

# Self-medication with antibiotics: Empirical evidence from 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—a 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 factors associated with the practice.

**Methods:** This is a cross-sectional survey using a validated questionnaire to collect data from 1,150 randomly selected clinic attendees (602 men/548 women, mean age  $32.6 \pm 16.5$  years), who visited the 25 Primary Health Centers in Niger State, Nigeria, between August 2014 and February 2015.

**Results:** Use of antibiotics within the past 12 months was reported by 945 clinic attendees (82.2%), while 689 (59.9%) reported that they had used antibiotics without medical prescription at least one time. The major sources of antibiotic self-medication were drug stores, chemist shops & pharmacy (89.5%). The antibiotics most frequently used for self-medication were Ampiclox – Ampicillin/Cloxacillin combination (29.2%), Ampicillin (25.5%), Amoxicillin (23.3%), Septrin (16.7%), and ciprofloxacin (5.3%). 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%) were the most frequent indications for the use of self-medicated antibiotics.

**Conclusion:** Nigerian rural population knowledge of antibiotics is insufficient. Despite the open and rapid access to primary health care services, it appears that a high proportion of Nigerian rural population 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 among Nigerian rural population is an important public health problem and this may reflect the situation among rural population in the whole of Nigeria. Self-medication with antibiotics is a serious problem in Nigeria and requires considerable attention.

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

33 **INTRODUCTION:** Antibiotics are revolutionary therapeutic agents for microbial eradication<sup>1</sup>.

34 Unfortunately, despite public awareness and concern of health care providers, irrational use of  
35 antibiotics is on a rise globally (50% to almost 100%)<sup>2,3</sup>. Rampant irrational use of  
36 antimicrobials without medical guidance may result in greater probability of inappropriate,  
37 incorrect, or undue therapy, missed diagnosis, delays in appropriate treatment, pathogen  
38 resistance and increased morbidity<sup>4,5</sup>. Emergence of human pathogen resistance to antibiotics,  
39 both due to over and under use, is potentially dangerous for both individuals and societies<sup>4,6,7</sup>.

40 ‘Self-medication has been defined as obtaining and consuming drugs without the advice  
41 of a physician either for diagnosis, prescription or surveillance of treatment’<sup>3,8</sup>. Self-medication  
42 with antibiotics constitute a major form of irrational use of medicine and can cause significant  
43 adverse effects such as resistance to microorganisms, treatment failures, drug toxicity, increase  
44 in treatment cost, prolonged hospitalization periods and increase in morbidity<sup>9</sup>. In majority of  
45 economically deprived countries, nearly 60- 80% of health related problems are treated through  
46 self-medicated as lower cost alternative<sup>10,11</sup>. Self-medication particularly with antimicrobials is  
47 a phenomenon of increasing global relevance. The utilization of antibiotics without prescription  
48 is motivated by a complex set of factors, worth mentioning are unchecked sales, economic and  
49 time constrains, influence of family and friends, consumer attitudes and expectations and media  
50 campaigns<sup>6,11,12,13</sup>. In Nigeria, like many other developing countries, antibiotics are easily  
51 accessible to everyone without a prescription, a phenomenon seen in many economically  
52 deprived countries<sup>14</sup>. In Nigeria, there are limited controls on the sale or advertisement of  
53 antimicrobials, creating opportunities for misinformation and misperceptions that can exacerbate  
54 improper antibiotic use<sup>15,16</sup>. In addition, counterfeit drugs and poor pharmaceutical qualities of  
55 available antimicrobials (containing no or substandard active ingredients) have been widely  
56 reported<sup>17,18,19</sup>. These factors often lead to higher rates of resistance to less-expensive first-line  
57 regimens compelling subsequent changes in treatment protocols to include more expensive and  
58 sometimes more toxic drugs<sup>20</sup>. In addition, access to good and effective medical interventions is  
59 often limited due to poor hospital facilities; service fees; poverty and hunger; and illiteracy  
60<sup>15,16,21,22</sup>. Patronage of "quacks," untrained individuals providing unconventional and unhygienic  
61 medical care, is therefore widespread and frequently becomes institutionalized as normal.  
62 Previous studies have sought to understand patterns of self-medication with antibiotics in

63 developing and other countries <sup>23-27</sup>. These studies have identified several indications for self-  
64 medication with antibiotics including the common cold, <sup>23,24,26</sup> diarrhea or constipation, <sup>25</sup> and  
65 sore throat <sup>26</sup>.

