



## **The Impact of Intervention on Pharmacists' Counselling on Patients' Knowledge and Opinion of Antibacterial Usage**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Author AAM designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors OMK and IOA managed the analyses of the study and performed the literature searches. All authors read and approved the final manuscript.*

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### **ABSTRACT**

The knowledge and opinion of patients on antibacterial usage depends on pharmacist's counselling. In Nigeria, study assessing patients' perception of pharmacists' antibacterial counselling is scarce. This study assessed the knowledge and opinion of patients on antibacterial usage as a result of pharmacists' counselling pre and post intervention. The study was a cross sectional study among 409 outpatients with antibacterial prescriptions in 17-government-owned secondary healthcare facilities in Ogun State of Nigeria between July 2017 and May 2018. The knowledge and the opinion of the patients were determined via structured questionnaire and deficiency was addressed via intervention training for the pharmacists. Re-assessment was carried out after a month. Four hundred and nine patients participated at each of the two phases of the study. The mean age at the baseline survey, was  $43.9 \pm 14.9$  and the age range was 19 - 87 years while at the post intervention survey, the mean age was  $44.1 \pm 15.7$  and the age range was from 18 to 91 years. The

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patients that were probed on drugs they had at hand or at home increased from 20 (4.9%) to 263 (64.3%) between the two phases. Seventeen, (4.2%) and 171 (41.8) claimed to receive counselling on necessity of completing the course of therapy at the two phases respectively. The survey confirmed that 284 (69.4%) and 319 (77.9%) at the two phases respectively were of the view that counselling on drugs is best done by pharmacists. Two hundred and fifty six (62.7%) and 262 (64.1%) patients rated the counselling they received as  $\geq 70\%$  at the two phases respectively. There was significant improvement in the knowledge and opinion of patients on antibacterial usage due to pharmacists' counselling post intervention  $p < .05$ . Constant training on antibacterial counselling should therefore be encouraged among pharmacists.

*Keywords: Antibacterials; patients; counselling; intervention; knowledge; opinion.*

## 1. INTRODUCTION

Undue exposure to antibacterial agents places patients at risk of adverse events with the likelihood of increase in antibacterial resistance without any medical advantage. The emergence of antibacterial resistance has been largely attributed to the worldwide uninformed use of antibacterial agents within and outside the hospitals [1,2]. Worldwide inappropriate prescriptions, dispensing and, usage of drugs including antibacterials is said to be over 50.0% [3,4]. The continual efficacy of antibacterial agents is under a great threat mainly due to antibacterial misuse [5,6,7].

The challenge of antibacterial misuse calls for urgent action. There is the possibility of emergence of bacteria which might be resistant to all antibacterials in the nearest future if nothing is done [8]. It is therefore important to explore all possible means to ensure the continual efficacy of existing antibacterials. Pharmacists are well placed to counsel patients on proper antibacterial use [9,10,11]. Professional expertise provided by pharmacists during counselling has the potentials of reducing therapy cost, preventing unnecessary hospitalization and improving therapeutic outcome [12,13].

The success of treatment is evident on the outcome of treatment manifested by the wellbeing of the patients. Patients' lack of knowledge about proper use of antibacterials may account, to a large extent, for the inappropriate antibacterial consumption [14,15]. Insufficient public awareness on antibacterial therapy has been said to lead to self medication and incorrect use of antibacterials [2,16]. Patients or their caregiver must be adequately counselled to conform to details of rational antibacterial use [17]. The professional setting of pharmacists in health care makes them most relevant at counselling patients on antibacterial

rational use [18]. Earlier studies tend to address antibacterial misuse by discouraging antibacterial use for infections of non bacterial origin. It is important to identify the quality and patients' comprehension of antibacterial counselling offered by pharmacists. The present study identified the knowledge and opinion of patients on antibacterial use due to pharmacists' counselling and gaps identified was addressed via intervention.

## 2. METHODS

The study was carried out in seventeen (17) government-owned secondary health care facilities in Ogun state, south west Nigeria. Each outpatient department had well defined pharmacy, headed by registered pharmacists. The pharmacists were involved with the dispensing and counselling of patients on antibacterials and other medications. Patients in the state depend mainly on these health facilities for their health needs. The research was a cross-sectional study among patients to whom antibacterials were prescribed and dispensed at the outpatient departments of the selected hospitals. The study comprised three phases namely: (1) baseline survey (2) intervention and (3) post intervention survey. Baseline data collection was done on Monday to Friday within the working hours of 7.30 am - 3.30 pm by the researchers for twelve weeks: July 2017 to September 2017.

