Self-medication with antibiotics: Empirical evidence from a Nigerian rural population

Abstract

Background: Self-medication is a strong determinant of antimicrobial overuse as well as a causative of drug resistance. Irrational antibiotic use among patients has led to antibiotic resistance and serious health problem globally.

Objective: The objectives of the present study were to estimate the prevalence of self-medication with antibiotics in a sample of rural population presenting in primary health care centers in Northern Nigeria and evaluate sociodemographic factors associated with the practice.

Methods: This is a cross-sectional survey using a structured questionnaire to collect data from 1,150 randomly selected clinic attendees who visited the 25 Primary Health Centersin Niger State, Nigeria, between August 2014 andFebruary 2015. Only participants who lived and reside in Niger State, Nigeria were enrolled into the study

Results: In this study 602 men and 548 women, with mean age of 52.6 ± 16.5 years actually participated.Use of antibiotics within 6 months was reported by 945 clinic attendees (82.2%). The majorsources of antibiotic self-medication weredrug stores(20.4%), chemist shops (58.2%)& pharmacy(10.9%). The antibiotics most frequently used for self-medication were ampicillin/cloxacillin combination (24.1%), ampicillin (20.3%),sulfamethoxazole/trimethoprim combination (14.2%),metronidazole (13.9%) and tetracycline (13.1%). Cough with productive mucus (30.1%), sore throat (23.7%), unremitting fever (20.7%), dysuria (10.6%) skin sepsis(7.5%), and vaginal discharge (7.4%) were themost frequent indications for the use of self-medicated antibiotics.The most important factors associated with self-medication were affordability(79.3%), accessibility 68.4% and application of previous prescriptions (60.4%).

Conclusion: Knowledge of antibiotics from rural population in Niger state, Nigeria is insufficient. Despite the open and rapid access to primary health care services, it appears that a high proportion of rural population in Niger state use antibiotics without medical prescription. More information about antibiotic use should be provided by physicians, pharmacists and chemists before prescribing and dispensing antibiotics. Self-medication with antibiotics is a serious problem in Nigeria and requires considerable attention.

Keywords: Self-medication; antibiotics; Nigeria; antibiotic use

INTRODUCTION: Antibiotics are revolutionary therapeutic agents for microbial eradication[1]. Unfortunately, despite public awareness and concern of health care providers, irrational use of antibiotics is on the rise globally (50% to almost 100%) [2,3].Rampant irrational use of antimicrobials without medicalguidance may result in greater probability of inappropriate, incorrect, or undue therapy, missed diagnosis, delays in appropriate treatment, pathogen resistance and increased morbidity[4,5]. Emergence of human pathogen resistance to antibiotics, both due to over and under use, is potentially dangerous for both individuals and societies[4,6,7].

Self-medication is defined as ‘‘the use of drugs to treat self-diagnosed disorders orsymptoms without prescription, or the intermittent or continued use of a prescribed drugfor chronic or recurrent disease or symptoms or sharing medicines with relatives ormembers of one's social circle or using leftover medicines stored at home’’ [3,8].

Self-medication with antibiotics constitute a major form of irrational use of medicine and cancause significant adverse effects such as resistance to microorganisms, treatment failures, drug toxicity, increase in treatment cost, prolonged hospitalization periods and increase in morbidity [9]. In majority of economically deprived countries, nearly 60-80% of health related problems are treated through self-medicated as lower cost alternative [10,11]. Self-medication particularly with antimicrobials is a phenomenon of increasing global relevance. The utilization of antibiotics without prescription is motivated by a complex set of factors, worthmentioning are unchecked sales, economic and time constrains, influence of family andfriends, consumer attitudes and expectations and media campaigns[6,11,12,13].In Nigeria, like many other developing countries, antibiotics are easily accessible to everyone without a prescription, a phenomenon seen in many economically deprived countries[14]. In addition, there are limited controls on the sale or advertisement of antimicrobials, creating opportunities for misinformation and misperceptions that can exacerbate improper antibiotic use[15,16]. In addition, counterfeit drugs and poor pharmaceutical qualities of available antimicrobials (containing no or substandard active ingredients) have been widely reported[17,18,19]. These factors often lead to higher rates of resistance ~~to~~ in less-expensive first-line regimens, compelling subsequent changes in treatment protocols to include more expensive and sometimes more toxic drugs[20]. ~~Ready~~ Abundant availability and easy access to antibiotics with poor pharmaceutical in patent medicine stores

encourages self-medication. In addition, access to good and effective medical interventions is often limited due to poor hospital facilities; service fees; poverty and hunger; and illiteracy [15,16,21,22]. Patronage of "quacks," untrained individuals providing unconventional and unhygienic medical care, is therefore widespread and frequently becomes institutionalized as normal. Previous studies have sought to understand patterns of self-medication with antibiotics in developing and other countries [23-27]. While irrational use of antibiotics through self-medication tends to carry more significance in thedeveloping world, the problem has been investigated in only a few of these countries including Nigeria. In Nigeria, a wide range of antibiotics are available on the market and acquiring drugs over the counter is a very common practice. This can facilitate self-medication which is thought to be highly common in Nigeria community, and a study like this is needed to support this assertion. Self-medication could result in treatment failures and several clinical complications. To help address these problems, and also provide a basis for relevant policy measures, the study was undertaken.