66 While irrational use of antibiotics through self-medication tends to carry more significance in the  
67 developing world, the problem has been investigated in only a few of these countries. In Nigeria,  
68 a wide range of antibiotics are available on the market and acquiring drugs over the counter is a  
69 very common practice. This can facilitate self-medication which is thought to be highly common  
70 in Nigeria community, and a study like this is needed to support this assertion. Self-medication  
71 could result in treatment failures and several clinical complications. To help address these  
72 problems, and also provide a basis for relevant policy measures, the study was undertaken.

73 Antibiotics represent one of the most prescribed drugs worldwide and their resistance is a major  
74 public health threat, hence the need for research on antibiotic usage patterns to help develop  
75 appropriate interventions. The objectives of the study were to estimate the prevalence of self-  
76 medication with antibiotics among Nigerian rural population and to identify factors associated  
77 with this practice.

## 78 METHODOLOGY

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

85 **Study design:** A <sup>29</sup> prospective cross-sectional study was designed based on a validated  
86 anonymous self-administered questionnaire. Approval was obtained from the officer-in-charges <sup>30</sup>  
87 of the PHC facilities and informed consent from the participants <sup>31</sup> to be eligible for this study,  
88 participants had to provide signed or thumb printed informed consent <sup>32</sup> the study was conducted  
89 in 25 PHCs in the State (one per LGA) <sup>33</sup> selected PHCs were chosen by simple random sampling  
90 technique. Respondents were recruited by the researchers. All the patients who came to the  
91 selected PHCs during the study period were asked to fill out the questionnaire at the PHCs,

92 regardless of antibiotic acquisition at the time of visit or antibiotic use at any time in life.  
93 Respondents under 18 and those with occupation related to health care were not included in this  
94 study. A total of 1150 respondents were eligible for the study. No incentive was offered for  
95 participation in the study. It was completely optional.

96 **Study instrument:** Information was collected using validated questionnaire (in English language  
97 but translated to local language) containing both open- and close-ended (multiple-choice)  
98 questions. The questionnaire was developed based on a previously conducted literature review<sup>29-</sup>  
99<sup>36</sup> and specific cultural considerations. The validity and reliability of the questionnaire were  
100 ascertained through a pilot study, in a sub-sample of 50 participants, to ensure that the  
101 questionnaire would be appropriate, comprehensive, and understandable among prospective  
102 respondents. The pilot testing allowed quality improvement of several questions by wording  
103 modification and achieved high internal consistency and reliability. In this study, self-medication  
104 was considered as selection and use of antibiotics by the study participants (or their family  
105 members) to treat self-recognized or self-diagnosed condition at any time in life without  
106 prescription.

107 **Sample size:** A sample size calculation was performed using the following equation:  $n = (Z^2$   
108  $P(1-P))/(d^2)$ , where  $n$  = sample size,  $Z$  = Statistic corresponding to a chosen level of confidence,  
109  $P$  = expected prevalence, and  $d$  = precision<sup>37</sup>. In our calculation, we used  $Z = 1.96$ ,  $P = 0.05$  and  $d$   
110 = 0.05. This calculation resulted in a sample size of 385. As the study was conducted in rural  
111 community PHCs, and to increase reliability of sampling and sampling-based generalizability,  
112 the required sample size was doubled resulting in a sample size of 670. In order to account for  
113 non-responses, the sample size was increased by 10% thus resulting into  $n=737$ . A total of 1200  
114 questionnaires were distributed to the selected PHCs. In total, 1150 respondents completed the  
115 questionnaire and were included in the study. Therefore 1150 were finally used as the study  
116 sample size

117 **Statistical analyses:** Reported data were collated, checked, coded, and entered into a Microsoft  
118 Access database. The data were then cleaned and analyzed using descriptive and inferential  
119 statistics. A descriptive and comparative statistical data analysis was processed with the SPSS  
120 17.0 (SPSS Inc., Chicago, IL, USA). Simple and multiple logistic regression models were used  
121 to evaluate associations between participant characteristics and reported usage of antibiotics.  
122 Odds ratios (OR), 95% confidence intervals (CI), and  $p$ -values were calculated for each



123 independent variable. Continuous data were presented as means, along with their 95%  
124 confidence intervals (CIs). A  $p$ -value less than 0.05 was considered to be statistically significant.