### 2.1 Sample Size Determination

The target sample size was determined by employing Raosoft Sample Size calculator [19]. The margin of error was set at 5%, confidence level 95%. The total population was 10830 calculated from the pharmacy register of the selected institutions. The recommended sample size was 372. Adjustment of the sample size for non-response was achieved by addition of 10% (37):  $372 + 37 = 409$ .

## 2.2 Sampling/Recruitment Technique

This involved convenient sampling of patients that reported at the outpatient pharmacy of the selected hospitals for filling of their prescriptions. Patients that had at least one antibacterial drug in their prescription were approached for participation. Details of procedure and objectives of the study as specified by the informed consent was explained to individual patients verbally either in English or Yoruba language. Those consented and were aged eighteen 18 years and above, were included. Those who declined participation and those below 18 years were excluded until the target sample size was achieved. Four hundred and nine (90.7%) patients consented out of a total of 451 approached. The questionnaire-guided interviews were administered to eligible patients after interacting with the pharmacists. This was done to verify their knowledge and opinion of antibacterial usage as a result of pharmacist's counselling. Patients or their care giver being interviewed were engaged in a private environment free from interference from the counselling pharmacist or other patients to ensure that the discussion neither influenced subsequent pharmacists' counselling nor modified other patients' responses.

## 2.3 Validation and Pretest of Data Collection Instruments

Face and content validity of the questionnaire was achieved by discussion with two lecturers (pharmacists) at the department of clinical pharmacy and pharmacy administration, university of Ibadan, Ibadan, Nigeria who had constructed acceptable questionnaires in related studies. This led to restatement of some questions after which the content was considered reasonable. The questionnaire was pre-tested among fifty two (52) patients at Sacred Heart Hospital, Lantoro, Abeokuta, Ogun state of Nigeria which is also a secondary health care institution like those selected for the study. The result of the pre-test was not included in the final analysis.

Findings from the pre-test were used to further validate the instrument. Some questions that were originally designed in closed-ended fashion were rephrased in an open-ended manner to allow self expression of intention more clearly. Some ambiguous questions were reconstructed while some were removed. The inclusion of patients' rating of pharmacists' counselling

section was included as a result of the feedback from the pre-test.

## 2.4 Reliability of Data Collection Instrument

The reliability of the questionnaire was established by applying Cronbach's Alpha test in the SPSS software. The value of Cronbach's Alpha ranged from 0.723 to 0.743. Cronbach's Alpha threshold  $\geq 0.7$  is generally acceptable by researchers as satisfactory [10,20]

## 2.5 Questionnaire-guided Interview

The questionnaire comprised: (a) Demographic characteristics which include: Gender, age, marital status, educational qualification and occupation. (b) Knowledge questions to assess the patients on antibacterial use (c) Questions verifying the opinion of patients about the counselling received from the pharmacist, and (d) Patients' rating of pharmacists' counselling.

## 2.6 Processing of Baseline Data

Patients' knowledge was computed by allocating a score of 1 to correct response and 0 to an incorrect response. Individual percentage knowledge score was computed by dividing score obtained by individual patient with total obtainable score multiplied by 100.

Individual percentage knowledge score =  $(\text{Score obtained} \div \text{Total obtainable score} \times 100)$

Cut off of % knowledge score of  $\geq 70\%$  was regarded as good knowledge while  $\leq 70\%$  was assumed to be poor knowledge [21]. For the patients rating of pharmacists' counselling, Excellent was allocated a score of 5, Very good a score of 4, good a score of 3, Fair a score of 2 and poor rating was allocated a score of 1 [10].

$\% \text{ Rating} = (\text{rating} \div \text{maximum obtainable rating}) \times 100$

$\% \text{ rating} < 70\%$  was considered poor counselling while  $\geq 70\%$  was viewed to be good counselling.

## 2.7 Intervention Training

The intervention training comprised educational training seminar and scripted drama developed to address the identified gaps in patients' knowledge and opinion. The training was conducted for the pharmacists between

December 2017 and January 2018. It centres on important antibacterial counselling tips.

