Original Article

Survey of Knowledge of Antimicrobial Resistance and Dispensing Practice Among Community Pharmacists in Akwa Ibom State, Southern Nigeria

Mary Richard Akpan*, Idongesit Linus Jackson, Chioma Cynthia Ozuluoha, Emediong Samuel Akpan
Department of Clinical Pharmacy and Biopharmacy, Faculty of Pharmacy, University of Uyo, Uyo, Akwa Ibom State, 520271, Nigeria.
*Corresponding author's E-mail: m.akpan2@uniuyo.edu.ng

ABSTRACT

Community pharmacists have pivotal roles in ensuring appropriate use of antibiotics and in reducing the threat posed by antimicrobial resistance (AMR). This study sought to assess community pharmacists' knowledge of the prevalence of AMR and factors which contribute to AMR, and to compare self-reported dispensing practice with findings of a simulation of management of self-limiting infections. A 13-item paper-based questionnaire was used to collect data from 100 community pharmacists. Data were analysed using SPSS version 25.0 and presented descriptively. Chi-square test was used to test for association between variables. Significance level was set at $p < 0.05$. Most (58%) of the participants were male within the age range of 25–34 (66%). The average number of medicines dispensed daily was between 101 and 150 (37%), with antibiotics accounting for 32% of medicines dispensed daily. Most of the participants were knowledgeable about the prevalence of AMR at global (98%) and national (96%) levels and factors that contribute to AMR (>80%). There was no significant association between the participants' characteristics and knowledge of AMR (p>0.05). Although the participants generally rated themselves favourably on different dispensing practice statements, their self-reported practice differed from the findings of a prior simulation of management of self-limiting infections conducted among the same population. The participants were very knowledgeable about the prevalence of AMR and contributing factors. However, their self-reported dispensing practice was different from the observed practice in an earlier simulation study. More needs to be done to dissuade community pharmacists from inappropriate dispensing/selling of antibiotics.

Keywords: Antibiotics, antimicrobial resistance, community pharmacists, dispensing practice, knowledge.

INTRODUCTION

Antimicrobial resistance (AMR) is an alarming global public health concern with numerous consequences. It is estimated that at the current rate, AMR will result in 10 million deaths every year and 2% to 3.5% reduction in productivity by the year 2050.[1] The use of antibiotics has been identified as a major modifiable risk factor associated with development of resistance.[2,3] The majority of antibiotic use occurs in the outpatient setting in both high-income and low- and middle-income countries (LMICs), where antibiotics are prescribed or dispensed for infections that do not require antibiotics, such as acute diarrhoea and upper respiratory tract infections.[4-6]

One of the core objectives of the World Health Organisation (WHO) global action plan on AMR is to promote optimal antibiotic use through improved awareness and understanding of resistance through education, training and surveillance.[7] Pharmacists play important roles in optimal antibiotic use. Some of these roles include providing expert advice to other healthcare professionals, patients, and the public; developing and maintaining antibiotic prescribing guidelines; and monitoring antibiotic use with feedback, among others.[8,9] In particular, the International Pharmaceutical Federation describes the roles of community pharmacists in the stewardship of available antibiotics to include triaging, which includes appropriate treatment of patients symptoms without antibiotics.[9] Community pharmacists

are the most accessible health professionals to the public; this unique position can be deployed for the stewardship of available antibiotics in light of the alarming rate of AMR and attendant consequences.[1,10] This study had two objectives: a) to assess community pharmacists' knowledge of the burden/prevalence of AMR and factors that contribute to the development of resistance, and b) to compare self-reported dispensing practice with the findings of a simulation of the management of self-limiting infections among community pharmacists.

MATERIALS AND METHODS

Study setting and design

This was a cross-sectional study carried out among registered community pharmacies in Akwa Ibom State. Akwa Ibom is a coastal state in southern Nigeria with an estimated population of over 7 million. Community pharmacies are registered by the regulatory body, the Pharmacy Council of Nigeria. A state chapter of the Pharmaceutical Society of Nigeria, an umbrella association for the Nigerian pharmaceutical sector, maintains the register of all registered community pharmacies in each state. A community pharmacy must have a registered pharmacist who superintends the practice and may have locum pharmacists in addition.

