ejpmr, 2017,4(6), 93-105

SJIF Impact Factor 4.161

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

PREVALENCE AND CORRELATES OF SELF-MEDICATION WITH ANTIBIOTICS AMONG PHARMACY UNDERGRADUATES IN A NIGERIAN UNIVERSITY

***[1]Sani Ibn Yakubu, [2]Nasiru Yakubu Ikunaiye, [3]Rosaline I. Aderemi-Williams, [2]Abubakar Babakura Tijjani and [2]Abdul-Basit Haliru Yakubu**

[1]Department of Clinical Pharmacy and Pharmacy Administration, Faculty of Pharmacy, University of Maiduguri, Nigeria.

[2]Department of Pharmaceutical Services, University of Maiduguri Teaching Hospital, Maiduguri, Nigeria.

[3]Department of Clinical Pharmacy, University of Lagos, Nigeria.

***Corresponding Author: Sani Ibn Yakubu**

Department of Clinical Pharmacy and Pharmacy Administration, Faculty of Pharmacy, University of Maiduguri, Nigeria.

Article Received on 07/04/2017 **Article Revised on 27/04/2017** **Article Accepted on 17/05/2017**

ABSTRACT

Self-medication with antibiotics (SMA) is a well-recognized form of drug misuse which needs concerted action. Awareness of this problem among pharmacy undergraduates is extremely vital. **Objective:** This study was to assess the prevalence of SMA and factors influencing the practice among pharmacy undergraduates of the University of Maiduguri, Nigeria. **Method:** A cross-sectional, pre-tested questionnaire-based survey using stratified, random sampling technique to collect the relevant information pertaining to the study variables. **Results:** A total of 185 students parcitipated (response rate of 100%). Out of these, 79 students (42.7%) were females, 106 (57.3%) males and their mean age was 23 years. Non-married students were in majority. Among them, 92.% had SMA, more than one SMA episode (60.1%) and had recommended antibiotics (69.9%) in the last one year. The most common conditions that prompted SMA were catarrh/cough (20.5%) and diarrhoea (19.6%), while the most self-medicated antibiotics among the students was metronidazole (17.3%), followed by amoxicillin and ciprofloxacin (15.0%). Most students (41.5%) had incomplete course of treatment and the outstanding reason cited for SMA was past successful treatment (81.9%). **Conclusion:** The prevalence of SMA was found to be high, but there was no significant variation ($p > 0.05$) in SMA based on gender, age, marital status, perception on antibiotic resistance, prior knowledge of antibiotics and level of knowledge on antibiotics. Furthermore, our findings revealed a significant association between high students' university level and the prevalence of SMA.

KEYWORDS: self-medication, antibiotics, pharmacy, students, prevalence.

INTRODUCTION

Self-medication with antibiotics (SMA), defined as antibiotic use by individuals to treat symptoms/diseases without professional advice or prescription, is a well recognized form of irrational use of medicine contributing to and sometimes increased morbidity among the population.[1,2,3] The reported estimates of SMA frequencies in the general population were 3%-19% in developed countries and 9%-100% in developing countries,[4] 3% in northern Europe as compared to 4-75% in Asia.[5] In Nigeria the prevalence of SMA was 38.8% among medical undergraduates,[6] while the prevalence was 70%[7] among medical students in Ghana Previous studies had looked at the prevalence, characteristics and reasons for self-medication among all university undergraduates in different countries of the world.[8,9,10,4] In Nigeria, previous studies had concentrated on self-medication practices among the general population,[11] health care workers[12] and SMA among medical undergraduates.[6] There was no known study conducted on SMA practices among pharmacy undergraduates, thereby creating a gap that needs to be filled. This study was apt because pharmacy undergraduates by virtue of their training in drug use control processes, they have the potential role in counselling patients about the advantages and disadvantages of self-medication. Thus, this study sought to assess the prevalence, characteristics and reasons of SMA practices among pharmacy undergraduates of the University of Maiduguri.

MATERIALS AND METHOD

Research Design and Setting

A cross-sectional, pre-tested questionnaire-based survey was carried out among pharmacy undergraduates of the Faculty of Pharmacy, University of Maiduguri, Borno state, North-East Nigeria.

Study Population
A total of 257 pharmacy undergraduates comprised of 74, 84, 67 and 32 in student university levels 200, 300, 400 and 500 respectively.

Sample size
The minimum sample size desired was calculated to be 154 using the sample size formula for cross sectional studies of population ≤10,000 described by Araoye[13] as follow: $n_t = \frac{Nn}{N+n}$ but can only be calculated from population ≥10,000; given by $n = \frac{z^2 pq}{d^2}$ **(**Desired sample size when the population is greater than 10,000); z = standard normal deviate at 95% confidence level usually set at 1.96; p= proportion of pharmacy undergraduates presumed to have practiced antibiotic self-medication (50%=0.5), whereas q= 1-p = 0.5; d= degree of precision or acceptable error margin (5% or 0.05 for this study). This gives $n = \frac{1.96^2(0.5)(0.5)}{(0.05)^2}$ = 384. We further calculated our desired sample size) n_t (p = < 10,000) using $n_t = \frac{Nn}{N+n}$,where N= sum total of study population group and n= desired sample size (p = ≥ 10,000). Then $n_t = \frac{257 \times 384}{257 + 384}$ = 154. As not all the desired population size, i.e. 154, could be reached; an adjusted sample size ($adj.n_t$) was calculated in order to fill in the gap for poor response rate. The response rate of 83%[6] was adopted. Thus, the sample size adjusted for response rate was calculated using the formula $adj.n_t = \frac{calc.sample\ size}{respond\ rate}$ as shown in Table 1. A proportional quota sampling technique was employed to arrived at the adjusted sample size ($adj.n_t$) of 185.

Table 1: Sample size distribution of pharmacy undergraduates.

Student	Population (P_i)	Contributing proportion $(\emptyset = \frac{P_i}{N})$	Sample size $(n_i = \emptyset \times n_t)$	sample size Adjusted for response rate $(adj.n_t = \frac{n_i}{0.83})$
200Level	74	0.29	45	54
300Level	84	0.33	51	61
400Level	67	0.26	40	48
500Level	32	0.12	18	22
Total	**N=∑ P_i= 257**		**n_t=154**	**Adj. n_t= 185**

Inclusion Criteria
Included were pharmacy undergraduates who were in 200 Level and above as well as had agreed to participate in the study.

Exclusion criteria
Excluded were pharmacy undergraduates who were in 100 level as well as those in other levels who were incapacitated to the extent that they could not respond to the questionnaire and had not agreed to participate in the study.

Ethical Clearance and Consent
Prior to the commencement of the study, ethical clearance and informed written consent were respectively obtained from the Research and Ethical Committee of the University of Maiduguri and each participant.