Antibiotics represent one of the most prescribed drugs worldwide and their resistance is a major public health threat, hence the need for research on antibiotic usage patterns to help develop appropriate interventions.The objectives of the study were to estimate the prevalence of self-medication with antibiotics in a rural area in Nigeria and to identify factorsassociated with this practice.

METHODOLOGY

Study setting: The study was carried out in Niger State, Nigeria, from August, 2014 to Feburary, 2015. Niger State is located in North Central Nigeria and has a population of above four million people [28]. The State has 25 General hospitals, 275 Primary health care centers (PHCs) and more than a thousand pharmacy and chemist shops, each of which is normally manned by a qualified pharmacist, pharmacy technician or primary health care worker.

Study design:A cross-sectional study was designed based on a validated anonymous self-administered questionnaire. Approval was obtained from the officer-in-charges of the PHC facilities and informed consent from the participantswas obtained.To be eligible for this study, participants had to provide signed or thumb printed informed consent. Only those who lived and reside in study areas were enrolled for the study.The questionnaire was translated to the local

language and properly explained before administering to those who were illiterates.The study was conducted in 25 PHCs in the State (one per Local Government Authority-LGA).Selected PHCs were chosen by simple random sampling technique. Respondents were recruited by the researchers. All the patients who came to the selected PHCs during the study period were asked to fill out the questionnaire at the PHCs, regardless of antibiotic acquisition at the time of visit or antibiotic use at any time in the last 6 months. Only participants who permanently reside and have stayed for two years and above in the study area were included for the study. Respondents under 18 and those with occupation related to health care were excluded from the study. A total of 1150 respondents were eligible for the study.No incentive was offered for participation in the study. It was completely optional.

Study instrument: Information was collected using structured questionnaire (in ~~english~~ English language but translated to local language) containing both open- and close-ended (multiple-choice) questions. The questionnaire was developed based on a previously conducted literature review [29-36]and specific cultural considerations. The validity and reliability of the questionnaire were ascertained through a pilot study, in a sub-sample of 50 participants, to ensure that the questionnaire would be appropriate, comprehensive, and understandable among prospective respondents. The pilot testing allowed quality improvement of several questions by wording modification and achieved high internal consistency and reliability. Cronbach's alpha was calculated as a measure of internal validity of the questionnaire. The Cronbach's alpha value for the questionnaire was 0.8 indicating a good level of internal consistency.In this study, self-medication was considered as selection and use of antibiotics by the study participants to treat self-recognized or self-diagnosed condition in the last 6 months to the study without prescription.

Sample size: A sample size calculation was performed using the following equation: $n = (Z^2P(1-P))/(d^2)$, where n = sample size, Z = Statistic corresponding to a chosen level of confidence, P = expected prevalence, and d = precision [37]. In our calculation, we used Z = 1.96, P = 0.5(0.5 was used because there was no local study with prevalence value that could be used)and d = 0.05. This calculation resulted in a sample size of 385.As the study was conducted in rural community PHCs(this is likely to cause a selection bias, which is one of the limitations of this study), and to increase reliability of sampling and sampling-based generalizability, the required sample size was doubled resulting in a sample size of 670. In order to account for non-responses, the sample size was increased by 10% thus resulting into n=737. A total of 1200 questionnaires were

distributed to the selected PHCs. In total, 1150 respondents completed the questionnaire and were included in the study. Therefore 1150 were finally used as the study sample size.

~~**Variables description**~~**Description of variables:** Self-medication with antibiotics among participants in survey areas of study was the outcome variable. Other variables in the analysis included geo-political zone (political grouping of the local government areas by geographical area), gender, duration of stay in the study area, education, marital status, age, sex,current health status, having antibiotics and antibiotics used during last 6 months.

Statistical analyses: Reported data were collated,checked, coded, and entered into a Microsoft Access database. The data were then cleaned and analyzed using descriptive and inferential statistics. A descriptive and comparative statistical data analysis was processed with the SPSS 17.0 (SPSS Inc., Chicago, IL, USA). Simple and multiple logistic regression models were used to evaluate associations between participant characteristics and reported usage of antibiotics. Odds ratios (OR), 95% confidence intervals (CI), and *p*-values were calculated for each independent variable. Continuous data were presented as means, along with their 95% confidence intervals (CIs). A *p*-value less than 0.05 were considered to be statistically significant.

Methods used for protecting against bias: It has been argued that imprecise and poorly designed questions may result in bias particularly if respondents fail to impart truthful answers due to misunderstandings and misinterpretations. In this study, questions were designed in such a way that they should be understandable to the planned study population without any trouble. Transparency of questions and the technical understanding of the questionnaire were tested and confirmed before starting the survey. A number of alternatives were given to respondents to clarify their answers especially for multiple option questions. Questionnaire used in the pilot survey had added space for comments by the respondents. These comments were used to fine tune the question when necessary. The questionnaire was also reviewed by experts with long experience of working with antibiotic self-medication research. Questionnaire was revised and finalized based on feedback from respondents of pilot and advice from experts on antibiotic medication research. Efforts were made and measures were taken to enhance the response rate because low response rate has been regarded as a source of bias in surveys. Other measures taken to improve the response rate included given several reminders, proper design of the questionnaire and fine tuning of sensitive questions.