Survey instrument

A 13-item self-completion questionnaire was adapted from previous studies.[11-14] The questionnaire consisted of

three sections. Section one collected demographic information about the participants. Section two asked community pharmacists' knowledge of the prevalence and causes of AMR using a 3-point Likert scale: 'agree', 'not sure', or 'disagree'. Section three assessed the dispensing practices of community pharmacists. The pharmacists were required to select 'never', 'sometimes', or 'always' for each question item.

Sampling technique and sample size

The survey was an aspect of a two-part study to compare knowledge of AMR, self-report of dispensing practice, and a simulation of the management of self-limiting infections. At least one pharmacist was targeted for data collection from the 166 registered community pharmacies across the state at the time of data collection. A convenient sample of 100 pharmacists practicing in the community participated in the survey.

Data collection and analysis

A paper-based questionnaire was used to collect data during pharmacy opening hours between October and December 2019. To compute the knowledge score for the prevalence and causes of AMR, responses were categorised as correct ('agree') or incorrect ('not sure' or disagree). Knowledge of the prevalence and causes of AMR was rated on a scale of 0-9, where 7-9 was categorised as good, 5-6, average and 0-4, poor.

Data were analysed using SPSS version 25.0. Data were presented using descriptive statistics (frequency, percent); Chi-square test was used to test for association between variables. The significance level was set at $p < 0.05$.

Ethical considerations

Approval for the study was sought and obtained from the Akwa Ibom State Ministry of Health Research Ethics Committee (MH/PRS/99/Vol.IV/693, 03/09/2019). Consent to participate in the survey was sought in the questionnaire.

RESULTS

One hundred community pharmacists participated in the study, the majority of whom were male (58%), in the age range of 25-34 (66%), and with less than five years of community practice (57%). The majority of the participants did not have a postgraduate qualification (82%). The average number of medicines dispensed per day in most of the participating pharmacies was between 101 and 150 (37%), with antibiotics accounting for 32% of medicines dispensed per day. Table 1 presents a summary of the participants' demographic characteristics.

Community pharmacists' knowledge of the burden/prevalence of AMR and factors that contribute to AMR development

Three statements assessed the burden of AMR, while six statements assessed possible factors that contribute to the development of resistance. Community pharmacists in this study were knowledgeable of both the burden/prevalence of AMR at national and global levels, as well as factors that contribute to the development of AMR.

Table 1: Demographic characteristics (N = 100)

Characteristic	Frequency	Percent
Age (years)[a]		
<25	15	15
25-34	66	66
35-44	12	12
>44	6	6
Gender		
Male	58	58
Female	42	42
Postgraduate qualification		
Postgraduate diploma	2	2
M. Sc/M. Pharm	15	15
MPH	1	1
None	82	82
Position in pharmacy		
Superintendent	71	71
Locum	29	29
Year of practice (years)		
≤5	57	57
6-10	31	31
>10	12	12
Staff strength		
1-5	50	50
6-10	39	39
>10	11	11
Average no. of medicines dispensed/day		
≤50	4	4
51-100	16	16
101-150	37	37
150-200	35	35
>200	8	8
Average no. of antibiotics dispensed/day		
≤10	1	1
11-20	28	28
21-30	32	32
31-40	22	22
>40	17	17

[a]Total = 99 because of non-response

The majority (92%) knew that dispensing antibiotics without prescription and for self-limiting infections, such as common cold and sore throat, respectively, could contribute to development of AMR. Eighty-nine percent knew prolonged use of antibiotics contributes to AMR, and 88% were aware that weak antibiotic regulation is a contributing factor to the problem of AMR. A summary of

the community pharmacists' knowledge of the burden/prevalence of AMR and factors that contribute to its development is provided in Table 2.