Data Collection Instruments
A total of 185 expert validated and pre-tested 40-item questionnaires adopted from the literature[14,6,15,16,17,18,4] were distributed among the students, using stratified, random sampling technique as shown in Table 1. Each questionnaire was divided into five sections: section A briefly covered the socio-demographic aspects, section B enquired whether the participants had practiced antibiotic self-medication (the specific drug(s) used, duration of use, side effects and other relevant information) with the lead question being - Have you ever self-medicated with antibiotics in the last one year?; sections C - D were geared towards knowing the source of acquiring the antibiotics, why turning to SMA practice and so on; section E contained 8 Likert-type statements that sought to rate the respondents' perception about antibiotic resistance using a five-step scale, and section F contained questions that asssed the respondents' general knowledge about antibiotics. Each correct answer to a knowledge question attracted one mark while wrong answers were scored zero. Scores obtainable ranged from 0 to10. Summated scores were used to assess the knowledge of the respondents about antibiotics. For the purpose of this study, a score of 0 to 4 was rated poor,while 5 to 10 was rated good knowledge about antibiotics.

Data Analysis
All the analyses were conducted in statistical package for social science (SPSS Inc., Chicago, IL, USA, 2008) version 20. Descriptive analysis was employed using simple frequency and percentages for categorical data whereas either mean or median, standard deviation or interquartile range (IQR) was applied to continuous variables after subjection of such data to normality test. Inferential analysis was carried-out using Chi-square test and multivariate regression to identify factors that might influence self-medication with antibiotics. P-value < 0.05 was considered statistically significant at 95% confidence interval (CI).

RESULTS

A total of 185 students participated in the study (response rate of 100%). Among them 79 (42.7%) were females, while 106 (57.3%) were males. The mean age of these students was 23 (the range18-31) years. The proportion of unmarried students was 89% and the majority (33%) was 300 level university students. Eighty five (n=85; 46.2%) of the students had poor perception of SMA and bacterial resistance while 99 (53.8%) of them had good perception. There was no significant difference ($p \leq 0.05$) between those with good and poor perception. Similarly for prior knowledge of antibiotic (PKA) and non prior knowledge of antibiotic (non-PKA). However, there was significant difference ($p \leq 0.05$) between students with poor 90 (51.4%) and those (48.6%) with good level of knowledge on antibiotics. The age, marital status and prior knowledge of antibiotics were significantly ($p \leq 0.05$) higher in relation to male gender (Table.2).

Table 2: Socio-demographic characteristics of pharmacy undergraduates of University of Maiduguri.

Variable	Total frequency n= 170 (%)	Gender frequency (%)		P value
		Female 69	Male 111	
Age range in years				
18 -21	59 (34.7)	34 (49.3)	25 (24.8)	0.006*
22-25	80 (47.1)	27 (39.1)	53 (52.5)	
26-29	22 (12.9)	7 (10.1)	15 (14.9)	
≥ 30	9 (5.3)	1 (1.4)	8 (7.9)	
Marital Status (n=183)				
Single	163 (89.1)	66 (83.5)	97 (93.3)	0.037*
Married	20 (10.9)	13 (16.5)	7 (6.7)	
Divorced	0 (0)	0 (0)	0 (0)	
Separated	0 (0)	0 (0)	0 (0)	
Widowed	0 (0)	0 (0)	0 (0)	
University Level (n=185)				
200	54 (29.2)	18 (22.8)	36 (34.0)	0.299
300	61 (33.0)	31 (39.2)	30 (28.3)	
400	48 (25.9)	20 (25.3)	28 (26.4)	
500	22 (11.9)	10 (12.7)	12 (11.3)	
Years on program (n=106)				
≤ 5	93 (87.7)	39 (84.8)	54 (90.0)	0.417
> 5	13 (12.3)	7 (15.2)	6 (10.0)	
Perception of SMA and bacterial resistance (n=184)				
Poor perception	85 (46.2)	40 (50.6)	44 (42.7)	0.288
Good perception	99 (53.8)	39 (49.4)	59 (57.3)	
Level of knowledge on Antibiotic (n=175)				
Poor knowledge	90 (51.4)	29 (38.7)	61 (61.6)	0.003*
Good knowledge	85 (48.6)	46 (61.3)	38 (38.4)	
Prior knowledge of antibiotic (PKA) (n=185)				
No (Non-PKA)	115 (62.2)	49 (62.0)	66 (62.3)	0.974
Yes (PKA)	70 (37.8)	30 (38.0)	40 (37.7)	

PKA: prior knowledge of antibiotic (PKA was defined as knowledge acquired through formal lectures about antibiotics in pharmacy school based curriculum); Non-PKA: non prior knowledge of antibiotic; *Statistically significant ($p \leq 0.05$).

Characteristics of antibiotic usage

Overall, 171 of the students (92.9%) had self-medicated with antibiotics in the last one year (Figure 1), while within one year 104 (60.1%), 47 (27.2%) and 22 (12.7%) of the students had practised SMA 1-2, 3-4 and >5 times respectively (Figure 2). Similarly, 123 students (69.9%) had recommended antibiotics for persons with infection in the last one year Figure 3.

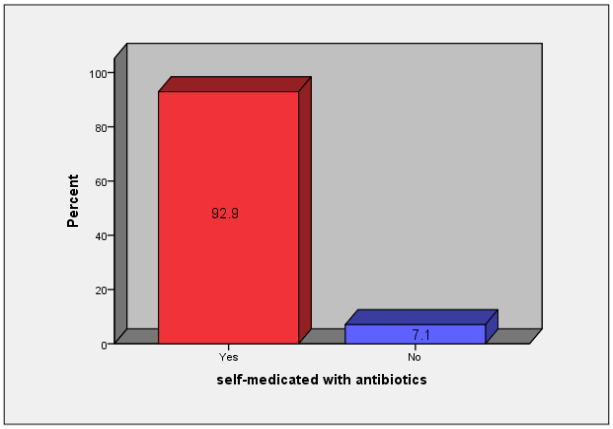

Figure 1: Prevalence of Self-medication with antibiotics in the last one year.

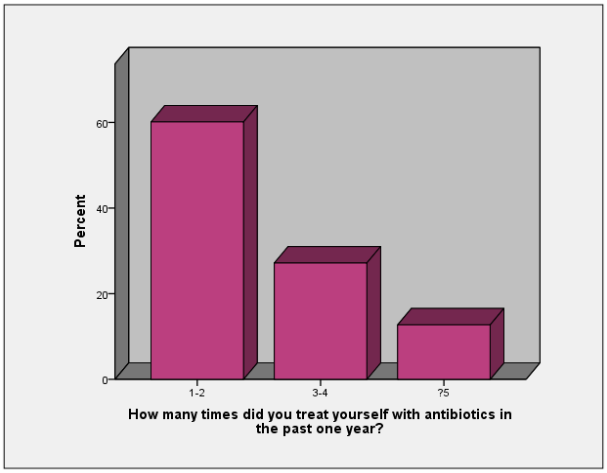

Figure 2: Frequency of SMA within the last on year.

