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Research Article

Self-Medicated Broad Spectrum Antibiotics in Rural Communities in Kano-Nigeria: A Cross-Sectional Survey

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ABSTRACT

Abuse of antibiotics through self-treatment is of public health concern, especially in rural communities of low income countries. This study evaluates the prevalence of self-medication with five broad spectrum antibiotics (ampiclox, amoxillin, co-trimoxazole, metronidazole and tetracycline) commonly used to treat infections among non-health workers living in rural communities in Kano, Nigeria. A cross-sectional survey of 300 randomly selected adult villagers was conducted with self-administered questionnaire. The prevalence of self-medication with at least one of the antibiotics was 70.3%. The most self-medicated antibiotic is ampiclox followed by tetracycline, amoxicillin, co-trimoxazole and metronidazole. Over 50% of the respondents purchased substandard antibiotics, which cost between $0.1-0.5 per dose from illegal drugs sellers in their communities. While only 29 respondents ever completed the dosage of the self-medicated antibiotics, about 22% took the antibiotics for 2 days and 41% took only 1 dose. A total of 154 (51.3%) self-used tetracycline and metronidazole for treating diarrhea, while 30.6% and 62% used ampiclox and amoxicillin to treat undiagnosed urinary tract infections and typhoid fever respectively. Only 33% have used antibiotics previously prescribed by health care workers, but the majority used them as a result of family and friends' recommendations. Surprisingly, only 19 out of 300 believed that self-medication is a problem, but the majority (168) has contrary believe and 35 have no idea. Self-medication with five commonly used broad spectrum antibiotics is very high in rural communities and will require the development of a viable antibiotic stewardship programs to arrest the situation.

Keywords: *self-medication; antibiotics; broad spectrum; rural; Nigeria*

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INTRODUCTION

Self-medication, especially in the African continent has been in existence for decades, where individuals use freely available antibiotics to treat themselves or their relatives for disorders or symptoms diagnosed by them (Kelesidis and Falagas, 2015; Ocas et al., 2015). In most cases, those engaged in self-medication uses substandard/counterfeit and previously prescribed antibiotics to treat chronic, recurrent illnesses or symptoms without consulting authorized prescribers.

In overwhelmed health care facilities typical of developing countries such as Nigeria, regulation of antibiotic sales and consumptions remained low for years, despite the efforts of both government and other drug regulatory bodies. In the urban areas, antibiotics are sold freely in open markets, illegal medical stores, and also hawked on the streets by illiterates. The situation is worst in the rural communities, where these vital agents are being abused by poorly trained prescribers (mostly non-doctors) and the majority of members of communities that have no relation with health care delivery. Hospitals in the rural communities in the Nigerian state of Kano, where the majority of the dwellers are poor living far below a dollar per day, are often supplied with some free drugs, such as anti-malarial drugs, few antibiotics and pregnancy care drugs among others by the state or local government councils (Daily Post, 2017).

Among the freely available antibiotics both in the hospital dispensaries and other illegal drug sales points in most communities in the rural area are five broad spectrum

antibiotics, ampiclox, amoxillin, co-trimoxazole, metronidazole and tetracycline.

These antibiotics are highly either abused or underused and also provide high profits for hundreds of unprofessional drug sellers in the communities, leaving the patients and other abusers vulnerable to antibiotic resistant infection causing bacteria.

Self-medication with different drugs, including antibiotics in Nigerian urban communities has been highlighted by previous studies (Olayemi et al., 2010; Sapkota et al., 2010, Fadare et al., 2011). These studies showed wide abuse and self-medication of different antimicrobials in hospitals, nursing homes, schools, markets by both young and adults, mainly in the urban settlements, a situation that can harm an individual as well as the society at large. But studies on self-medication among the rural dwellers in Nigerian communities, especially in the northwest geopolitical zones are scanty.