Association between community pharmacists' characteristics and knowledge of antimicrobial resistance

Age, gender, post-graduate qualification, and length of practice had no influence on community pharmacists' knowledge of the burden and causes of AMR. The association between community pharmacists' characteristics and knowledge of AMR is shown in Table 3.

Table 2 Community Pharmacists' Knowledge of Antibiotic Resistance

Item	Frequency	Percent
AMR is a serious global health threat	98	98
AMR is a serious health threat in Nigeria	96	96
Resistance of organisms that commonly cause infections in hospital and community (e.g., *E. coli, S. aureus*) to first-line agents (e.g., fluoroquinolones, methicillin) is on the rise globally	88	88
Dispensing antibiotics without prescription increases resistance	92	92
Dispensing too many antibiotics causes resistance	84	84
Dispensing antibiotics for cough, common cold and sore throat increases resistance	92	92
Recommending antibiotics for too long causes AMR	89	89
Weak antibiotic regulation contributes to the problem of AMR	88	88
Dispensing and/or recommendations of antibiotics contribute to development of resistance	91	91

Note: values are n (%) of participants who responded correctly to the questionnaire items; AMR – antimicrobial resistance.

Table 3 Association between community pharmacists' characteristics and knowledge of antimicrobial resistance

Characteristics	Good knowledge	Average knowledge	Poor knowledge	*P*-value
Age (years)				
<25	13 (86.7%)	1 (6.7%)	1 (6.7%)	0.663
23-34	56 (84.8%)	8 (12.1%)	2 (3.0%)	
35-44	10 (83.3%)	2 (16.7%)	0 (0%)	
>44	1 (66.7%)	1 (66.7%)	1 (5.6%)	
Gender				
Male	49 (84.5%)	8 (13.8%)	1 (1.7%)	0.464
Female	34 (81.0%)	5 (11.9%)	3 (7.1%)	
Postgraduate qualification				
Yes	14 (77.8%)	3 (16.7%)	1 (5.6%)	0.631
No	69 (84.1%)	10 (12.2%)	3 (3.7%)	
Cadre				
Superintendent	59 (83.1%)	9 (12.7%)	3 (4.2%)	1.000
Locum	24 (82.8%)	4 (13.8%)	1 (3.4%)	
Length of practice (years)				
≤5	47 (82.5%)	7 (12.3%)	3 (5.3%)	0.962
6-10	25 (80.6%)	5 (16.1%)	1 (3.2%)	
>10	11 (91.7%)	1 (8.3%)	0 (0%)	