RESULT

***Study population characteristics*:** A total of 1150 out of 1220 administered questionnaires (93.9% response rate) were completed and returned by the participants from the 25 Local Government Authorities (LGAs) in Niger State, Nigeria. Out of 1150 participants, majority (61.1%) were males. Median age of the participants was 25 years (range 19-68). Majority(39.1%) of participants belonged to Zone C (Geo-political). Very few participants (11.8%) had tertiary education. One third of the participants categorized their health status as excellent (36.7%) and good (34.5%). The characteristics of the study population are summarized in Table 1.

Past experiences with antibiotics self-Medication:Use of antibiotics within the past 6months was reported by 945 (82.2%)clinic attendees without medical prescription.A little more than half (50.8%) participantself-medicated with antibiotics to treat their illnesses. About one quarter (24.3%) participants claimed that they rarely used antibiotic through self-medication when they were sick. More than one-third (35.8%) were completely satisfiedwith their experience of self-medication with antibiotics. Only10% ofparticipants ever encountered side effects with antibiotic self-medication, and of thesemajority (46.4%) experienced gastrointestinal system related side effects. Less than ten percent wereun-decisive, most of the time, on their own whether they needantibiotic for illness or not. About half (48.2%) of the participants were of the view that self-medication with antibiotics was good while 51.8% were not sure about it. Just overone-third (34.7%) participants were not sure whether self-medication is safe or not.Percentage differences in those who experienced self-medication as safe (22.1%) andunsafe (24.8%) were not appreciable. Less than five percent (3.9%) participants were aware of the factthat self-medication with antibiotics may result in adverse effects. More than one-third (36.2%) of the participants reported that they would use antibiotics through self-medication infuture.

Sources of Information:The major sources of antibiotic for self-medication were drug stores (20.4%), chemist shops (58.7%) & pharmacy (10.9%). Other sources were relations (5.4%), friends (4.3) and remnant stock (0.8%).

Prevalence of self-medication:This study demonstrated that an appreciably high percentage (82.2%) of Nigerians in the study area had self-medicated themselves with antibiotics.

Types of antibiotics and indications for self-medication:The antibiotics most frequently used for self-medication were ampicillin/cloxacillin combination (24.1%), ampicillin (20.3%), amoxicillin (10.7%), sulfamethoxazole/trimethoprim combination (14.2%), ciprofloxacin (3.7%), metronidazole (13.9%) and tetracycline (13.1%) (Table 2).Cough with productive mucus (30.1%), sore throat (23.7%), unremitting fever (20.7%), dysuria (10.6%) skin sepsis (7.5%), and vaginal discharge (7.4%) were the most frequent indications for the use of self-medicated antibiotics.

Reasons for Antibiotic self-medication:Several reasons were cited for practicing self-medication (Table 4). The most important reasons for practicing self-medication were that it was less expensive compared to medical care in the health facility (79.3%), and secondly, self-medication is associated with easy accessibility (68.4%). Difficulty in accessing health facility was the least reason for self-medication (18.7%).

Treatment of specific symptom/infection: Table 5 summarizes the types of antibiotics that were used to treat specific infection and provides estimates of the prevalence of use for each antibiotic; ampicillin/cloxacillin combination, ampicillin, amocixillin, sulfamethoxazole/trimethoprim, ciprofloxacin, metronidazole and tetracycline were used to treat the symptoms/infections (6 infections/symptoms) like productive cough, sore throat dysuria, skin sepsis, vaginal discharge and unremitting fever. The higher the prevalence under each symptom/infection the more likelihood the preferred antibiotic for such symptom/infection . Generally ampicillin/cloxacillin seems to be most preferred antibiotic for self- medication for various ailments encountered by the participants. If a preferred antibiotic was not available, 21.3% (95% CI: 15.7% to 26.9) of study participants reported that they would use another type of antibiotic to treat the specific symptom/infection. The antibiotics were said to be effective in relieving symptoms/infections, a number of participants reported that the drugs relieved each of the symptoms/infections, of which the largest proportions indicated that antibiotics relieved cough with productive sputum (16%, 95% CI: 12% to 20%), sore throat (15%, 95% CI: 11% to

19%), dysuria(21%, 95% CI: 17% to 25%) , skin sepsis (13%, 95% CI: 9% to 17%), vaginal discharge (18%, 95% CI: 14% to 22%) and unremitting fever (20%, 95% CI: 16% to 24%).

There was no significant difference between the self-medication practices of participants based on ethnicity (p=0.07) and having stock of antibiotics (p=0.08). Self-medication practices of participants were significantly affected by level of education (p=0.03),current health status (p=0.042), gender (p=0.007), and duration of stay in the study area (p=0.04).Ironically, self-medication rates were not significantly lower in participants who were awareof its harmful effects (p=0.2) and those who think it is not safe (p=0.2). There wasstatistically significant difference between self-medication practices of those who got sickduring last 6 months and those who did not (p=0.04), healthcare and non-healthcarerelated professionals (p=0.005).

Only 17.8% (205/1150) of the participants, who did not report self-medication with antibiotics, had stored drugs at home compared to 59.2% (401/689) of the participants who reported self-medication (p< 0.05). About one-quarter 388 (25.9%) of the participants reported earlier discontinuation of antibiotics when symptoms improved and 175 (15.2%) continued to use antibiotics as preventive measure even when the symptoms have completely disappeared or when they engaged in un-protected sex.