Recent detections of extended spectrum beta-lactamase and carbapenemase producing pathogens among rural dwellers admitted to either rural hospitals or referral hospitals where carbapenems and other expensive beta lactam antibiotics are not available to them for treatment, may indicate the level of misuse of antibiotics in the rural communities (Yusuf et al., 2013). With the emergence of these hard to treat pathogenic organisms in the rural community settings, clinicians serving in the rural communities will have limited drug options for the treatment of bacterial infectious diseases with common and affordable antibiotics the rural dwellers can afford. There is need therefore for evaluation of the situation in the rural communities so that specific intervention strategies can be formulated and put in place. However, for the interventions to be successfully implemented, there is need for better understanding of the underlying socio-cultural factors that contribute to the abuse of these common antibiotics among rural dwellers

This study was therefore aimed to evaluate the prevalence of self-medication with five broad spectrum antibiotics commonly used to treat infection related illnesses among non-health workers living in rural communities in Kano, the most populous state in Nigeria.

MATERIALS AND METHODS

Study site and design: The study site was conducted in five local government areas located in Kano, a state situated in the north-west geopolitical region of the country. It is the only state in the country with 44 local government councils, have about 70% of settlements in rural communities. Ten randomly selected locations from 5 local governments in the state were selected for the collection of data. The selection was based on (1) lack of a general hospital in the community (2) present/absent of primary health care and (3) presence of at least 1 unauthorized medical store. The design of this study was cross-sectional and exclusively non-experimental. The data were obtained through a structured questionnaire based interview from adult villagers from August to September, 2016.

Ethical approval: Before the start of this study, approval from the concerned authorities of Kano State Hospital Management board was obtained (MOH/Off/797/T.I/286).

Participants and questionnaire: For the purposes of this study, only adult individuals residing in villages located in the selected sites were chosen to complete the questionnaire. A well-structured, pretest questionnaire was used to collect the information needed. A pilot study was carried out on 20 individuals that were not included in the study. After the pilot study, the content of the questionnaire was restructured, where clarity of some questions and responses were improved and some were deleted. The questions were formulated loosely with the understanding of someone living in the rural areas with no formal education.

The final questionnaire contained 10 questions. Some of the questions are fixed-choice items in the form of a Likert scale, while others are in the form of multiple choice questions. The demographic information collected from all the participants are age, gender, and occupation. Another part of the questionnaire retrieved information from them on the types of antibiotics commonly purchased, the reasons for which the people engaged in antibiotic self-medication, the self-recognized symptoms for which the drugs were used, the duration of use of the drugs as well as the individual perception pertaining effect of antibiotic self-medication.

A total of 300 structured questionnaires was prepared and distributed by three of the authors to 150 females and 150 male villagers after obtaining their verbal consent. The purpose of the study was explained to all the respondents in their local dialect and the questionnaire was filled according to their chosen options. The five antibiotics were displayed to the participants to test their knowledge of the antibiotics. Assurance of confidentiality of their personal data and other information shared was also provided.

Data analysis: The information retrieved were presented in frequency distribution tables and figures. Statistical analysis was performed using SPSS statistical package (SPSS Inc., Chicago, IL, USA). Chi-square test was used to compare differences between groups. Statistical significance was set at $p < 0.05$.

RESULTS

Study population

Of the initial three hundred questionnaires distributed to the participants, a total of two hundred and fifty six participants participated fully by responding to all the questions in the questionnaires. Of the total 44 who did not participate, 17 including 6 females and 11 males were qualified, but they backed out at the middle of the interview after agreeing initially to participate. The other 27 participants did not return their questionnaires despite repeated visits. Additional 44 questionnaires were distributed to other participants to complete the total number of participants to 300. The age distribution of both male and female participants and their occupation is shown in Table 1. The whole study population has an average age of 36.7 years, within the range of 18-62. The majority of the male participants were farmers while the females were full house wives.

Table 1
Demographic information and distribution of study participants

Parameter	Males (N=150)	Females N=150)
Age		
Average (STD)	37.5	35.7
Range	20-57	18-62
Occupation		
Farmers	69 (46.0%)	11 (7.3%)
Labourers	49 (32.6%)	33 (22.0%)
Hand work	32 (21.3%)	42 (28.0%)
Housewives	00 (00)	64 (42.6%)

Self-medication with common antibiotics

The participants were asked in the questionnaire on whether they had experienced self-medication with any of the selected antibiotics before the study. Their responses was shown in Fig 1. The majority of the rural dwellers, 211 (70.3%) out of the 300 that participated in study had experienced self-medication with at least one of the antibiotics before the study. Moreover, 6.3% of the respondents had undergoes self-medication with all the five antibiotics before the study.