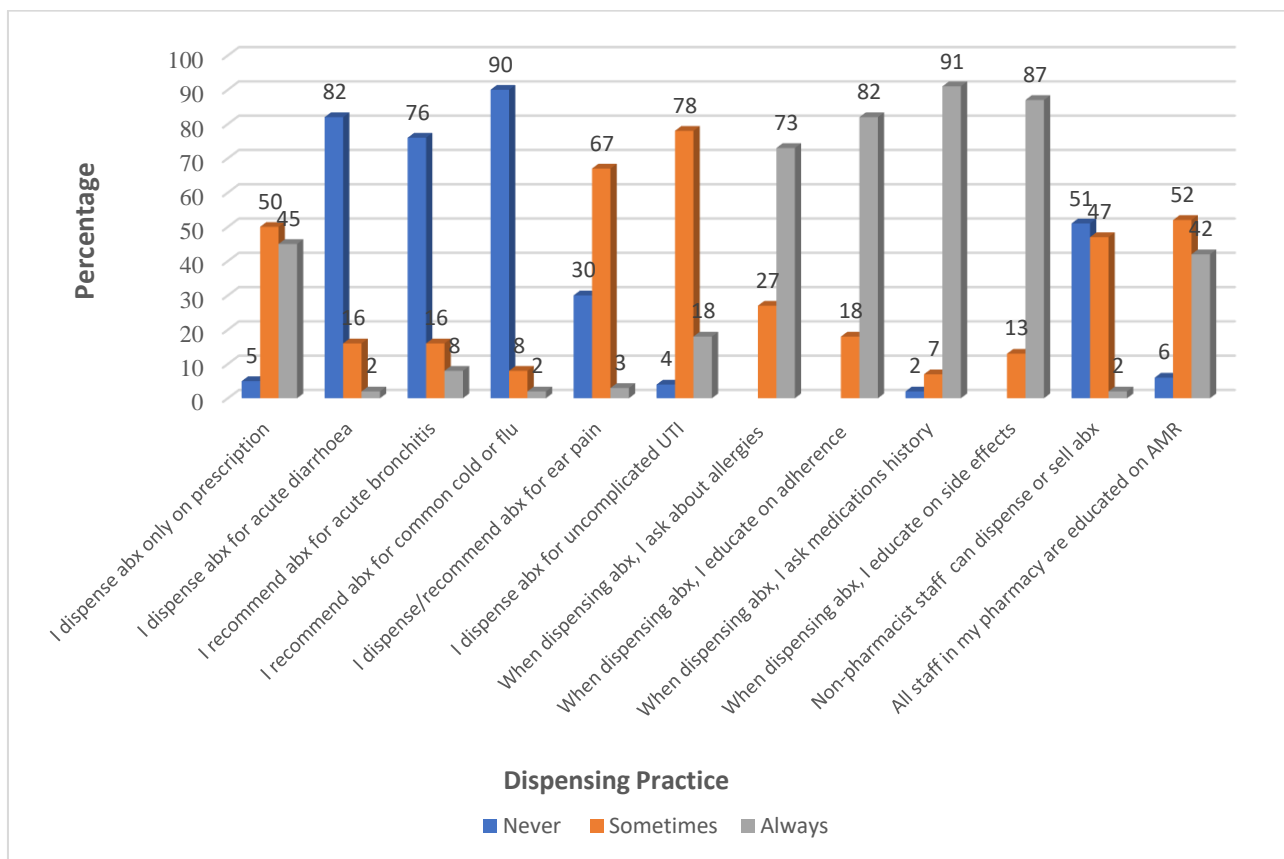*Note*: values are n (%).

Figure 1 Dispensing practice of community pharmacists

Key Abx: antibiotics; AMR: antimicrobial resistance; UTI: urinary tract infection

Antibiotic dispensing practice

Twelve statements assessed the dispensing practices of community pharmacists. Half of the community pharmacists indicated that they sometimes dispense antibiotics only on prescription. Seventy-six percent and 90% indicated that they never dispense antibiotics for acute bronchitis/chest cold or common cold or flu, respectively. Eighty-two indicated that they never dispense antibiotics for acute diarrhoea. Seventy-three of the pharmacists indicated that they always obtain an allergy history when dispensing antibiotics, and 91% indicated they always ask patients if they take other medications when dispensing antibiotics. The antibiotic dispensing practice of participants in this study is shown in Figure 1.

DISCUSSION

This study was an aspect of a two-part study that assessed community pharmacists' knowledge of the burden/prevalence, and factors that contribute to the development of AMR and self-reported dispensing practices in comparison with a simulation of the management of self-limiting infections. Generally, community pharmacists in this study had good knowledge of the burden/prevalence of AMR at the national and global levels, as well as factors that contribute to the development of resistance. Previous studies have reported that pharmacists and other health professionals have good knowledge of the burden/prevalence of AMR and the factors that are associated with it.[12,15-17] In this study, age,

postgraduate qualification, cadre, and length of practice had no influence on community pharmacists' knowledge of the burden of AMR and the factors that contribute to AMR.