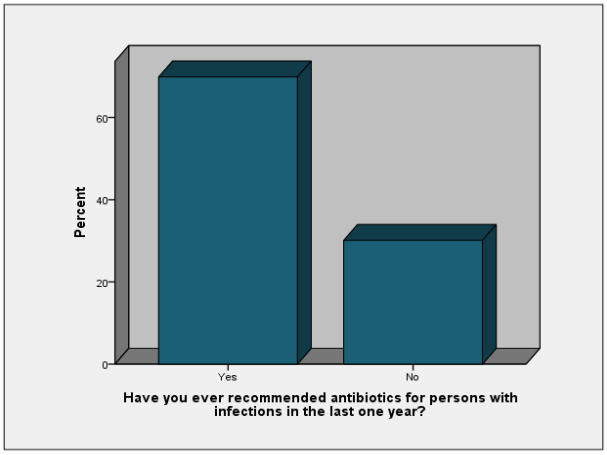

Figure 3: Percentage of students that recommended antibiotics for others.

Figure 4 described the frequency of SMA practice for various conditions: 69 of them were to relieve catarrh/cough (20.5%), 66 for diarrhoea (19.6%) while 43 were for fever (12.8%) and 42 for typhoid fever (12.5%). SMA was also employed by 41 (12.2%), 31 (9.2%), 19 (5.6%), 10 (3.0%) and 7 (2.1%) students for sore throat, skin diseases, genito-urinary infections and ear problems respectively. The option for others (malaria fever, eye problem, peptic ulcer disease, abdominal pain, toothache, weakness, muscle/joint pain, wound, headache, nausea and pyrexia) constituted (2.7%).

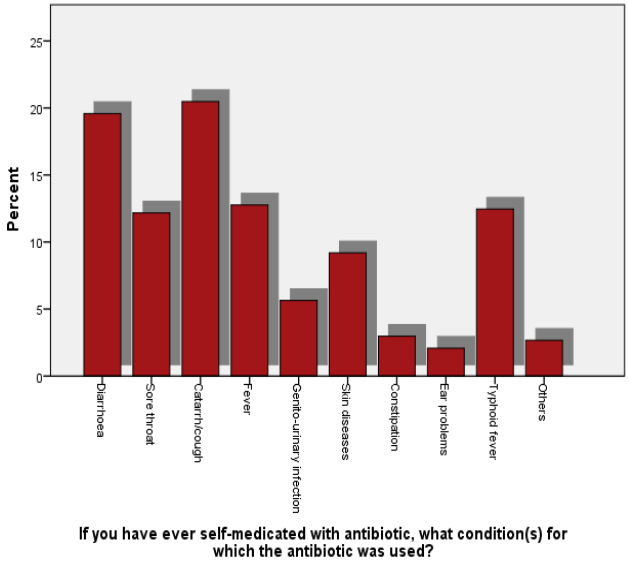

Figure 4: Conditions for which SMA was employed.

The frequency distributation of self-medicated antibiotics in Figure 5 indicates metronidazole was the most commonly used 76 (17.3%), followed by amoxicillin and ciprofloxacin 66 (15.0%) each, co-trimoxazole 57 (13.0%), while 47 (10.7%), 45 (10.3%), 23 (5.2%), 21 (4.8%), 18 (4.1%), 16 (3.6%) students used ampicillin+cloxacillin, tetracycline, amoxicillin+clavulanic acid, gentamicin, cefuroxime and erythromycin respectively. Others collectively accounting for 0.9%.

Majority of the students 76 (41.5%) used the antibiotics for less than 5 days translating to incomplete course of treatment, meanwhile 51 (28.5%) of them had 5 days treatment course, 26 (14.5%) for up to 1 week and 27 (15.1%) for more than 1 week (Figure 6).

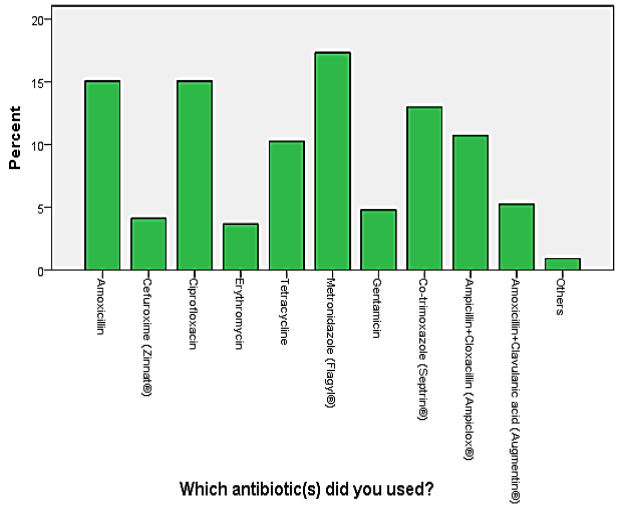

Figure 5: Frequency distribution of antibiotics used for SMA.

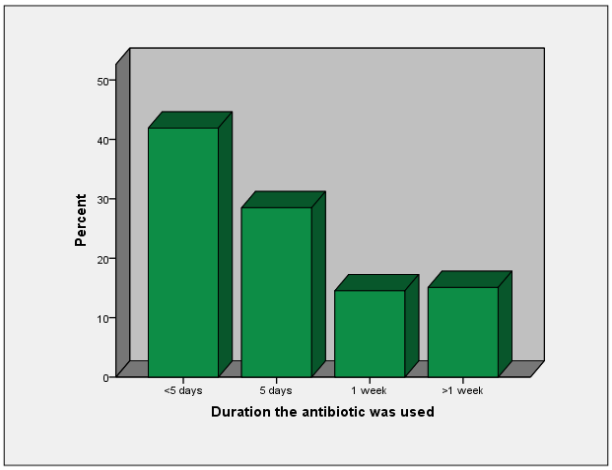

Figure 6: Duration of use of antibiotics by the students.

Most of the students reported to have had successful treatment 145 (81.9%) and only few reported partial or complete treatment failure Figure 7.

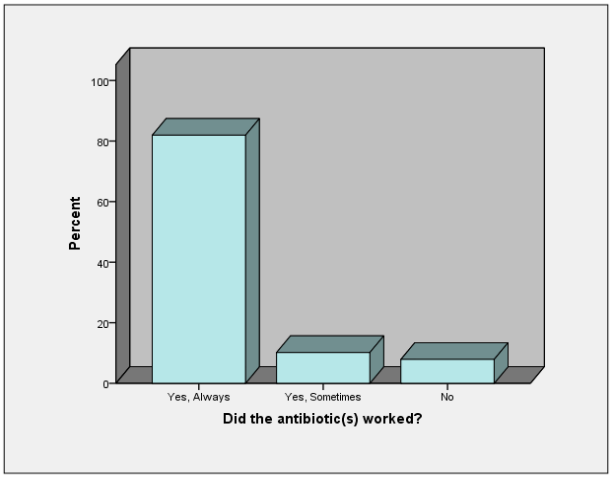

Figure 7: Success rate of SMA practice amon the students.