Ampiclox which has been used at least once by 41.3% of the participants was the most self-medicated antibiotic. It was followed by tetracycline, amoxicillin, co-trimoxazole and metronidazole (Fig 2). There is no significance difference between male and females in relation to self-medication with all of the antibiotics except tetracycline, which is more abused by men (result not shown).

The cost of antibiotics self-medicated by the participants was shown in Fig 3. Over fifty percent of the participants (55.3%) had bought cheapest antibiotics, which cost between $0.1-0.5 per dose from non-health care workers selling drugs in their communities. Highly expensive antibiotics are not self mediated by the participants living in the study communities. The result of whether or not the participants completed the required dose of the antibiotics they self-used was shown in Fig. 4. About 40 and 22% of the participants used the antibiotics for self-medication for only one and two days respectively. Meanwhile, only 29 participants (9.6%) had used complete dosage of self-medicated antibiotics.

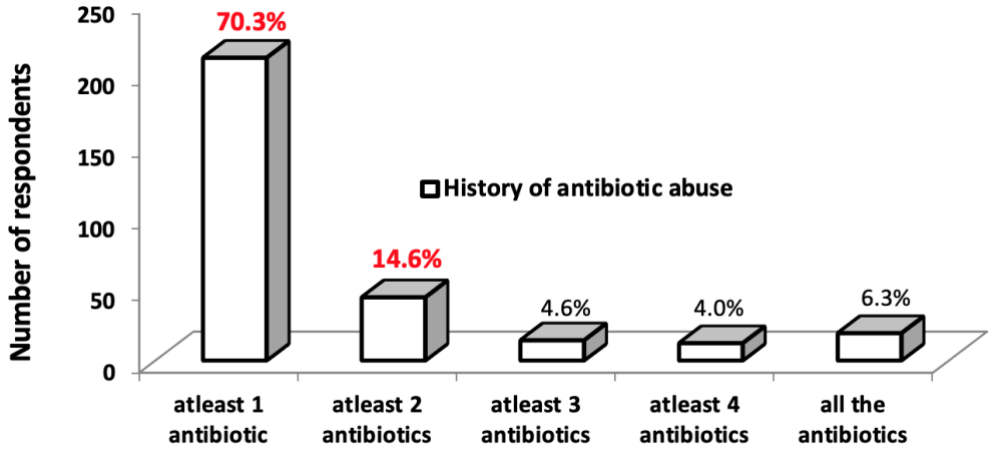

Figure 1
Percentage of number of antibiotics the participants have self-used to treat undiagnosed diseases/infections