Regarding the assessment of dispensing practice, participants generally assessed themselves well on the different statements, such as dispensing antibiotics on, or without a prescription, and dispensing antibiotics for self-limiting infections, including acute diarrhoea, acute bronchitis or chest cold, common cold, and ear pain (otitis media). These findings, however, conflict with a simulation study that was conducted among a cross-section of community pharmacists who participated in a survey to assess their management of self-limiting infections.[18] In the simulation study, more than half of the participants recommended an antibiotic (mostly azithromycin) for a common cold, which conflicts with 90% of the participants in the present survey, who indicated that they never recommend antibiotics for a common cold. A large proportion of the community pharmacists in the present study indicated that they never dispensed antibiotics for acute diarrhoea in the survey; this contrasts with the over 70% who dispensed metronidazole alone or in combination with amoxicillin or tetracycline to treat acute diarrhoea in the simulation study reported earlier.[18] Previous studies have reported a difference between what community pharmacists say about their dispensing practice and what happens in real practice.[13,14,19,20] For example, a study in south-west Nigeria that compared the knowledge and attitude of community pharmacists in the management of

acute diarrhoea in children with their observed practice reported that the observed practice was inappropriate and significantly different from the claims in the questionnaire.[20]

Dispensing antibiotics without a prescription has been reported as a frequent feature of community pharmacy practice in LMICs. A systematic review of non-prescription sales of antibiotics at community pharmacies, which included 50 studies, found that all the studies reported one or more sales of antibiotics without a prescription.[21] Although the non-prescription sale of antibiotics is largely a problem in developing countries with poor regulations, it has been reported in a developed economy.[22] In this study, half of the participants indicated they sometimes dispense antibiotics without a prescription, which confirms that non-prescription antibiotic dispensing is a frequent feature of community pharmacy practice.

While most of the community pharmacists in this study indicated they always take allergy and medication histories while dispensing antibiotics and educate or provide patients with pertinent information about their medication, a previous study found the contrary.[23] Bin Abdulhak et al. found that in all simulated clinical scenarios, which included sore throat, diarrhoea, acute bronchitis, otitis media, etc., none of the pharmacists who participated asked about their history of drug allergies or provided information on potential drug interactions when dispensing any antibiotics.[23] This further confirms a disparity between reported practice and observed practice in community pharmacy practice.

Of note, almost half of the community pharmacists in this study reported that non-pharmacist staff sometimes dispense or sell antibiotics. In a study of 256 pharmacies to quantify sales of antibiotics without prescription, Chang et al. reported that antibiotics were obtained without a prescription from about half of the community pharmacies when paediatric diarrhoea was simulated and from about three-quarters of the community pharmacies when adult respiratory infection was simulated, of which pharmacists were available in only a few of the pharmacies.[24] This implies a good number of antibiotics in both scenarios were dispensed by non-pharmacist staff, which is consistent with the findings of our study that non-pharmacists sometimes dispense or sell antibiotics. This is of concern considering that non-pharmacist staff are not sufficiently educated on the problem of AMR. In our study, just about 40% of participants indicated that they always educate their staff on AMR. In line with this finding, Chang et al. reported that the performance of pharmacy staff on information provision and advice after dispensing an antibiotic was unsatisfactory.[24]

Our study found inconsistencies between reported practice and actual practice in a prior simulation of acute diarrhoea and the common cold. This finding calls for improved awareness among the public and education and training among community pharmacists in LMICs. This can take the form of public enlightenment in local communities on the

impact of misuse of antibiotics and continuous professional development among community pharmacists by regulatory bodies, with an emphasis on AMR and other ways of making profit. This is because among the factors that have been identified as drivers of over-the-counter use of antibiotics without a prescription are clients' demand and need for business survival and profit.[21,25,26] There is also a need for strengthened antibiotic regulations and monitoring to ensure compliance.

This study has some limitations: it was limited to a single Nigerian state and had a small sample size, so the findings may not be generalized to other settings.

CONCLUSION

Participants in this study were very knowledgeable about the prevalence of AMR and the contributing factors. However, their self-reported dispensing practice was different from the observed practice in a simulation study. More needs to be done to dissuade community pharmacists from inappropriate dispensing/selling of antibiotics, despite their knowledge of the implications of such practice.

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