## 125 RESULT


126 **Study population characteristics:** A total of 1150 out of 1225 administered questionnaires  
127 (93.9% response rate) were completed and returned by the participants from the 25 LGAs in  
128 Niger State, Nigeria. Out of 1150 participants, majority (61.1%) were males. Median age of the  
129 participants was 25 years (range 19-38). Majority of participants (58.2%) belonged to Zone  
130 (39.1%). Very few participants (11.8%) had tertiary education. Majority of the participants  
131 categorized their health status as excellent (36.7%) and good (34.5%). The characteristics of the  
132 study population are summarized in Table 1.

133 **Past experiences with antibiotics self-Medication:** Use of antibiotics within the past 12 months  
134 was reported by 945 (82.2%) clinic attendees without medical prescription. Among 82.2%  
135 participants who had used antibiotics in their lifetime, almost every day (53.4%) reported un-  
136 prescribed use. A little more than half (50.8%) participant cited that they had used antibiotics through  
137 self-medication to treat their illnesses. About one quarter (24.3%) participants claimed that they  
138 rarely used antibiotic through self-medication when they were sick. More than one-third (35.8%)  
139 were completely satisfied with their experience of self-medication with antibiotics. Only 10% of  
140 participants ever encountered side effects with antibiotic self-medication, and of these majority  
141 (46.4%) experienced gastrointestinal system related side effects. Less than ten percent were un-  
142 decisive, most of the time, on their own whether they need antibiotic for illness or not. About half  
143 (48.2%) of the participants were of the view that self-medication with antibiotics was good while  
144 51.8% were not sure about it. Just over one-third (34.7%) participants were not sure whether self-  
145 medication is safe or not. Percentage differences in those who experienced self-medication as safe  
146 (22.1%) and unsafe (24.8%) were not appreciable. Less than five percent (3.9%) participants were  
147 aware of the fact that self-medication with antibiotics may result in adverse effects. More than one-  
148 third (36.2%) of the participants reported that they would use antibiotics through self-medication in  
149 future.

150 **Sources of Information:** The major sources of antibiotic for self-medication without prescription  
151 were drug stores (91.5%), chemist shops (85.7%) & pharmacy (89.5%)


152 **Prevalence of self-medication:** This study demonstrated that an appreciably high percentage  
153 (59.9%) of Nigerians in the study area had self-medicated themselves with antibiotics

154 When asked about the self-medicated use of antibiotics, 82.2% reported that they had used  
 155 antibiotics without medical prescription at least one time in the past 12 months.

156 **Types of antibiotics and indications for self-medication:** The antibiotics most frequently used  
 157 for self-medication were Ampiclox – Ampicillin/Cloxacillin combination (24.1%), Ampicillin  
 158 (20.3%), Amoxicillin (10.7%), Septrin- Sulphadiazole/Methoprin combination (14.2%),  
 159 Ciprofloxacin (3.7%), Metronidazole (13.9%) and Tetracycline (13.1%) (Table 2). Cough with  
 160 productive mucus (30.1%), Sore throat (23.7%), Un-remitting fever (20.7%), dysuria (10.6%)  
 161 skin sepsis (7.5%), and vaginal discharge (7.4%) were the most frequent indications for the use  
 162 of self-medicated antibiotics (Table 3). 