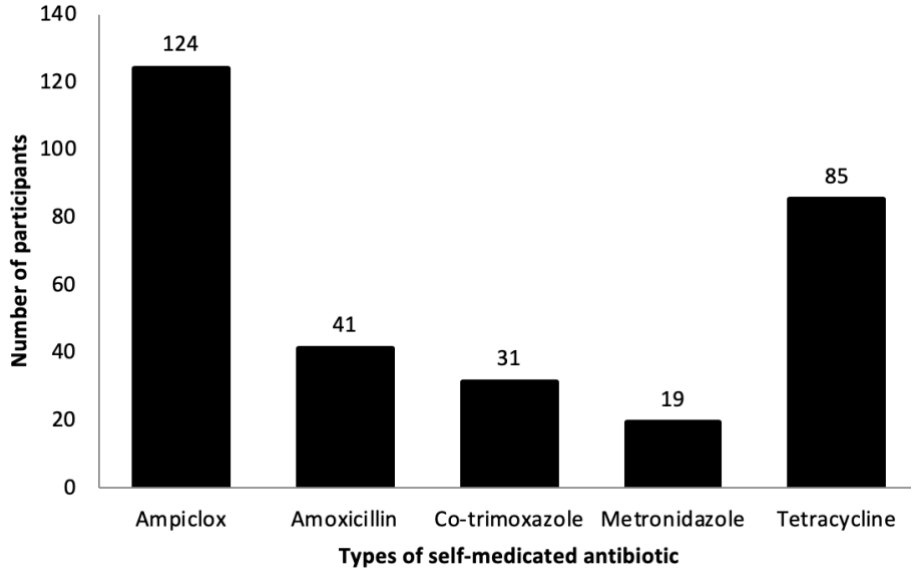

Figure 2
Prevalence of self-medication with five broad spectrum antibiotics

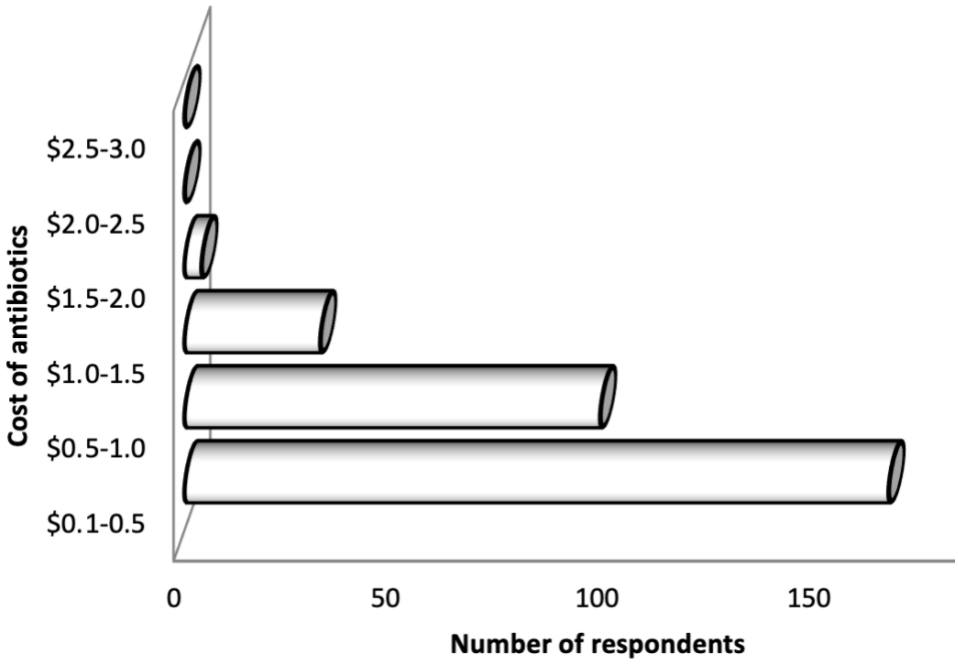

Figure 3
Costs of a dose of antibiotics self-medicated by members of rural communities

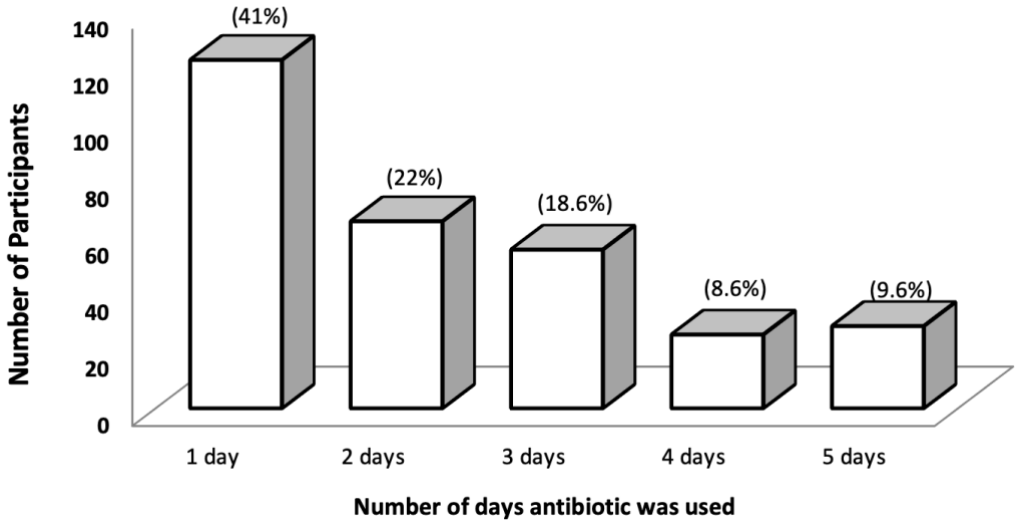

Figure 4
Number of days self-medicated antibiotics are used by rural community members