DISCUSSION

The response rate in this study was 93.9%.Over the years, the response rate in surveys has always been a matter of concern forinvestigators. Response rate varies a lot, especially, in internet-based surveys[38, 39]. It has been reported that response rate is an important indicator of level of success of asurvey in collecting information from all eligible in a population or sample. Inability ofsome sample members to give the required information, disentitlement of some samplemembers, non-existence of some members of the sample, refusal to participate due to anyreason, failure to find and contact targeted members, physical and language limitationscould be the grounds resulting in failure to get required information in a survey.Additionally, reluctance, stigma and shame associated with self-perceived lowperformance or dispersal of information may result in refusal to participate and nonresponse[(40)].

To the best of our knowledge, this study represents the first published work on irrational antibioticuse through self-medicationamong rural dwellers in the study area.

This study aimed to estimate prevalence of self-medication. The study further assessed self-reporteduse of non-prescribed antibiotics, as well as sources for obtaining antibiotics, reasons for

self-medication and type of antibiotics. This study also assessed common types of illnesses, frequently usedantibiotics and determinants of self-medication. The long-term aim of the study was to getan overview of antibiotic self-medication among Nigerianrural dwellers in order tohelp in planning future interventions to address this issue. Indirectly, this study also determined the reasons for self-medicationwith antibiotics.Self-medication would not be acceptable and justified even in real urgent/emergency situation as well as in treating minor ailments that do not require physician consultation and thus a way to cut down burden on healthcare system especially in resource-poor countries like Nigeria. However, certain pre-conditions should be met to guarantee user safety like indication to use the drug must be recognized, and user must know the right use and possible side effects/interactions with other drugs.

Unrestricted sales at pharmacies, experience with similar illness, good experience with antibiotic, assumed knowledge about antibiotics, earlier use of prescribed antibiotics, wrong prescription of antibiotic, compulsive antibiotic prescribing, saving time, problem too trivial, socioeconomic factors, emergency need, access to literature, leftovers, lifestyle and a potential to manage certain illnesses through self-care were the common factors triggering antibiotic self-medication.

Self-medication with antibiotics, a phenomenon practiced globally, is affecting both developing and developed countries. Worldwide, such human malpractice has resulted in inadequate dosing, incomplete courses and indiscriminate antimicrobial use and thus is thought to be associated with increase in the probability of inappropriate, incorrect, or undue therapy, adverse reactions, missed diagnosis, delays in proper treatment and pathogen resistance. Resultantly, the phenomenon has contributed to prolonged human sufferings in terms of morbidity and mortality [41-46]. Emerging pathogen resistance to antimicrobial, fueled by self-medication, is a real globalproblem[46]. To combat microbial resistance issues, newantibiotics are under development. Development of new and even more expensive drugsto fight resistant microbes will further add to the problems of unprivileged particularly inresource-poor countries such as Nigeria

This study demonstrated that an appreciably high percentage (82.2%) of Nigerian rural dwellers had self-medicated themselves with antibiotics. To the best of our knowledge no study like this exist before this in the study area, so far, thus no data was available for comparisons. High prevalence of self-medication in general and with antibiotics in particular is a universal problem and variations regarding such medications in terms of prevalence vary across the globe; Hong Kong (72.1%-94%)[47], Sudan (79.5% to 48%)[40], Lithuania (39.9%)[48], Ethiopia (38.5%)[11]. Interestingly, somelower rates

have been reported in Malta (19.2%)[49], Mexico (5%)[50] and Sweden (3%)[51]. Thesevariations could be due to differences in attitudes, literacy, environment, culture andlegislation in these countries. Evidence from the various studies including ours indicate that self- medicationappears to be relatively higher in the developing world compared to the developed which is notsurprising given the free access and marketing of antibiotics in the former. Prevalence rate in this study is much lower compared tosome other countries but still high enough to be taken seriously.

Our study showed that self-medication practices among participants were significantly influenced by level of education ($p < 0.05$). Another Nigerianstudy identified level of education as a major factor that influenced self-medicationpatterns[52]. Sapkota et alfurther showed that a higher level of education isinversely associated with self-medication of antibiotics[42]. Another study contended that respondents with low education are less aware ofconsequences of self-medication and thus more prone to practice it [53]. Findings from this study are consistent with the findings of other Nigeria studies [(52, 54)], where age was not significantly associated with antibiotic self-medication. On the otherhand, in Lithuania, self-medication was found to be reasonably affected by age [48].

In this study males seemed more prone to self-medication than females. Our finding is similar to that of other studies where antibiotic usage is associated with gender [48, 55].Chemist and Pharmacy shops were the most common source of antibiotics. Previous studies conducted in Africa have also identified pharmacies as important sources of self-administered drugs [46, 56]. Understanding the sources of information and sourcesof drugs for antibiotic self-medication can help in the formulation of community-based interventions that can help to reduce self-medication practices.

Many medical conditions are predisposing factors to antibiotic self-medication. In this study, self-medication was as a result of participants having cough with productive mucus (30.1%), sore throat (23.7%), un-remitting fever (20.7%), dysuria (10.6%) skin sepsis (7.5%), and vaginal discharge (7.4%). These ailments were the most frequent indications for the use of self-medicated antibiotics. The indications for self-medication in this study was similarly found and reported in other previous studies [47, 55, 57]. Unfortunately, majority of the medical conditions/symptoms are of viral origin and usually need no antibiotic treatment for cure. The study by Afolabi et al[52] also reported dental symptoms as indications for antibiotic self-medication.