163 **Reasons for Antibiotic self-medication:** Several reasons were cited for practicing self-  
 164 medication (Table 4). The most important reasons for practicing self-medication were  
 165 that it was less expensive compared to medical care in the health facility (79.3%), and  
 166 secondly, medical care in health facility were associated with easy accessibility (68.4%).  
 167 Difficulty in accessing health facility was the least reason for self-medication (18.7%).  
 168

169 **Treatment of specific symptom/infection:** Table 5 summarizes the types of antibiotics that  
 170 were used to treat specific infection and provides estimates of the prevalence of use for each  
 171 antibiotic. Ampiclox, Ampicillin, Amocixillin, Cotrimoxazole, ciprofloxacin, metronidazole and  
 172 tetracycline were used to treat the symptoms/infections (6 infections/symptoms) like productive  
 173 cough, sore throat dysuria, skin sepsis, vaginal discharge and unremitting fever. The higher the  
 174 prevalence under each symptom/infection the more likelihood the preferred antibiotic for such  
 175 symptom/infection . Generally Ampiclox seems to be most preferred antibiotic for self-  
 176 medication for various ailments encountered by the participants. If a preferred antibiotic was not  
 177 available, 21.3% (95% CI: 15.7% to 26.9) of study participants reported that they would use  
 178 another type of antibiotic to treat the specific symptom/infection. The antibiotics were said to be  
 179 effective in relieving symptoms/infections, a number of participants reported that the drugs  
 180 relieved each of the symptoms/infections, of which the largest proportions indicated that  
 181 antibiotics relieved cough with productive sputum, (16%, 95% CI: 12% to 20%), sore throat  
 182 (15%, 95% CI: 11% to 19%), dysuria(21%, 95% CI: 17% to 25%) , skin sepsis (13%, 95% CI:  
 183 9% to 17%), vaginal discharge (18%, 95% CI: 14% to 22%) and unremitting fever (20%, 95%  
 184 CI: 16% to 24%).  
 185

186 There was no significant difference between the self-medication practices of participants  
 187 based on ethnicity ( $p=0.07$ ) and having stock of antibiotics ( $p=0.08$ ). Self-medication  
 188 practices of participants were significantly affected by level of education ( $p=0.003$ ), current  
 189 health status ( $p=0.4$ ),  gender ( $p=0.7$ ), and duration of stay in the study area ( $p=0.4$ ). Ironically,  
 190 self-medication rates were not significantly lower in participants who were aware of its harmful  
 191 effects ( $p=0.2$ ) and those who think it is not safe ( $p=0.2$ ). There was statistically significant



192 difference between self-medication practices of those who got sick during last 6 months and  
193 those who did not ( $p=0.04$ ), healthcare and non-healthcare related professionals ( $p=0.005$ ).  
194 Only 17.8% (205/1150) of the participants, who did not report self-medication with antibiotics,  
195 had stored drugs at home compared to 59.2% (401/689) of the participants who reported self-  
196 medication ( $P < 0.05$ ). About one-quarter 388 (25.9%) of the participants reported earlier  
197 discontinuation of antibiotics when symptoms improved and 175 (15.2%) continued to use  
198 antibiotics as preventive measure even when the symptoms have completely disappeared or  
199 when they engaged in un-protected sex.

## 200 **DISCUSSION**

201 The response rate in this study was 93.9%. Over the years, the response rate in surveys has always  
202 been a matter of concern for investigators. Response rate varies a lot, especially, in internet-based  
203 surveys<sup>38,39</sup> It has been reported that response rate is an important indicator of level of success of a  
204 survey in collecting information from all eligible in a population or sample. Inability of some sample  
205 members to give the required information, disinterest of some sample members, non-existence of  
206 some members of the sample, refusal to participate due to any reason, failure to find and contact  
207 targeted members, physical and language limitations could be the grounds resulting in failure to get  
208 required information in a survey. Additionally, reluctance, stigma and shame associated with self-  
209 perceived low performance or dispersal of information may result in refusal to participate and  
210 nonresponse<sup>(40)</sup>.

211 To the best of our knowledge, this study represents the first published work on irrational  
212 antibiotic use through self-medication among rural dwellers in the study area.