Table 2.
Ailments for which the five spectrum antibiotics were self-medicated by the members of the community

Antibiotics	Health conditions for which the antibiotics were used						
	Diarrhoea	UTI	Typhoid fever	Boils	Rashes	Cough	Wound
Ampiclox	0 (0.0)	92 (30.6)	36 (12.0)	122 (40.6)	74 (24.6)	18 (6.0)	64 (21.3)
Amoxicillin	0 (0.0)	27 (9.0)	186 (62.0)	24 (8.0)	22 (7.3)	44 (14.6)	0 (0.0)
Co-trimoxazole	4 (1.33)	16 (5.3)	2 (0.67)	16 (5.3)	8 (2.67)	136 (45.3)	0 (0.0)
Metronidazole	146 (48.6)	0 (0.0)	4 (1.33)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Tetracycline	162 (54.0)	4 (1.3)	6 (2.0)	4 (1.33)	0 (0.0)	0 (0.0)	6 (2.0)

Figures in parenthesis are percentages

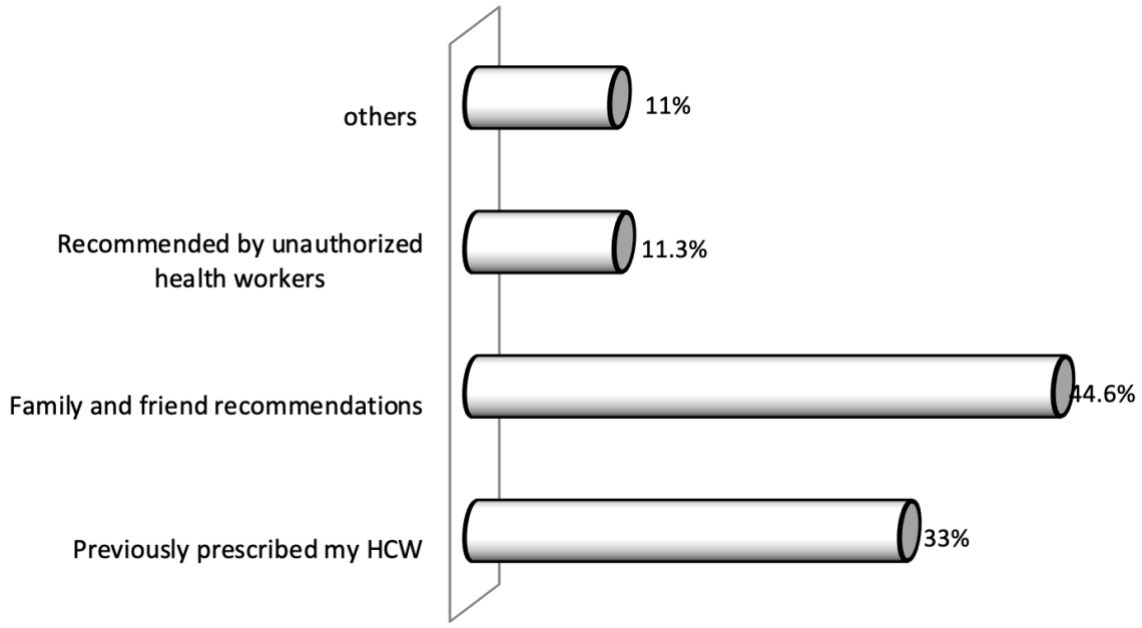

Figure 5
Indications for self-medication with any of the five antibiotics

Table 3
Response of participants to questions related to antibiotic medication and identification