Ampiclox is the most commonlyself-medicated antibiotic in this study. This finding is in contrast to that of other studies[58-60] that reported Amoxicillin as the most frequently used antibiotic for self-medication.Amoxicillin is the mostfrequent used antibiotic because of low-cost across the globe and its wide-spread prescription by health care providers, thus making it well-known to public [58-60]. Other

antibiotics used for self medication in this study include ampicillin, tetracycline, ciprofloxacin and metronidazole. This finding is consistent with earlier studies [54, 60] as participants consumed antibiotics for self-medication belonging to five different types/classes and among those of penicillin group were on the top. The diversities in selection of antibiotics among different study groups might be because of their different knowledge and attitude towards such medication.

Self- medication in this study appears to be more driven by economic factors meaning that the participants were unable to pay for the cost of health facility care and therefore resulted into self-medication which they considered to be cheaper and affordable. This finding agrees with studies done in Sudan [27]and Bogotá [61]. This thereforeimplies that providing affordable health care services may be crucial for dealing with theproblem of irrational antibiotic associated with self-medication. However the medical services shouldalso be convenient for patients in terms of waiting periods, as delays at hospitals/clinics was anothermajor factor associated with self-medication[62].

CONCLUSION: This study has shown that irrational use of antibiotics through self- medication appears to be a common practice among Nigerian rural areas. This finding provides a vivid evidence about the abuse of antibiotics in Nigeria and explains the escalating trend of antibiotic resistance in the country. Despite easy accessibility to primary care services, it appears that a high proportion of rural adult population prefers to use antibiotics without medical prescription. The high prevalence of self-medication with antibiotics in Nigerian rural areaunderscores the role of the primary care physician in advising patients about the correct use of the prescribed antibiotics. Another important intervention to stem the tide of self-medication with antibiotics is effective legislation banning unregulated sale of antibiotics without medical prescription.Efforts should be made by appropriate health organizations to conduct annual antibiotic awareness campaign emphasizing the importance of using antibiotics responsibly. By targeting rural dwellers, this study addresses a population with fewer resources than the general population. Future research should include other populations of Nigerian to determine the overall prevalence of self-medication with antibiotic.

LIMITATIONS: Some limitations were identified and research ethics demands that they better be acknowledged. These limitations include the following:

1. Recall bias: This is a cross-sectional study that utilized a self-administeredsurvey to estimate the prevalence of self-medicated antibiotic use in the past. Therefore, bydesign, recall bias cannot be ruled out.Recall period used in this study was 6 months.
2. Definition of terms: Defining and explaining 'self-medication' and 'antibiotic' for the participants seemed somewhat complicated. In their responses, some participants regarded non-antibiotics as antibiotics, this shows that either definition was not clear to them or they were not knowledgeable enough to differentiate the two Although questionnaire did not contain much difficult terms, irrespective of this fact, there is a theoretical possibility that participants' encountered difficulties in understanding, interpreting and answering few questions due to some medical and unfamiliar terms used. This might be due to their educational background and language limitations.
3. Inability of some sample members to give the required information, disentitlement of some sample members, refusal to participate due to any reason, failure to find and contact targeted members, physical and language limitations could be the grounds resulting in failure to get required information in a survey.

Table 1: Study Population Characteristics

Demographic Characteristics	Frequency	Percentage
Geopolitical distribution		
Zone A	400	34.8
Zone B	300	26.1
Zone C	450	39.1
Education level		
Primary	623	54.2
Secondary	390	33.9
Tertiary	137	11.9
Age (Years)		
18-22	206	17.9
23-27	417	36.3
28-32	323	28.1
33-37	100	8.7
>38	104	9.0
Sex		

Male	602	52.3
Female	548	47.7
Marital Status		
Single	301	26.2
Married	609	53
Separated	150	13
Divorce	90	7.8

Table 2: Prevalence of use of each antibiotic for self-medication

Antibiotic	Prevalence (%)	95% Confidence Interval
Ampicillin/ Clocacillin combination	24.1	20-27
Ampicillin	20.3	18-26
Amoxicillin	10.7	8-15
Sulfamethoxazole/trimethoprim combination	14.2	10-18
Ciprofloxacin	3.7	1-6
Metronidazole	13.9	11.6-15.8
Tetracycline	13.1	10 -16

Table 3: Multivariate analysis of factors that may influence self-medication with antibiotics for treatment of ailments

Independent Variable (n)	Odd ratio	95% Confidence Interval	P-value
Productive Cough			
No (267)	1.00	-	
Yes (883)	1.68	1.32-1.96	0.03
Sore throat			
No (160)	1.00	-	
Yes (990)	1.84	1.63-2.51	0.02
Dysuria			
No (152)	1.00	-	
Yes (998)	1.76	1.57-1.86 [A1]	0.02
Skin Sepsis			
No (275)	1.00	-	
Yes (875) 1.62	1.29-1.87	0.005	
Vaginal Discharge			

No (245)	1.00	-	
Yes (905)	1.71	`1.42- 1.94	0.04
Unremitting fever			
No (352)	1.00		
Yes (798)	1.48	10.22-1.96	0.005
Age (yrs)			
<20	1.00	-	
21-29	1.07	1.52-1.64	0.89
>30	1.59	1.27-1.83	0.63
Education			
Primary (623)	1.00		
Secondary (390)	1.24	1.13-1.87	0.046
Tertiary (137)	1.32	1.18- 1.96	0.031
Gender			
Male (602)1.56	1.48-1.64	0.0053	
Female (548)	1.00		

