fight against SMA as lower prevalence levels are desired to guarantee hope for the continued relevance of antibiotics.

The study revealed that the majority of the antibiotics purchased were based on recommendations by healthcare professionals. This is a silent and predominant challenge against progress in the fight to eradicate self-medication with antibiotics as many healthcare professionals have made it a norm to easily prescribe and dispense antibiotics over the counter. The habit of purchasing antibiotics by self-medication which many people indulge in partly results from the constant prescription of these medications by healthcare professionals for the public to the extent that people now use the experience gained to prescribe for themselves and others[26]**.** There is a need to refrain from such practices as they only make worse the challenge of resistance already present worldwide[24,26].

A relationship was found to exist between the knowledge level of the respondents about antibiotics and their geographical location as respondents who visited Alpha pharmacy which is located in a high-income density area (Ikeja) had the highest knowledge about antibiotic use. The reason for this is not exclusively known but like in other studies, it might be related to high literacy and better financial status obtainable in such areas among other possible factors. This is similar to a 2018 study that concluded that a lower prevalence of SMA was associated with better income[24].

Also, from this research, it was observed that a higher percentage of women knew more about the use of antibiotics than their male counterparts with similar results obtained in a previous study[21]. This could be as a result of the cautious mindset found in females regarding their health unlike the males, especially in cases of urinary tract infections or sexually transmitted infections where females are mostly symptomatic and the males asymptomatic[21,27].

CONCLUSION

An appreciable level of knowledge was recorded in this study about antibiotics and the factors that contribute to the development of antibiotic resistance however, the practice of self-medication with antibiotics was still common among the study participants as was seen by the high prevalence recorded. Thus, intentional policies must be established by relevant agencies of government to curb improper access to antibiotics by members of the public, and consistent public enlightenment programs on the dangers of self-medication with antibiotics and antibiotics misuse should be engaged in by all health professionals with greater focus placed on males and those with lower incomes and literacy.

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