Questions	**Options**		
	Yes	No	No idea/not decided
Did you consider antibiotic self-medication as a problem?	19 (6.3)	246 (82.0)	35 (11.6)
Are you willing to stop self-medication with antibiotics	69 (23.0)	123 (41.0)	154 (51.3)
Correct identification of antibiotics	Correct	Not correct	Not sure
Ampiclox	165 (55.0)	84 (28.0)	51 (17.0)
Amoxicillin	131 (43.6)	77 (25.6)	92 (30.6)
Co-trimoxazole	93 (31.0)	126 (42.0)	81 (27.0)
Metronidazole	261 (87.0)	5 (1.67)	34 (11.3)
Tetracycline	282 (94.0)	8 (2.67)	10 (3.33)

The majority of the participants 73(48.6%) and 81 (54.0%) have self-used tetracycline and metronidazole for treating diarrhea respectively. Similarly, 30.6% and 62% had used ampiclox and amoxicillin to treat un-diagnosed urinary tract infections and typhoid fever respectively. The indications the participants used different self-medicated antibiotics to treat were shown in Table 2. Ampiclox was also used by the participants to treat boils, rashes and 21.3% of them used to open the capsule and applied the powder on wounds.

All the participants were asked to the best of their knowledge to give reasons for antibiotic self-medication. Their general responses were presented in Fig 5.

While about 30% of the participants self treat themselves with antibiotics previously prescribed by health care workers, but the majority (44.6%) used the self-medicated antibiotics as a result of family and friends' recommendation. However, some 11% of the participants used any of the antibiotics for self-medication as a result of recommendation by unauthorized health care workers or other means.

The participant's believe on whether or not self-medication is a problem and their ability to differentiate between antibiotics was presented in Table 3. It is surprising that only 6.3% of the participants believed that self-medication with antibiotics is a problem, and 11.6% of them have no idea of whether or not self-medication with antibiotic have a problem. While only 23% of the participants are willing to stop self-medication with antibiotics, the majority (51.3%) are yet to decide and 41% are so attached to the practice that they are not willing to stop. The majority of the respondents correctly identified metronidazole and tetracycline. But 25.6%, 28% and 42% of them were unable to identify amoxicillin, ampiclox and co-trimoxazole displayed to them respectively correctly

DISCUSSION

In this study, a cross sectional survey of how rural community members abused five commonly prescribed broad spectrum antibiotics was conducted. This is necessary since the knowledge of the level of abuse and people's adherence to self-medication practices will help in planning strategies and policies on how to tackle the problem especially in rural communities where the level of education is extremely low.

Historically, self-medication with different drugs is not new in Nigeria and other developing countries in Africa, Asia and South America. Literatures that reported self-medication with

different drugs and in different places are available with varying figures Shah et al., 2014; Ocan et al., 2014; Domingues et al., 2015). Also available are growing rates of pathogens that are resistant to both cheaply available and highly cost antibiotics in hospitals and in the communities (Yusuf et al., 2013; 2014; Olanitola et al., 2015; Tedesse et al., 2017). Even though the fight against drug abuse and illegal handling of drugs is ongoing in Nigeria, but the impacts are more felt in the urban areas (Chinendu, 2008). The recent emergence of clinical isolates from patients in rural communities that are resistant to last resort antibiotics that are not available for use, is a clear indication of increasing antibiotic resistance in rural communities (Yusuf et al., 2013). To the best of our knowledge, this is the first study to report the self-medication of 5 cheap and commonly available broad spectrum antibiotics in the rural communities of Kano, one of the most populous states in Nigeria.

The randomly selected participants from the selected communities were adults. This is because adults are in good position to take their own decision in their life, unlike children and very old people. The majority of the select participants has no knowledge of the danger of self-medication with antibiotics before the study. This is not surprising because sensitization programs for prudent use of antibiotics specifically targeting rural dwellers is not in place. In addition, almost all of them lack formal education, and live below poverty level, the two other factors that will facilitate their ignorance of effect of antibiotic resistance. Occupation plays no role in their knowledge of antibiotic usage. There is no significant difference in the response of laborers and farmers, housewives and those with handwork skills cumulatively (data not shown). The finding of our study is also not much different from a similar study conducted among urban and rural dwellers of Bahir Dar city administration in Ethiopia, where illiterates that cannot read and write and those engaged in regular jobs are more involved in antibiotic abuse (Gebeyehu et al., 2015).