Table 4: Factors associated with self-medication (Reasons for self-Medication)

Reasons	Frequency	Percentage	95% CI
Affordability (Less expensive)	912	79.3	74.2-84.3
Accessibility (Antibiotics are easily obtained)	787	68.4	65.2-72.9
Application of previous prescription	695	60.4	57.2- 63.5
Imitating others in drug usage	584	50.8	46.4- 55.2
Hospital/Clinics delays	634	55.1	50.4- 59.8
Previous knowledge of antibiotics	481	41.8	39.2-44.4
Difficulty in accessing Health Facility	215	18.7	15.2- 22.2
Health workers attitude	603	52.4	48.3- 56.5

Table 5: Prevalence of each antibiotic to treat specific Infection/Disease

Antibiotic	Productive cough		Sore throat		Dysuria		Skin sepsis		Vagina discharge		Unremitting fever	
	Prev	95% CI	Prev	95% CI	Prev	95% CI	Prev	95% CI	Prev	95% CI	Prev	95% CI
Ampiclox	80.6	77.20-83.9	87.4	84.3-90.5	95.8	92.1-99.5	68.4	67.3-69.5	98.3	96.7-99.9	64.5	63.10-65.9
Ampicillin	71.5	70.0-73.0	81.3	78.4-84.2	88.7	86-91.4	66.8	65.1-68.5	72.8	71.4-74.2	58.4	56.3-60.5
Amoxicillin	75.2	73.1-77.3	94.8	92.7-96.9	69.5	67.8-70.2	58.1	55.7-60.5	60.3	59.1-61.5	52.3	51.4-53.2
Cotrimoxazole	83.6	80.6-86.4	82.8	80.9-84.7	78.0	76.5-79.5	52.5	48.3-56.7	51.2	49.6-52.8	69.4	67.6-71.2
Ciprofloxacin	91.8	90.6-93.0	85.6	83.5-87.7	97.8	97.1-98.5	70.5	68.4-72.6	96.7	96.1-97.3	57.9	56.6-59.5
Metronidazole	53.7	51.5-55.9	51.0	49.2-52.8	73.6	72.7-74.5	50.3	48.9-51.7	85.3	83.1-87.4	67.5	66.2-68.8
Tetracycline	50.1	48.9-51.3	51.4	50.0-52.8	82.4	81.5- 83.3	50.7	49.1-52.3	60.7	59.4-62.0	64.3	62.5-66.1

REFERENCES

1.Mainous AG, Diaz VA, Carnemolla M. Factors affecting Latino adults' use of antibiotics for self-medication. J Am Board Fam Med 2008;21(2):128-134.

2. Gaash B. Irrational use of antibiotics. Indian journal of practicing doctor 2008;5(1):25-29

3. Zafar SN, Syed R, Waqar S, Zubairi AJ, Vaqar T, Shaikh M, et al. Self-medication amongst University Students of Karachi: Prevalence,Knowledge and Attitudes. J Pak Med Assoc. Student's corner 2008;58(4):214-217.

4. Matuz M, Benko R, Doro R, Hajdu E, Soos G. Non-prescription antibiotic use in Hungary. Pharm World Sci 2007;29:695-698

5. Parimi N, Pereira LMP, Prabhakar P. Caregivers' practices, knowledge and beliefs of antibiotics in paediatric upper respiratorytract infections in Trinidad and Tobago: a crosssectionalstudy. BMC Family Practice 2004;5:28.

6. Kristiansson C, Reilly M, Gotuzzo E, Rodriguez H, Bartoloni A, Thorson A, et al. Antibiotic use and health-seeking behaviour inan underprivileged area of Peru´. Tropical Medicine and International Health 2008;13(3):434-441.

7. Sahoo KC. Antibiotic use, environment and antibiotic resistance: A qualitative study among human and veterinary health care professionals in Orissa, India. Masters thesis in Applied Ecology: University of Halmstad School of Business and Engineering, 2008. Available from: URL: hh.diva-portal.org/smash/get/diva2:239095/FULLTEXT01

8.World Health Organization. Guidelines for the regulatory assessment of Medicinal Products for use in self-medication.Characteristics of self-medication. WHO/EDM/QSM/00.1, 2000.

9. Goossens, H.; Ferech, M.; Vander Stichele, R.; Elseviers, M. Outpatient antibiotic use in Europe and association with resistance: A cross-national database study. Lancet2005;365: 579–587.

10. Awad AI and Eltayeb IB. Self-Medication Practices with Antibiotics and Antimalarials Among Sudanese Undergraduate University Students. The Annals of Pharmacotherapy 2007;41(7):1249-1255.

11. Abay SM and Amelo W. Assessment of self-medication practices among medical, pharmacy, and health science students in Gondar University, Ethiopia. J Young Pharmacists 2010;2:306-10.

12. Rowe AK, de Savigny D, Lanata CF et al. How can we achieve and maintain high-quality performance of health workers in low-resource settings? The Lancet 2005;366(9490):1026-1035

13. Barros ARR, Griep RH, Rotenberg L. Self-medication among nursing workers from public hospitals. RibeirãoPreto. Rev. Latino-Am. Enfermagem 2009;17(6):1015-1022

14. Chang FR, Trivedi PK. Economics of self-medication: theory and evidence. Health Econ 2003;12:721-739.

15.Okeke IN, Aboderin OA, Byarugaba DK, Ojo KK, Opintan JA: Growing problem of multidrug-resistant enteric pathogens in Africa. Emerging Infectious Diseases 2007;13:1640-1646.