213 This study aimed to estimate prevalence/magnitude of self-medication. The study further assessed  
214 self-reported use of non-prescribed antibiotics, as well as sources for obtaining antibiotics, reasons  
215 for self-medication and type of antibiotics. This study also assessed common types of illnesses,  
216 frequently used antibiotics and determinants of self-medication. The long-term aim of the study was  
217 to get an overview of antibiotic self-medication among Nigerian rural dwellers in order to help in  
218 planning future interventions to address this issue. Indirectly, this study also determined the reasons  
219 for self-medication with antibiotics. Self-medication would be acceptable and justified in real  
220 urgent/emergency situation and in treating minor ailments that do not require physician consultation  
221 and thus a way to cut down burden on healthcare system especially in resource-poor Countries like  
222 Nigeria. However, certain pre-conditions should be met to guarantee user safety like indication to use


223 the drug must be recognized, and user must know the right use and possible side effects/interactions  
224 with other drugs.

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

231 Self-medication with antibiotics, a phenomenon practiced globally, is affecting both  
232 developing and developed countries. Worldwide, such human malpractice has resulted in  
233 inadequate dosing, incomplete courses and indiscriminate antimicrobial use and thus is  
234 thought to be associated with increase in the probability of inappropriate, incorrect, or  
235 undue therapy, adverse reactions, missed diagnosis, delays in proper treatment and  
236 pathogen resistance. Resultantly, the phenomenon has contributed to prolonged human  
237 sufferings in terms of morbidity and mortality<sup>41-46</sup>. Emerging pathogen resistance to antimicrobial,  
238 fueled by self-medication, is a real global problem<sup>46</sup>. To combat microbial resistance issues, new  
239 antibiotics are under development. Development of new and even more expensive drugs to fight  
240 resistant microbes will further add to the problems of unprivileged particularly in resource-poor  
241 countries such as Nigeria

242 This study demonstrated that an appreciably high percentage (59.9%) of Nigerian rural dwellers had  
243 self-medicated themselves with antibiotics, whereas the percentage of those who ever did so is even  
244 higher (82.2%). To the best of our knowledge no study like this exist before this in the study area, so  
245 far, thus no data is available for comparisons. High prevalence of self-medication in general and with  
246 antibiotics in particular is a universal problem and variations regarding such medications in terms of  
247 prevalence vary across the globe; Hong Kong (72.1%-94%)<sup>47</sup>, Sudan (79.5% to 48%)<sup>40</sup>, Lithuania  
248 (39.9%)<sup>48</sup>, Ethiopia (38.5%)<sup>49</sup>, Interestingly, some lower rates have been reported in Malta (19.2%)  
249<sup>50</sup>, Mexico (5%)<sup>51</sup> and Sweden (3%)<sup>52</sup>. These variations could be due to differences in attitudes,  
250 literacy, environment, culture and legislation in these countries. Evidence from the various studies  
251 including ours indicate that self- medication appears to be relatively higher in the developing  
252 world compared to the developed which is not surprising given the free access and marketing of  
253 antibiotics in the former. Prevalence rate in this study is much lower compared to some other  
254 countries but still high enough to be taken seriously.



255 Our study showed that self-medication practices among participants were significantly influenced by  
256 level of education ( $p < 0.05$ ). Another Nigerian study identified level of education as a major factor  
257 that influenced self-medication patterns <sup>53</sup>. *Sapkota et al* further showed that a higher level of  
258 education is inversely associated with self-medication of antibiotics <sup>42</sup>. Another study contended that  
259 respondents with low education are less aware of consequences of self-medication and thus more  
260 prone to practice it <sup>54</sup>. Findings from this study are consistent with the findings of other studi  <sup>3, 55</sup>,  
261 where age was not significantly associated with antibiotic self-medication. On the other hand, in  
262 Lithuania, self-medication was found to be reasonably affected by age <sup>48, 53, 55</sup>.