Our study confirms significant gaps in knowledge of members of rural communities toward the prudent use of the five selected broad spectrum antibiotics. At least one of the 5 antibiotics studied was self-medicated by 70.3% of the study population. No study in other rural communities in Kano or nearby states which had studied the prevalence of self-medication with these antibiotics was available for comparison. This rate is disturbing as it is very high when compared with results conducted among households in Khartoum, Sudan (48.1%) (Awad et al., 2005), undergraduate students in Northern Nigeria (38.8%) (Fadare and Tamuno, 2011), (56.9%) Olayemi et al., 2010). The result, however, agreed with findings of Donkor et al. and Kumar et al. where 70.0% and 78.6% of students of tertiary institutions in Ghana and India respectively, had self-used antibiotics (Kemar et al., 2013; Donkor et al., 2012). Similarly the prevalence of self-medication in the second most populous country, India was 78.8% among medical students. Major reasons for self-medication among different groups in many studies include lifestyle, easy access to drugs, and online advertisement of drugs (Yadav and Rawal, 2015). Antibiotics in these rural communities with no hospitals are obtained mostly through purchase from cities by unauthorized personnel's which include relatively literate, but unprofessional and illiterate members of communities that engaged in the drug business. The unrestricted access to antibiotics by these groups of people from their counterparts in the city will make curtailing very difficult. It is therefore necessary for the government to revisit the laws or practices of drug administration, distribution and control in the state or the country at large. The fact that some 4-6% of the total respondents have self-used all the 5 antibiotics for treating different un-diagnosed illness showed the level of abuse in the rural communities and can also point to the fact that the use of the antibiotics are not guided by genuine medical knowledge like they do have for traditional medicine.

Ampiclox was the most commonly self-used antibiotic in this study, which agreed with the similar results obtained in the previous study conducted in the neighboring state (Olayemi et al., 2010). Ampiclox is commonly used to treat infection related illnesses such as boils, rashes and even menstrual pain by both members of urban and rural communities (Sapkota et al., 2010). The total resistance of different clinical pathogens to ampiclox has been reported in the region (Olanitola et al., 2015; Nkang et al., 2009; Tula and Iyoha, 2015). Tetracycline (commonly called red and yellow) was the second most self-medicated broad spectrum antibiotics in the selected rural communities of Kano, Nigeria. The antibiotic which was supposed to be used to treat bacteria confirmed to cause stooling is now being used uncontrollably by rural dwellers to treat diarrhea, dysentery and other symptoms related to food poisoning. Tetracycline resistance in on increase in both hospital and environment sample in Nigeria. Detection of multiple tetracycline resistant genes in bacteria isolated from aquatic systems in southwestern Nigeria may indicate the possibility of horizontal transfer of the genes to pathogenic bacteria (Adesoji et al., 2015). The high prevalence of bacteria to tetracycline reported in the literature in various part of Nigeria will be connected with its gross abuse by both humans and animals (Adesoji et al., 2015; Ayeni et al., 2016). Co-trimoxazole is mainly used to treat cough, sore throat, running nose and related respiratory infections by the members of the communities. The complete dosage of the antibiotics is hardly completed by self-users, because only two tablets are taken with other sedative drugs to treat the symptoms. Co-trimoxazole abuse has been widely reported in Nigeria (Nigerian Bulletin, 2014) and up to 100% resistance of some bacterial pathogens to the antibiotic has been reported (Nkang et al., 2009). Metronidazole commonly called flagyl in the rural communities was the least self-medicated antibiotic in this study. This is in contrary with studies conducted in the Ranjashi city in Bangladesh, where metronidazole was the top self-medicated antibiotic in the region (Biswas et al., 2014). Other antibiotics such as amoxicillin, tetracycline and ciprofloxacin were more frequently used ahead of metronidazole by people that are used to self-medication in other studies (Sapkota et al., 2010; Fadare and tamuno, 2011). Even though it has adverse effects like loss of appetite, dizziness, headache, seizures, tremors and slurred speech, It is a must have drug for the majority of people in Northern Nigeria especially during festivals, when a lot of meat is being consumed. Due to improper cleaning and sanitation of meat and slaughter places, large consumption of meat has usually been associated with stomach ache and

stooling in many communities and flagyl is the self-recommended drugs for many families and friend.