The complete list of adverse effects thought to be caused by antibiotics by pharmacy students is presented in Table 3. However, 68% of the students experienced one side-effect or the other (Figure 8). Nausea/vomiting was the most common 22.7%, followed by tiredness/dizziness with 20.3%, headache 16.9% and others (constipation, loss of appetite, yellowish urine and sedation collectively) 1.4%.

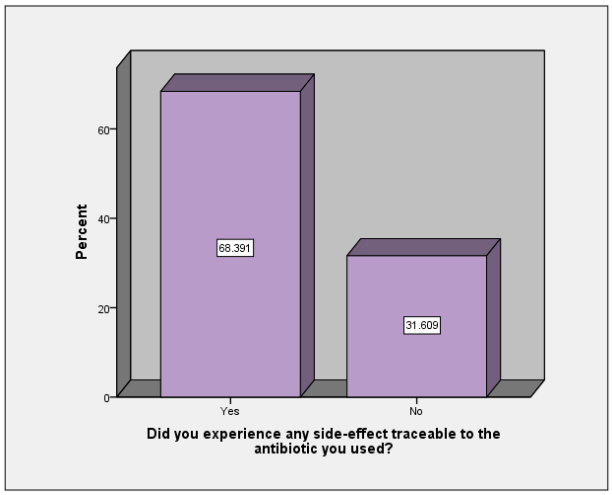

Figure 8: Percentage of students that experienced side-effects after SMA.

Table 3: Side effects experienced with SMA.

Side effects	Frequency	Percent
Nausea/vomiting	47	22.7
Fever	11	5.3
Headache	33	16.9
Diarrhoea/abdominal pain	18	8.7
Teeth Discoloration	7	3.4
Muscular/joint pain	14	6.8
Tiredness/dizziness	42	20.3
Yellow skin/eye	2	1.0
Allergic reaction	23	11.1
others	8	3.8
Total	**207**	**100.0**

Regarding knowledge of antbiotics, 100 of the students (46.9%) got to know the antibiotic they used through previous physician's prescription only, 77 of the students (36.2%) claimed to have used school lectures as a knowledge source, while others (17%) used medical workshop, pharmacist consultation, textbook, experience from patent medicine store and advice from family/friends (Figure 9).

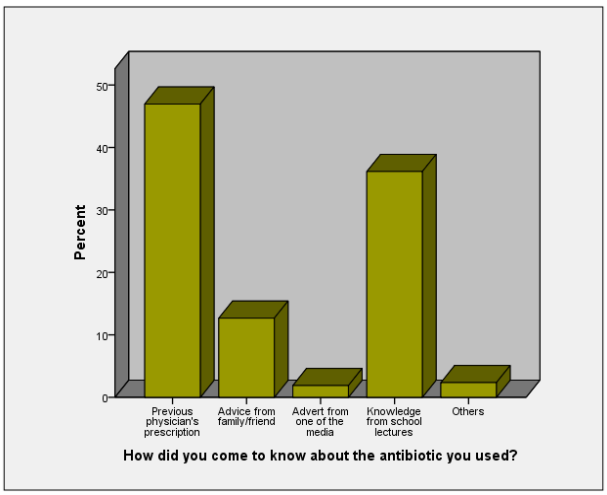

Figure 9: Source of knowledge of antibiotics for SMA.

Regarding source of antibiotics, nearly half of the student population (48.6%) purchased their drugs from pharmacy stores, 85 of students (40.9%) got theirs from patent medicine store, 10 each (4.8%) obtained the antibiotics from family/friend and left-over from previous prescriptions, while 2 others got their own from the hospital/clinic unused prescriptions Figure 10.

Reasons for SMA practice

The reasons for SMA practice by students rather than visiting a certified healthcare professional for their ailments by students (n = 185) have been reported in Table 4 and Figure 11. We noted past successful treatment with the drug (62.2%) as the main reason of SMA practice by students, followed by convience/save time (35.1%). Factors that influenced the choice of antibiotic for SMA and the termination time for the SMA practice are all detailed in Table 4. It was observed personal experience (26.7%) and community pharmacists' recommendation (20.5%) were dorminant factors for choice of antibiotics for SMA. Only one student clearly reported to stop taking antibiotic after three days, while 2 and 1 selected antibiotic based on their effectiveness and the type of ailment respectively.

Table 4: Reasons for practising SMA and its termination time (n = 185).

Variable	Frequency (%)
Why did you resort to antibiotic self-medication?	
Saves time	65 (35.1)
Left over medicine	18 (6.3)
Past successful treatment	115 (62.2%)
Worked for family/friend	20 (7.0)
Saves money	17 (5.9)
To avoid hassle of going to the Doctor	44 (15.4)
Lack of trust for prescribing Doctors	7 (2.4)
Your selection of antibiotics for self-medication was based on…	
Result from hospital/clinic	57 (18.8)
Recommendation by community pharmacists	62 (20.5)
Opinion of family members	26 (8.6)
Opinion of friends	18 (5.9)
My own experience	81 (26.7)
Recommendation by net citizens	2 (0.7)
Previous doctor's prescription	49 (16.2)
The advertisement	8 (2.6)
What did you consider when selecting antibiotics?	
Type of antibiotics	87 (24.0)
Brand of antibiotics	59 (16.3)
Price of antibiotics	41 (11.3)
Indications for use	79 (21.8)
Adverse reactions	40 (11.0)
Availability/Accessibility	54 (14.9)
Others	3 (0.8)
When did you normally stop taking antibiotics?	
After a few days regardless of the outcome	27 (11.1)
After symptoms disappeared	59 (24.3)
A few days after the recovery	67 (27.6)
After antibiotics ran out	16 (6.6)
At the completion of the course	59 (24.3)
After consulting a doctor/pharmacist	14 (5.8)
Others	(1.4)

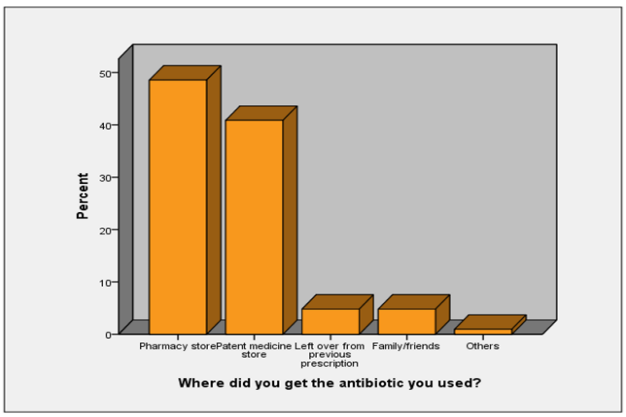

Figure 10: Source of getting the antibiotics.