263 In this study males seemed more prone to self-medication than females. Our finding is similar to that  
264 of other studies where antibiotic usage is associated with gender <sup>48, 56</sup>. Chemist and Pharmacy shops  
265 were the most common source of antibiotics. Previous studies conducted in Africa have also  
266 identified pharmacies as important sources of self-administered drugs <sup>46, 57</sup>. Understanding the  
267 sources of information and sources of drugs for antibiotic self-medication can help in the  
268 formulation of community-based interventions that can help to reduce self-medication practices.  
269 Many medical conditions are predisposing factors to antibiotic self-medication. In this study,  
270 self-medication was as a result of participants having cough with productive mucus (30.1%),  
271 Sore throat (23.7%), Un-remitting fever (20.7%), dysuria (10.6%) skin sepsis (7.5%) , and  
272 vaginal discharge (7.4%). These ailments were the most frequent indications for the use of self-  
273 medicated antibiotics. The indications for self-medication in this study was similarly found and  
274 reported in other previous studies <sup>47, 56, 58</sup>. Unfortunately, majority of the medical  
275 conditions/symptoms are of viral origin and usually need no antibiotic treatment for cure. The study  
276 by Afolabi et al <sup>53</sup> also reported dental symptoms as indications for antibiotic self-medication.

277 Ampiclox is the most commonly self-medicated antibiotic in this study. This finding is in contrast to  
278 that of other studies <sup>59-61</sup> that reported Amoxicillin as the most frequently used antibiotic for self-  
279 medication. Amoxicillin is the most frequent used antibiotic because of low-cost across the globe and  
280 its wide-spread prescription by health care providers, thus making it well-known to public <sup>59-61</sup>. *Other*  
281 *antibiotics used for self medication in this study include Ampicillin, Tetracycline, Ciprofloxacin and*  
282 *Metronidazole. This finding is consistent with earlier studies <sup>55, 61</sup> as participants consumed*  
283 *antibiotics for self-medication belonging to five different types/classes and among those of Penicillin*  
284 *group were on the top. The diversities in selection of antibiotics among different study groups might*  
285 *be because of their different knowledge and attitude towards such medication.*

286 Self- medication in this study appears to be more driven by economic factors meaning that the  
287 participants were unable to pay for the cost of health facility care and therefore resulted into self-  
288 medication which they considered to be cheaper and affordable. This finding agrees with studies  
289 done in Sudan <sup>27</sup> and Bogotá <sup>62</sup>. This therefore implies that providing affordable health care  
290 services may be crucial for dealing with the problem of irrational antibiotic associated with self-  
291 medication. However the medical services should also be convenient for patients in terms of  
292 waiting periods, as delays at hospitals/clinics was another major factor associated with self-  
293 medication <sup>63</sup>. The participants surveyed in this study represent a small but very important segment  
294 of Nigerian population. Thus, it is unclear whether the responses of the surveyed participants are  
295 representative of other Nigerians who did not participate in the survey.



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

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

- 312 1. Recall bias: This is a cross-sectional study that utilized a self-administered survey to  
313 estimate the prevalence of self-medicated antibiotic use in the past. Therefore, by design,  
314 recall bias cannot be ruled out.
- 315 2. Definition of terms: Defining and explaining 'self-medication' and 'antibiotic' for the  
316 participants seemed somewhat complicated. In their responses, some participants

317 regarded non-antibiotics as antibiotics, this shows that either definition was not clear  
 318 to them or they were not knowledgeable enough to differentiate the two. Although  
 319 questionnaire did not contain much difficult terms, irrespective of this fact, there is a  
 320 theoretical possibility that participants' encountered difficulties in understanding,  
 321 interpreting and answering few questions due to some medical and unfamiliar terms  
 322 used. This might be due their educational background and language limitations.