Failed treatment with antibiotics in the Africa and other developing countries in Asia and South America are also connected with the circulation of counterfeit antibiotics (Kelesidis and Falage, 2015). In the study area, over half of the participants that have engaged in antibiotic self-medication often patronize the cheapest, mostly unregistered, counterfeit antibiotics, manufactured and imported mostly from India and China. Some of these cheap antibiotics that cost less than 0.1$ per dose are well sold in the rural communities where the fear of arrest by law enforcement agents is low. The lack of knowledge to differentiate between one drug and another, good and fake drugs and high rate of poverty among the rural dwellers could be among other reasons why proliferations of counterfeit drugs are more available. The fact that, none of the known good antibiotics that cost between $2-3 per dose was abused by the rural dwellers, even though they may not be available to them, clearly showed that cheapness and availability assist the rural dwellers in abusing antibiotics.

The general knowledge of the participants prior to the study on the need to complete antibiotic treatment was very low. The majority (41%) of the participants that have self-used any of the 5 broad spectrum antibiotics only used the antibiotic for 1 day. This is a clear indication that awareness of dangers of antibiotic underuse and its consequences is insignificant in the communities. The very low figures of those who had taken their self-medicated antibiotics for five days, indicate that only a few are aware of importance of dosage completion. Even though we cannot link the ability of the 9.6% participants that completed their antibiotic treatment to having true knowledge of the effect of under dosage, but it could be by trying and error, where the antibiotic intake will continue until the condition for which they take the antibiotic subsided.

The main reasons for selecting a particular antibiotic for un-diagnosed diseases by the respondents were mainly previous prescription by health care workers, past experiences of antibiotics by family and friends. If for example, a family member or friend had previously used an antibiotic for an infection and someone developed similar symptoms, they suggest for the later to use the same antibiotics. Further, some (11%) of the respondents get to know about the use of antibiotics from illegal drug selling points whom the members of rural communities considered to be knowledgeable about antibiotic use. Other reasons gave by the participants as the reason for their self-medication is availability and easy access to the antibiotics (over-the-counter sales of antibiotics), high cost of travel to hospital and difficulty attached to medical practitioners.

The fact that only 6.3% of the participants believed that antibiotic self-medication is a problem indicated the importance attached to self-medication by members of rural communities and may probably account for major reason why the rates of resistant pathogens in rural communities are getting higher. However, with the lack of commitment of stakeholders to educate these people coupled with lack of effective surveillance system and infection control in place, there will be continue spread of resistant pathogen from one community to another. Disturbingly, the majority are not willing to stop self-medication with antibiotics for no reason. In as many antibiotics will be available for them and unauthorized people will be allowed unhindered to hawk or own medical stores, self-medicating with these five broad spectrum antibiotics and others will continue in rural communities. These disturbing figures need appropriate and urgent policies from policy-makers to regulate the availability of antibiotics in rural communities and to ensure their implementation.

This study has some limitations. Kano has a population of over 10 million, with more than half of them residing in the rural communities. The findings obtained from this small sample size (300) cannot be generalized to the whole population of about 36 local government areas located in the rural areas. Therefore, the 300 individuals that participated in this study are only the representative of the 10 communities in the 5 selected local governments.

In conclusion, our findings provide the first information on self-medication with five broad spectrum antibiotics for the treatment of un-diagnosed illnesses among rural community members of the most populous state in Nigeria. The finding provides a vivid evidence about the abuse of antibiotics in the communities and could explain the high rates of antibiotic-resistant pathogens previously reported among the dwellers.

Lack of knowledge, easy access to antibiotics, poor access to health care services are some of the factors that support their actions. Age, sex, and type of occupation does not play a role in their antibiotic abuse. The need to develop a viable antibiotic stewardship programs in rural areas is highly stressed.

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