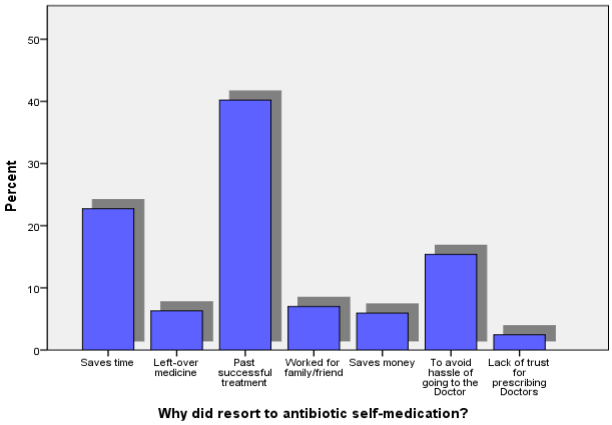

Figure11: Reasons for practising SMA.

Univariate and multivariate regression analyses factors modifying prevalence of SMA practices demontrated that there was no significant ($p \leq 0.05$) variation in frequency of SMA in relation to age, gender, marital status, years on pharmacy program, perception of SMA and bacterial resistance, level of knowledge on antibiotics and prior knowledge of antibiotics (PKA) except university level (Table 5 and 6). At students' university level 400 for instance, students who practised SMA were significantly more than those who did not.

Table 5: Univariate analysis of factors modifying prevalence of SMA practices.

Variable	Total (%)	SMA (%)	Non-SMA (%)	OR	95% CI	P value
Age						
18 -21	58 (34.3)	52 (33.3)	6 (46.2)	Ref		
22-25	80 (47.3)	74 (47.4)	6 (42.2)	0.703	0.215 2.300	0.560
26-29	22 (13.0)	21 (21)	1 (7.7)	0.413	0.047 3.639	0.426
≥ 30	9 (5.3)	9 (5.8)	0 (0.0)	NC	NC	0.999
Gender						
Female	79 (42.9)	72 (42.1)	7 (53.8)	Ref		
Male	105 (57.1)	99 (57.9)	6 (46.2)	0.623	0.201 1.933	0.413
Marital Status (n=183)						
Single	162 (89.0)	150 (88.8)	12 (92.3)	Ref		
Married	20 (11.0)	19 (11.2)	1 (7.7)	0.658	0.081 5.346	0.695
Divorced	0	0	0	NC	NC	NC
Separated	0	0	0	NC	NC	NC
widowed	0	0	0	NC	NC	NC
University Level						
200	54 (29.2)	48 (28.1)	6 (42.9)	Ref		
300	61 (33.0)	56 (32.7)	5 (35.7)	0.571	0.152 2.145	0.407
400	48 (25.9)	45 (26.3)	3 (21.4)	0.533	0.126 2.261	0.394
500	22 (11.9)	22 (12.9)	0 (0.0)	NC	NC	0.998
Years on program (n=105)						
≤ 5	92 (87.6)	84 (86.6)	8 (100)	Ref		
> 5	13 (12.4)	13 (13.4)	0 (0.0)	NC	NC	0.999
Perception of SMA and bacterial resistance (n=184)						
Poor perception	84 (46.4)	77 (45.8)	7 (53.8)	Ref		
Good perception	97 (53.6)	91 (54.2)	6 (46.2)	0.725	0.234 2.249	0.578
Level of knowledge on Antibiotic (n=175)						
Poor knowledge	90 (52.0)	84 (52.2)	6 (50.0)	Ref		
Good knowledge	83 (48.0)	77 (47.8)	6 (50.0)	1.091	0.338 3.526	0.884
Prior knowledge of antibiotic (PKA) (n=185)						
No (Non-PKA)	114 (62.0)	104 (60.8)	10 (76.9)	Ref		
Yes (PKA)	70 (38.0)	67 (39.2)	3 (23.1)	0.466	0.124 1.754	0.259

NC= Not calculated.

Table 6: Multivariate analysis of factors modifying prevalence of SMA practices.

Variable	Total (%)	SMA (%)	Non-SMA (%)	OR	95% CI	P value
Age						
18 -21	58 (34.3)	52 (33.3)	6 (46.2)	Ref		
22-25	80 (47.3)	74 (47.4)	6 (42.2)	0.469	0.071 3.073	0.430
26-29	22 (13.0)	21 (21)	1 (7.7)	0.000	0.000 NC	0.999
≥ 30	9 (5.3)	9 (5.8)	0 (0.0)	0.000	0.000 NC	0.999
Gender						

Female	79 (42.9)	72 (42.1)	7 (53.8)	Ref		
Male	105 (57.1)	99 (57.9)	6 (46.2)	0.336	0.042 2.668	0.302
Marital Status (n=183)						
Single	162 (89.0)	150 (88.8)	12 (92.3)	Ref		
Married	20 (11.0)	19 (11.2)	1 (7.7)	0.000	0.000 NC	0.998
Divorced	0	0	0			
Separated	0	0	0			
widowed	0	0	0			
University Level (n=185)						
200	54 (29.2)	48 (28.1)	6 (42.9)	Ref		
300	61 (33.0)	56 (32.7)	5 (35.7)	0.221	0.23 2.127	0.221
400	48 (25.9)	45 (26.3)	3 (21.4)	0.065	0.005 0.861	0.038*
500	22 (11.9)	22 (12.9)	0 (0.0)	NC	NC	0.999
Years on program (n=106)						
≤ 5	92 (87.6)	84 (86.6)	8 (100)	Ref		
> 5	13 (12.4)	13 (13.4)	0 (0.0)	1.227	NC	1.000
Perception of SMA and bacterial resistance (n=181)						
Poor perception	84 (46.4)	77 (45.8)	7 (53.8)	Ref		
Good perception	97 (53.6)	91 (54.2)	6 (46.2)	0.460	0.072 2.931	0.411
Level of knowledge on Antibiotic (n=175)						
Poor knowledge	90 (52.0)	84 (52.2)	6 (50.0)	Ref		
Good knowledge	83 (48.0)	77 (47.8)	6 (50.0)	0.716	0.111 4.623	0.726
Prior knowledge of antibiotic (PKA) (n=185)						
No (Non-PKA)	114 (62.0)	104 (60.8)	10 (76.9)	Ref		
Yes (PKA)	70 (38.0)	67 (39.2)	3 (23.1)			

*Statistically significant ($p \leq 0.05$). NC=Not calculated

DISCUSSION

A total of 185 studens parcitipated with the response rate of 100%. Although the rate was apparently unusual, it concurred with that reported in a study among second year medical students in Central India[18] and was closed to a study in Nigeria (99.3%).[19] Our study population had higher number of males than females and the majority at their early twenties which constituted over 80% ($p = 0.006$) and most students were not married (89.1%, p=0.037). The students with poor knowledge on antibiotics were signicantly higher than those with good knowledge (Table 2).