16. Ojo KK, Sapkota A.Self-prescribed use of antimicrobials during menstrual periods: a disturbing new example of information poverty in Nigeria. Journal of Infection in Developing Countries 2007;1:123-124.

17.Okeke IN, Lamikanra A: Quality and bioavailability of tetracycline capsules in a Nigerian semiurban community. International Journal of Antimicrobial Agents 1995;5:245-250.

18.Nkang AO, Okonko IO, Lennox JA, Babalola ET, Adewale OG, Motayo BO, *et al.*: Survey of the efficacy and quality of some brands of the antibiotics sold in Calabar Metropolis, South-south region of Nigeria. Scientific Research and Essays 2010;5:395-406.

19.Okeke IN, Lamikanra A: Quality and bioavailability of ampicillin capsules dispensed in a Nigerian semi-urban community. Afr J Med MedSci 2001;30:47-51

20. Okeke IN, Ojo KK: Antimicrobial use and resistance in Africa. InAntimicrobial Resistance in Developing Countries.Edited by Sosa A, Byarugaba DK, Amábile-Cuevas CF, Hsueh PR, Kariuki S, Okeke IN. New York: Springer; 2009:301-314.

21. Ojo KK, Sapkota AR, Ojo TB, Pottinger PS: Antimicrobial resistance gene distribution: A socioeconomic and sociocultural perspective. GMS German Medical Science - an Interdisciplinary Journal2008;3:Doc 26.

22. Shankar PR, Partha P, Shenoy N: Self-medication and non-doctor prescription practices in Pokhara valley, Western Nepal: a questionnaire-based study. BMC FamPract 2002;3:17.

23. Saradamma RD, Higginbotham N, Nichter M: Social factors influencing the acquisition of antibiotics without prescription in Kerala State, south India. Social Science & Medicine 2000, 50:891-903.

24. Buke C, Hosgor-Limoncu M, Ermertcan S, Ciceklioglu M, Tuncel M, Kose T, *et al*.: Irrational use of antibiotics among university students. Journal of Infection2005;51:135-139.

25. Sawalha AF: Self-medication with antibiotics: A study in Palestine. The International Journal of Risk and Safety in Medicine2008;20:213-222.

26.Borg MA, Scicluna EA: Over-the-counter acquisition of antibiotics in the Maltese general population. Int J Antimicrob Agents2002;20:253-257.

27.Awad A, Eltayeb I, Matowe L, Thalib L: Self-medication with Antibiotics and Antimalarials in the community of Khartoum State, Sudan. Journal of Pharmacy and Pharmaceutical Sciences2005;8:326-331.

28. National Population Commission, Federal Republic of Nigeria. 2013 national census results

29.You, J.H.S.; Yau, B.; Choi, K.C.; Chau, C.T.S.; Huang, Q.R.; Lee, S.S. Public knowledge, attitudes and behavior on antibiotic use: A telephone survey in Hong Kong. Infection 2008;*36*, 153–157.

30. Lim, K.K.; Teh, C.C. A Cross sectional study of public knowledge and attitude towards antibiotics in Putrajaya, Malaysia. South. Med. Rev.2012;*5*, 26–33.

31. Barah, F.; Gonçalves, V. Antibiotic use and knowledge in the community in Kalamoon, Syrian Arab Republic: A cross-sectional study. East.Mediterr. Health J2010;*16*, 516–521.

32. Ling Oh, A.; Hassali, M.A.; Al-Haddad, M.S.; Syed Sulaiman, S.A.; Shafie, A.A.; Awaisu, A.Public knowledge and attitudes towards antibiotic usage: A cross-sectional study among the general public in the state of Penang, Malaysia. J. Infect. Dev. Ctries2011;*5*, 338–347.

33. Väänänen, M.H.; Pietilä, K.; Airaksinen, M. Self-medication with antibiotics—Does it really happen in Europe? Health Policy2006, *77*, 166–171.Int. J. Environ. Res. Public Health 2015;12:7015

34. Skliros, E.; Merkouris, P.; Papazafiropoulou, A.; Gikas, A.; Matzouranis, G.; Papafragos, C.; Tsakanikas, I.; Zarbala, I.; Vasibosis, A.; Stamataki, P.; Sotiropoulos, A. Self-medication with antibiotics in rural population in Greece: A cross-sectional multicenter study. BMC Fam. Pract 2010, 11, doi:10.1186/1471-2296-11-58.

35. Ilhan, M.N.; Durukan, E.; Ilhan, S.O.; Aksakal, F.N.; Ozkan, S.; Bumin, M.A. Self-medicationwith antibiotics: Questionnaire survey among primary care center attendants. Pharmacoepidemiol.Drug Saf2009;18: 1150–1157.

36. Al-Azzam, S.I.; Al-Husein, B.A.; Alzoubi, F.; Masadeh, M.M.; Al-Horani, M.A.S. Self-medicationwith antibiotics in Jordanian population. Int. J. Occup. Med. Environ. Health 2007;20: 373–380.