323  
 324 **Table 1: Study Population Characteristics**

326	Demographic Characteristics	Frequency	Percentage
328	<b>Geopolitical distribution</b>		
329	Zone A	400	34.8
330	Zone B	300	26.1
331	Zone C 	450	39.1
333	<b>Education level</b>		
334	Primary	623	54.3
335	Secondary	390	33.9
336	Tertiary	135	11.8
338	<b>Age (Years)</b>		
339	<18	44	3.8
340	18-22	206	17.9
341	23-27	417	36.3
342	28-32	323	28.1
343	33-37	100	8.7
344	>38	60	5.2
346	<b>Sex</b>		
347	Male	602	52.3
348	Female	548	47.7
350	<b>Marital Status</b>		
351	Single	301	26.2
352	Married	609	53
353	Separated	150	13
354	Divorce 	90	7.8
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**Table 2: Prevalence of use of each antibiotic for self-medication**

Antibiotic	Prevalence	Confidence Interval
Ampiclox (Ampicillin + Cloxacillin)	24.1	0.20-0.27
Ampicillin	20.3	0.18-0.26
Amoxicillin	10.7	0.80-0.15
Cotrimoxazole	14.2	0.10-0.18
Ciprofloxacin	3.7	0.01-0.06
Metronidazole	13.9	11.6-15.8
Tetracycline	13.1	0.10 -0.16

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

Independent Variable	Odd ratio	95% Confidence Interval	P-value
<b>Productive Cough</b>			
No (n=267)	1.00	-	
Yes (n=883)	0.68	0.32-0.96	0.03
<b>Sore throat</b>			
No (n=160)	1.00	-	
Yes (990)	0.84	0.47-1.24	0.02
<b>Dysuria</b>			
No (152)	1.00	-	
Yes (998)	0.76	0.34-1.38	0.02
<b>Skin Sepsis</b>			
Yes (275)	1.00	-	
No (875)	0.62	0.29-1.17	0.05
<b>Vaginal Discharge</b>			
No (245)	1.00	-	
Yes (905)	0.71	0.31- 1.35	0.04
<b>Unremitting fever</b>			
No (n=352)	1.00	-	
Yes (n=798)	0.48	0.22-0.96	0.005
<b>Age (yrs)</b>			
<20	1.00	-	
21-29	1.07	0.52-1.64	0.89
>30	1.59	0.27-0.83	0.63
<b>Education</b>			
Primary (n=623)	1.00	-	
Secondary (n=390)	0.24	0.23-0.87	0.046
Tertiary (n= 135)	0.32	0.18- 0.96	0.031
<b>Gender</b>			
Male	0.56	0.48-0.64	0.53
Female	1.00	-	

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**Table 4: Reasons for self-Medication**

Reasons	Frequency	Percentage	95% CI
Affordability (Less expensive) 84.3	912	79.3	74.2-84.3
Accessibility 72.9 (Antibiotics are easily obtained)	787	68.4	65.2-72.9
Application of previous prescription 63.5	695	60.4	57.2-63.5
Imitating others in drug usage 55.2	584	50.8	46.4-55.2
Hospital/Clinics delays 59.8	634	55.1	50.4-59.8
Previous knowledge of antibiotics 44.4	481	41.8	39.2-44.4
Difficulty in accessing Health Facility 22.2	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	2.62-9.8	87.4	3.46-10.56	95.8	4.54-12.8	68.4	0.74-1.12	98.3	5.32-13.86	64.5	0.58-0.94
Ampicillin	71.5	0.78-1.46	81.3	2.90-11.32	88.7	2.68-13.49	66.8	0.66-0.92	72.8	0.82-1.36	58.4	0.36-0.79
Amoxicillin	75.2	0.94-1.86	94.8	4.22-1.34	69.5	0.75-1.14	58.1	0.39-0.71	60.3	0.42-0.69	52.3	0.27-0.61
Cotrimoxazole	83.6	2.86-10.75	82.8	2.99-10.68	78.0	1.73-8.42	52.5	0.26-0.64	51.2	0.19-0.48	69.4	0.29-0.78
Ciprofloxacin	91.8	2.94-10.43	85.6	2.97-11.66	97.8	5.27-13.59	70.5	0.93-1.58	96.7	4.59-12.44	57.9	0.27-0.69



Metronidazole	53.7	0.28-0.72	51	0.18	0.46	73.6	0.85-1.46	50.3	0.18-0.52	85.3	2.48-11.86	67.5	0.25-0.62
Tetracycline	50.1	0.17-0.56	51.4	0.19	0.49	82.4	0.82-1.77	50.7	0.22-0.64	60.7	0.66-0.82	64.3	0.84-1.46

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