Studies had been conducted on self-medication with antibiotics (SMA) in Nigeria among medical students[6] and on self-medication practices among the general population,[11] health care workers[12] (Bamgboye *et al*., 2006). However, to the best of our knowledge, no published work that had exclusively looked at self-medication with antibiotics among pharmacy undergraduates. Internationally, some published works were available, although the population sample was a mixture of pharmacy undergraduates and undergraduates of other healthcare disciplines.[20,21] This present study focused specifically on the pharmacy undergraduates. We found out that SMA was widely practiced (92.6%) by the pharmacy undergraduates of the University of Maiduguri. The prevalence rate was higher on comparison with studies among medical students in Nigeria (38.8%)[6] and Ghana (70%).[7] In other countries, studies revealed prevalence of self-medication with antibiotics to be 47.8% in Southern China,[4] 79.5% in Sudan,[22] 47.8% in Pakistan,[17] 54% in India,[23] in UAE[24] and 87.50% in India.[20] The observed disparity in the prevalence of SMA practice could partly be attributed to the fact that information generally obtained in all the studies were self-reported by the various respondents with varied time periods for recall. For instance, the prevalence of self-medication with antibiotics was assessed in Nigeria[6] and Uganda[25] over a six-month and twelve-month periods of time, respectively. Beside, self-report as a tool for obtaining information has been associated with recall bias resulting to over-estimation by 20% or more.[26]

This study also evaluated various factors that could be associated with SMA practice amongst the study population (Tables 5 and 6). No association could be established between SMA and socio-demographic factors of age gender and marital status unlike the finding from a study in Nigeria[19] which reported self-medication was significantly associated with age, gender and students'level in the university at $p < 0.001$ but in agreement with that in China.[4] However, in this study SMA was higher in male than female students in contrast to the finding of a study conducted among medical students in Ghana.[7] Although our finding revealed statistical significance for frequency of self-medication with antibiotics in relation to students'level in the university, a finding similar to that of another study[19] and was contrary to that in studies in Pakistan.[17,27] Thus, Female gender, age, university level, marital status, perception on antibiotic resistance, and prior knowledge of antibiotics (PKA) were identified as independent risk factors of SMA. There was no significant ($p \leq 0.05$) difference between the students with and without PKA

regarding SMA frequency similar to the findings in a study among University in China.[4]

There was no study else where to compare perception of SMA and bacterial resistance among pharmacy students. However, the finding in this study revealed no significant ($p \leq 0.05$) difference between the students with good perception and those with poor perception of SMA and bacterial resistance.

The study revealed that 60% and 40% the students self-treated with antibiotics at least once and ≥3 times in the last one year, a finding consistent with the report of a study in India.[20] This negative trend is not suprising considering the fact that antibiotics are widely sold in community pharmacies and drug stores without precriptions from physcians due to lack of regulation in Nigeria[6] as previously reported in another study in India.[28]

Respiratory complaints (catarrh/cough) and diarrhoea were the most common conditions for which the antibiotics were used. This finding concurs with the presenting conditions highlighted for self-medication with antibiotics in previous studies carried out in Sudan,[22] India[22] and Nigeria.[6] The finding is obvious considering the prevailing weather condition and other environmental factors coupled with socioeconomic status of the population in these parts of the world which are favourable for those conditions to triave.

As reported in two previous studies[23,29] metronidazole was found to be most used antibiotic for SMA, this correlated with the fact that diarrhoea was the second most common condition, because empirically, the drug was being employed in the management of this condition.The next most commonly used antibiotics was amoxicillin as reported in several studies[6,7,17] and ciprofloxacin, and with slightly lower frequency was co-trimoxazole. This finding can also be related to the incidence of catarrh/cough, typhoid fever and sore throat for which amoxicillin and ciprofloxacin are usually indicated. Furthermore, amoxicillin is cheap, easily accessible, has a good safety profile and somehow broad spectrum of antimicrobial activity. Although not proven, the low incidences of antibiotics such as amoxicillin+clavulanic acid and cefuroxime might be due to their high cost price (about 1500 Naira /10 US Dollars) per course of treatment, this in a country where over 60% of the population survives on less than 2 US Dollars daily.[6]

An optimal antibiotic regimen requires not only getting the right antibiotic for the right indication at the right dose, duration of treatment is also very important; if the duration is not completed, there are high chances of treatment failure. Our study revealed about half of the students used antibiotics for < 5days, this implied that treatment course was not completed, a finding that was in agreement with the findings of some researchers.[20,7]

Several previous studies[30,31] had linked antibiotic resistance to misuse and overuse of antibiotics which puts selective pressure on bacterial pathogens leading to the emergence and spread of resistance. The report by the students regarding success of treatment of over 80% in this study was by far greater than that of Donkor et al where the reported success was about 40%.[7]

The majorityof the students was aware of potential adverse effects of antibiotics. About 68% of the students expreienced one side-effect of antibiotics or the other and yet the practice of using self-medication with antibiotics was observed, a finding similar to that found in a study carried out among non-medical university students in Pakistan.[17]

Source of knowledge on the antibiotics used for SMA is equally an important factor in SMA and also a possible point of intervention by concerned authorities. The two major sources were previous physician's prescription and knowledge from school lectures, as part of the general population they must have visited or come across a physician's prescription and being pharmacy undergraduates this finding was simply justified. The finding was in contrast to an Indian study[20] where the main source of information was the textbook, but close to the finding of another study[32] that was conducted among medical undergraduates and in agreement with a study in Dubai.[24] The observed similarities in source of knowledge on antibiotic between medical and pharmacy students was not suprising, considering both groups were being trained as future prescribers and dispensers of drugs.

Researchers[6,19] prevously reported that most of the students got their drugs from patent medicine stores and community pharmacies, a finding similar to our study except that the proportion of community pharmacy patronizers was slightly higher than that of patent medicine store patronizers. This was still a major problem as previously stated, because irrespective of the source, the end point was SMA practice. This implied that there was a poor regulation regarding the prescription and the sale of antibiotics, a similar situation in Spain[33] which had a knock-on effect upon community pharmacy services.

The main reasons for SMA were found to be past successful treatment and saving time, while another fraction trying to avoid the rigors of seeing a doctor. This, in a country where there were poor management of resources, lack of adequate healthcare personnel and infrastructure, is not a surprising outcome; similar findings were reported by some researchers in Pakistan[17] and in Ghana.[7]

Furthermore, it has already been noted in this study that about half of the students did not complete their treatment course; this was also reinforced from the answer to the question that inquired when normally the

antibiotic course was terminated; where many stopped a few days regardless of the outcome, after symptoms disappeared and a few days after the recovery. No studies were available to compare factors the pharmacy students considered while embarking on SMA, however, it was clear that a vast majority chose to self-medicate with antibiotics out of poor judgment, insufficient knowledge as well as taking the advantage of weak laws, regulations and enforcement on antibiotic prescribing, selling and dispensing.

CONCLUSION

This work, to the best of our knowledge, was the first done on self-medication with antibiotics exclusively among pharmacy undergraduates in a university setting. The prevalence of SMA was found to be high, but there was no significant variation in SMA based on gender, age, marital status, perception on antibiotic resistance, prior knowledge of antibiotics and level of knowledge on antibiotics except students' university level. The most commonly used antibiotics were metronidazole, amoxicillin and ciprofloxacin while ailments mainly treated were catarrh/cough and diarrhoea. Majority of the students knew that antibiotics cause side effects. Past successful treatment and saving time were the major reasons for SMA practice.