37. Daniel WW: Biostatistics: A Foundation for Analysis in the Health Sciences New York: John Wiley & Sons, Incorporated, 7 1998.

38.Braithwaite D, Emery J, Lusignan S, Sutton S. Using the internet to conduct surveys of health professionals: a valid alternative? Family Practice 2003;20:545-551.

39.Pulakka A. What, when and from whom? Healthcare providers' views to infectious diseases screening practices of immigrants in Finland. MHS Thesis, University of Tampere, 2009. Available from:URL: http://tutkielmat.uta.fi/pdf/gradu03905.pdf

40.Khan R. Knowledge of clinical case management of IMNCI among trained and untrainedprimary health care personnel in two districts of province Punjab in Pakistan. MHSThesis, University of Tampere, 2009. Available from: URL: http://tutkielmat.uta.fi/pdf/gradu03938.pdf

41. Verma RK, Mohan L, Pandey M. Evaluation of self-medication among professional students in North India: proper statutory drug control must be implemented. Asian Journal of Pharmaceutical and Clinical Research 2010;3(1):60-64

42. Spellberg B, Guidos R, Gilbert D et al for the Infectious Diseases Society of America. The epidemic of antibiotic-resistant infections: a call to action for the medical community from the Infectious Diseases Society of America. Clin Infect Dis 2008;46(2):155-164.

43. Matuz M, Benko R, Doro R, Hajdu E, Soos G. Non-prescription antibiotic use in Hungary. Pharm World Sci 2007;29:695-698

44.Parimi N, Pereira LMP, Prabhakar P. Caregivers' practices, knowledge and beliefs of antibiotics in paediatric upper respiratorytract infections in Trinidad and Tobago: a crosssectional study. BMC Family Practice 2004;5:28.

45. Al-azzam SI, Al-husein BA, Alzoubi F, Masadeh MM, Al-horani MAS. Self-medication with antibiotics in Jordanian population. International Journal of Occupational Medicine and Environmental Health 2007;20(4):373–380.

46. Awad A, Eltayeb I, Matowe L et al. Self-medication with antibiotics and antimalarials in

the community of Khartoum State, Sudan. J Pharm PharmSci 2005;8(2):326-31.

47. Lau GS, Lee KK, Luk CT. Self-medication among university students in Hong Kong. Asia Pac J Public Health 1995;8:153-7.

48. Berzanskyte A, Valinteliene R, Haaijer-Ruskamp FM, Gurevicius R, Grigoryan L. Self-Medication with antibiotics in Lithuania.Int J Occup Med Environ Health 2006;19(4):246-53.

490. Borg MA and Scicluna EA .Over-the-counter acquisition of antibiotics in the Maltese general population. Int J Antimicrob Agents 2002;20(4):253-7.

50.Calva J and Bojalil R. Antibiotic use in a periurban community in Mexico: A household and drug store survey. SocSci Med 1996;42(8):1121-1128.

51. Svensson E, Haaijer-ruskamp FM and Lundborg CS. Self-Medication with Antibiotics in a Swedish General Population. Scandinavian Journal of Infectious Diseases. 2004;36(6-7):450-452.

52. Afolabi AO. Factors influencing the pattern of self-medication in an adult Nigerian population. Ann Afr Med 2008;7:120-127.

53.Grigoryan L, Burgerhof JG, Degener JE, et al for the Self-Medication with Antibiotics and Resistance (SAR) Consortium. Determinants of self-medication with antibiotics in Europe: the impact of beliefs, country wealth and the healthcare system. J Antimicrob Chemother 2008;61(5):1172-1179.

54. Sapkota AR, Coker ME, Goldstein RER, Atkinson NL, Sweet SJ et al. Self-medication with antibiotics for the treatment of menstrual symptoms in southwest Nigeria: a crosssectional study. BMC Public Health 2010; 10:610.

55. Ali SE, Ibrahim MIM, Palaian S. Medication storage and self-medication behavior amongst female students in Malaysia. Pharmacy Practice (Internet) 2010;8(4):226-232.

56. Joubert PH, Sebata PD, van Reenen OR: Self-medication in a developing community. S Afr Med J 1984[A2]; 65:129-131.

57.Olayemi OJ, Olayinka BO and Musa AI. Evaluation of antibiotic self-medication pattern amongst undergraduate students of Ahmadu Bello University (Main Campus), Zaria. Research Journal of Applied Engineering and Technology 2010;2(1):35-38.

58. Al-azzam SI, Al-husein BA, Alzoubi F, Masadeh MM, Al-horani MAS. Self-medication with antibiotics in Jordanian population. International Journal of Occupational Medicine and Environmental Health 2007;20(4):373–380.

59. Sarahroodi S and Arzi A. Self-medication with antibiotics, is it a problem among Iranian College students in Tehran. J. Biol. Sci 2009;9:829-832.

60. Sarahroodi S, Arzi A, Sawalha AF and Ashtarinezhad A. Antibiotics self-medication among southern iranian university students. Int. J. Pharmacol 2010;6:48-52.

61. López, J.J.; Dennis, R.; Moscoso, S.M. A study of self-medication in a neighborhood in Bogotá.Rev. Salud. Publica (Bogota) 2009;11: 432–442.

62.Self-Medication Practices with Antibiotics among Tertiary Level Students in Accra, Ghana: A Cross-Sectional Study.Int. J. Environ. Res. Public Health 2012;9: 3519-3529