RECOMMENDATION

The government should revise the laws pertaining to antibiotic prescription practice and sale, to ensure tighter control with strict enforcement of such laws and severe penalties for defaulters as well as public education campaign.

The university administrators in collaboration with health educators and promoters should generally enlighten students about self-medication, its merits and demerits. This could be done during orientation lectures or by organizing special seminars and workshops.

The pharmacy undergraduate curriculum should be revised to include modules like self-care and self-medication, while rational use of drugs should be treated in different perspectives to let the students realize their role in the society as students and future pharmacists.

ACKNOWLEDGEMENT

We wish to express our appreciation to all students who prticipated in this study.

APPENDIX

Self-medication with antibiotics questionnaire

Thank you for taking the time to complete this survey regarding self-medication with antibiotics among undergraduate pharmacy students in University of Maiduguri. This survey contains 40 largely closed-ended questions. It will take fifteen minutes maximally for you to complete. Please try to answer all the questions below honestly. All your answers are anonymous and will be kept confidential, and your privacy is guaranteed. Your responses to the survey will help us develop appropriate educational activities such as lectures, seminars, workshops, or counseling in future to ensure improved healthcare for students.

Section A: Socio-demographic Data.

1)Age :
2)Gender: Male [ ], Female [ ]
3)Marital status: Single [ ], Married [ ], Divorced [ ], Separated[ ]
4)Level: 200 [ ], 300 [ ], 400[ ], 500 [ ] 5) Year of admission:_____

Section B: Self-Medication Behaviour.

6) Have you ever taken antibiotics? Yes [ ] , No [ ] 7)Have you ever treated yourself (self-medicated) with antibiotics in the last one year? Yes [ ], No [ ] 8) How many times did you treat yourself with antibiotics in the past one year? ---------- 9) Have you ever recommended antibiotics for persons with infections in the last one year? Yes[ ], No[ ]
10) If you have ever self-medicated with antibiotic, what condition(s) for which the antibiotic was employed? (tick as many as applicable) Diarrhoea [ ] Sore throat [ ] Catarrh/ Cough [ ] Fever [ ] Genito-urinary Infection[ ] Skin Diseases [ ] Constipation [ ] Ear problems [ ] Typhoid Fever [ ] Others, specify_____
11) Which antibiotic(s) did you used? (tick as many as applicable) Amoxicillin [ ] Cefuroxime (Zinnat®)[ ] Ciprofloxacin[ ] Erythromycin[ ] Tetracycline [ ] Metronidazole(Flagyl®) [ ] Gentamicin [ ]Co-trimoxazole (Septrin®) [ ] Ampicillin + Cloxacillin (Ampiclox®)[ ] Amoxicillin + Clavulanic acid(Augmentin®)[ ] Others, specify_____
12)Duration it was used :<5 days [ ] 5 days[ ] 1 week[> 1 week[ ]

13) Did the antibiotic(s) worked? Yes, Always [ ] , Yes, sometimes, No [ ]
14When did you normally stop taking antibiotics? [tick as many as applicable]
After a few days regardless of the outcome [ ] After symptoms disappeared [ ] A few days after the recovery [ ], After antibiotics ran out [ ] At the completion of the course [ ] After consulting a doctor/pharmacist [ ] Others (specify)_____

15) Do antibiotics cause side effects? Yes [ ] No [ ]

16) Which of these side effect(s) did you experience? (tick as many as applicable)
Nausea/vomiting [ ] Fever [ ] Headache [ ] Diarrhoea/abdominal pain [ ] Teeth discoloration[ ] Muscle/joint pain [ ] Tiredness/dizziness [ ] Yellow skin/eye [ ] Allergic reactions [ ] Liver Problem [ ] Kidney Problem [ ] Others specify_____

Section C: source of the antibiotic used.

17) How did you come to know about the antibiotic(s) you used?
Previous physician's prescription [ ] Advice from a family/friend [ ]
Advert from one of the media [ ] Knowledge from school lectures [ ], others----------18) Where do you get the drugs?

Pharmacy store [ ] Patent medicine store [ ], left over from previous prescription [ ], Family/friends [ ] Others specify_____

Section D: Reason(s) for practicing antibiotic self-medication.

19) Why did you resort to antibiotic self-medication? (tick as many as applicable)
Saves time [ ] Left over medicine [ ] Past successful treatment [ ] Worked for family/friend [ ] Saves money [ ] To avoid hassle of going to the Doctor [ ] Lack of trust for prescribing Doctors [ ]
20) Your selection of antibiotics for self-medication was based on… [tick as many appropriate]
Result from hospital/clinic [ ] Recommendation by community pharmacists [ ] Opinion of family members [ ] Opinion of friends [ ] My own experience [ ] Recommendation by net citizens [ ], Previous doctor's prescription [ ], The advertisement [ ]

21) What did you consider when selecting antibiotics? [tick as many as appropriate]
Type of antibiotics [ ] Brand of antibiotics [ ] Price of antibiotics [ ] Indications for use [ ]Adverse reactions [ ], Availability/Accessibility [ ] [Others (specify ----------

Section E: Perception about antibiotic resistance (kindly tick to express what you think about the following statements)

statement	Strongly agree	agree	neutral	disagree	Strongly disagree
22) Antibiotic resistance is common					
23)Indiscriminate use of antibiotic decreases incidence of resistance to antibiotic					
24) Patient could develop resistance to antibiotic					
25)There is only one known mechanism through which resistance to antibiotic occur and thus resistance to antibiotic is not a big deal					
26) Resistance could be conferred from one organism to another					
27) Antibiotic misuse could only lead to treatment failure if it causes emergence of entirely new organism					
28) Antibiotic misuse could lead to emergence of untreatable infection					
29) Resistance to antibiotic decreases cost of treatment					

30) Resistance could occur against multiple antibiotics and reduces treatment options for an infection					

Section F: General Knowledge on antibiotics.

Which of the following statement(s) about antibiotics is (are) correct? True False		
statement	**True**	**False**
31) Foreign brand is better than Nigerian brand		
32) The more expensive, the better		
33) The newer generations are better than the older ones		
34) Broad-spectrum antibiotics are better than narrow-spectrum ones		
35) The use of multiple antibiotics is better than that of single antibiotics		
36) Higher doses result in faster recovery		
37) Lower doses result in less adverse reactions		
38) Switching antibiotics enhances drug effects		
39) Switching antibiotics reduces adverse reactions		
40) Parenteral is better than oral antibiotics		

REFERENCES

1. Aswapokee N, Vaithayapichet S, Heller RF Pattern of antibiotic use in medical wards of a university hospital, Bangkok, Thailand. Rev. Infect. Dis, 1990; 12(1): 136-141.
2. Okeke NI, Lamikanra A, Edelman R. Socioeconomic and behavioral factors leading to acquired bacterial resistance to antibiotics in developing countries. Emerg. Infect, Dis. 1999; 5: 18-27.
3. Morgan DJ, Okeke IN, Laxminarayan R, Perencevich EN,Weisenberg S. Non-prescription antimicrobial use worldwide:a systematic review. Lancet Infect Dis, 2011; 11: 692e701.
4. Zhu X, Pan H, Yang Z, Cui B, Zhang B and Ba-Thein B. Self-medication practices with antibiotics among Chinese university students. Public health, 2016; 130: 78-83.
5. Kafle KK, Gartoulla RP. Self-medication and its impact on essential drugs schemes in Nepal: a socio-cultural research project: action programme on essential drugs. Geneva: World Health Organization, 1993.
6. Fadere JO, Tamuno FI. Antibiotic self-medication among university medical undergraduates in Northern Nigeria. Journal of Public Health and Epidemiology, 2011; 3(5): 217-220.
7. Donkor E S, Patience B, Tetteh-Quarcoo, Nartey P, Agyeman I G Self-Medication Practices with Antibiotics among Tertiary Level Students in Accra, Ghana: A Cross-Sectional Study. International Journal of Environmental Research and Public Health, 2012; 9: 3519-3529.
8. Zafar SN, Syed R, Waqar S, Zubairi AJ, Vaqar T, Shaikh M, Yousaf W, Shahid S, Saleem S. Self-medication amongst university students of Karachi: prevalence, knowledge and attitudes. J. Pak. Med. Assoc, 2008; 58(4): 214-217.
9. Sawalha AF A descriptive study of self-medication practices among Palestinian medical and nonmedical university students. Res. Social. Adm. Pharm, 2008; 4(2): 164-172.
10. Lucas R, Lunet N, Carvalho R, Langa J, Muanantatha M, Nkunda LP, Barros H. Patterns in the use of medicines by university students in Maputo, Mozambique. Cad Saude Publica, 2007; 3(12): 2845-2852.
11. Afolabi AO Factors influencing the pattern of self-medication in an adult Nigerian population. Ann. Afr. Med, 2008; 7(3): 120-127.
12. Bamgboye EA, Amoran OE, Yusuf OB Self-medication practices among workers in a tertiary hospital in Nigeria. Afr. J. Med. Sci, 2006; 35(4): 411-415.
13. Araoye MO Research methodology with statistics for Health and Social Sciences Ed., Nathadox, Ilorin, Nigeria, 2004; 115-122.
14. Afolabi AO. Self-Medication, Drug Dependency and Self-Managed Health Care - A Review, Public Health - Social and Behavioral Health, Prof. Jay Maddock (Ed.), 2012; ISBN: 978-953-51-0620-3.
15. Chaminie B G, Sakeena MHF and Sivayoganthan C Awareness of Rational Medication Use and Antibiotic Self-Medication Practices among Undergraduate Students in a University in Sri Lanka. Tropical Journal of Pharmaceutical Research, April 2015; 14(4): 723-729.
16. Abobakr A, Jiri V, Mohammed A, Ales K, Self-medication with antibiotics by the community of Abu Dhabi Emirate, United Arab Emirates, J Infect Dev Ctries, 2009; 3(7): 491-497.
17. Syed JS, Hamna A, Rija BR, Sidra N, Mirrah M, Muhammad H J, Muhammad SR, Muhammad ZA, Saba F and Masood MK. Self-medication with antibiotics among non-medical university students of Karachi: a cross-sectional study. BMC Pharmacology and Toxicology, 2014; 15.
18. Manali M, Sujata D, Swapnil D. A questionnaire based survey on the knowledge, attitude and practices about antimicrobial resistance and usage among the second year MBBS students of a

Teaching tertiary care Hospital in Central India. International Journal of Pharmacological Research, 2014; 4(4): 175-179.
19. Osemene KP and Lamikanra A. A Study of the Prevalence of Self-Medication Practice among University Students in South western Nigeria Tropical Journal of Pharmaceutical Research August, 2012; 11(4): 683-689.
20. Philip TP, Senan A, Reji S, Kumar AKR. Assessment of self medication practices among undergraduate medical and paramedical students: A Case of rural Medical Schools of Tamil Nadu, India. World Journal of Pharmacy and Pharmaceutical Sciences, 2015; 4(10): 1587-1604.
21. Naznin A, Nadia S, Riaz U. Self-medication among medical and pharmacy students in Bangladesh. BMC Res Notes, 2015; 8: 763.
22. Awad AI, Eltayeb IB: Self-medication practices with antibiotics and antimalarials among Sudanese undergraduate university students. Ann Pharmacother, 2007; 41(7–8): 1249–55.
23. Suvadip Biswas, Aritra Ghosh, Krishnendu Mondal, Saikat Kumar Dalui, Mithilesh Haldar and Supreeti Biswas. Self-medication with antibiotics among undergraduate nursing students of a government medical college in Eastern India International Journal of Pharmacological Research, 2015; 5(10).
24. Abasaeed A, Jiri V, Mohammed A, Ales K Self-medication with antibiotics by the community of Abu Dhabi Emirate, United Arab Emirates. J Infect Dev Ctries, 2009; 3(7): 491-497.
25. Jacqueline N, Sarah N, Micheal B, Samantha K, Norman M, et al. Antibiotic use knowledge and behavior at a Ugandan University. Int J Infect Control, 2011; 7(4): 1-7.
26. Wagner, GJ Rabkin, JG. Measuring medication adherence: are missed doses reported more accurately than perfect adherence. AIDS Care, 2000; 12(4): 405-408.
27. James H, Handu SS, Khaja KA, Sequeira RP. Influence of medical training on self-medication by students. Int. J. Pharmacol. Ther, 2008; 46(1): 23-29.
28. Vaananen MH, Pietila K, Airaksinen M Self-medication with antibiotic - does it really happen in Europe, Health Policy, 2006; 77: 166-171.
29. Nishat C, Mohammad R I, Mehedi H, Mahmudur R. Prevalence of self-medication of antibiotics among people in Bangladesh. International Journal of Pharmacy Teaching and Practices, 2013; 4(1): 504-510.
30. Vila J, Pal T. Update on antibacterial resistance in low-income countries: Factors favouring the emergence of resistance. Open Infect. Dis. J, 2010; 4: 38–54.
31. Harbarth, S.; Samore, M.H. Antimicrobial resistance determinants and future control. Emerg. Infect. Dis, 2005; 11: 794–801.
32. Roopadevi HS, Shashi Kumar NS, Pankaja R, Ramesh KN Assessment of Self-Medication Practices among Undergraduate Medical Students at a Tertiary Care Teaching Hospital, Karnataka. International Journal of Scientific Research, 2015; 4(8).
33. Deschepper R, Lundborg CS, Monnet DL, Scicluna EA, Birkin J, Haaijer-Ruskamp FM, SAR consortium Attitudes, beliefs and knowledge concerning antibiotic use and self-medication: a comparative European study. Pharmacoepidemiol and Drug Safety, 2007; 16: 1234-43.