## 2.8 Antibacterial Training Seminar

The antibacterial training seminar was handled by a hospital based pharmacist with doctorate degree in pharmaceuticals in collaboration with the principal researcher. The training was done in three locations. Each participant attended one of the training sessions. From the baseline survey, the patients were deficient in the following important areas of antibacterial usage: Missed doses, Regular dosing intervals, complete course of therapy, Side effects, Duration, Antibacterial awareness and identification, Food and drug interactions and action to take in case of Therapy delay or failure [22]. A mnemonic, **MR CS DAFT** was coined by the investigator as antibacterial counselling tips. MR C S DAFT signifies: **M** = Missed dosage, **R** = Regularity of dosages, **C** = Completing the course of therapy, **S** = Side effects, **D** = Duration of therapy, **A** = Antibacterial awareness and identification, **F** = Food and drug interactions, **T** = Therapy delay/failure. All the forty five pharmacists in charge of patients' counselling at the selected sites participated in the training and a pre and post intervention test was conducted to ascertain the success of the training.

## 2.9 Participatory Scripted Drama

This was the second training approach. The pharmacists were engaged in five different drama scenarios of antibacterial counselling. These were to demonstrate the possibility of result-oriented antibacterial counselling by employing MR C S DAFT-guide. The pharmacists were thus informed on the neglected areas of antibacterial counselling.

The drama addressed among others: A patient with a single antibacterial drug with emphasis on regularity of dosage intervals and completion of course of treatment, the use of empathy to gain the attention and cooperation of nervous patient, antibacterial-drug interactions, antibacterial-drug and antibacterial-food interactions while the fifth scenario was on patients with more than one antibacterials. All the scenarios took place in a semi-private setting to de-emphasize window dispensing. In each scenario, one pharmacist acted the part of a pharmacist counsellor and the other as a patient while the investigator moderated. Every pharmacist participated in at least one of the scenarios and had the

opportunity of acting both as the pharmacist and patient in turns.

## 2.10 Post Intervention Survey

This involved the re administration of the same questionnaire-guided interview to patients as at the baseline after being counselled by the pharmacists. This was carried out from March to May 2018.

## 2.11 Data Analysis

Descriptive statistics such as frequency, percentage and mean  $\pm$  standard deviation were used to summarize the data. The data collected were coded and entered in to the SPSS-package version-20. Association between patients' socio-demographic characteristics and knowledge of antibacterial use as well as patients' opinion and rating of pharmacist's counselling were examined using the Chi square ( $X^2$ ) test. Independent sample t-test was employed for the comparison of patients' means scores on knowledge and rating of pharmacists' antibacterial counselling at the baseline and post intervention studies. McNemar test was used to compare the difference of scores between each response at the two phases.  $P < .05$  was considered to be statistically significant.

## 3. RESULTS

### 3.1 Socio-demographic Characteristics of Patients at Baseline and Post Intervention Surveys

Four hundred and nine, (409) patients participated at each of the two phases of the study. The mean age at the baseline survey, was  $43.9 \pm 14.9$  and the age range was 19 - 87 years while at the post intervention survey, the mean age was  $44.1 \pm 15.7$  and the age range was from 18 to 91 years. There was no significant difference in age and gender of patients at the two phases,  $p > 0.05$  (Table 1).

### 3.2 Antibacterials Dispensed to the Patients Pre and Post Intervention

The penicillins, 149 (36.0%) and the cephalosporins, 139 (33.9%) were the most frequently prescribed and dispensed class of antibacterial agents at the two phases respectively. Fig. 1 compared the classes of antibacterials prescribed and dispensed at the two phases.

### 3.3 Baseline and Post-intervention Knowledge of Patients on Antibacterial Usage

One hundred and sixty two patients (39.6%) and 338 (82.6%) were aware that antibacterial drug(s) was dispensed to them at the baseline and post intervention surveys respectively. One hundred and sixty one (39.4%) and 335 (81.9%) were able to correctly identify the antibacterial drug(s) at the two phases respectively. Good knowledge of antibacterial usage, depicted by a score  $\geq 70.0\%$  was displayed by 11 (2.74%) and 262 (64.1%) of the patients at baseline and post intervention surveys respectively (Table 2).

### 3.4 Patients Knowledge of Drugs at Home and Antibacterial Usage Pre and Post-intervention

The patients that were probed on drugs they had at hand or at home increased from twenty, 20 (4.9%) to 263 (64.3%) between the two phases. Seventeen, (4.2%) and 171 (41.8) claimed to

receive counselling on necessity to complete the course of therapy at the two phases respectively (Table 3).

### 3.5 Patients' Opinion and Rating of Counselling Received from Pharmacists

The survey confirmed that two hundred and eighty four (69.4%) and 319 (77.9%) were of the view that counselling on drugs is best done by pharmacists at the two phases respectively. Two hundred and fifty six (62.7%) and 262 (64.1%) patients rated the counselling they received as  $\geq 70\%$  pre and post intervention (Table 4).

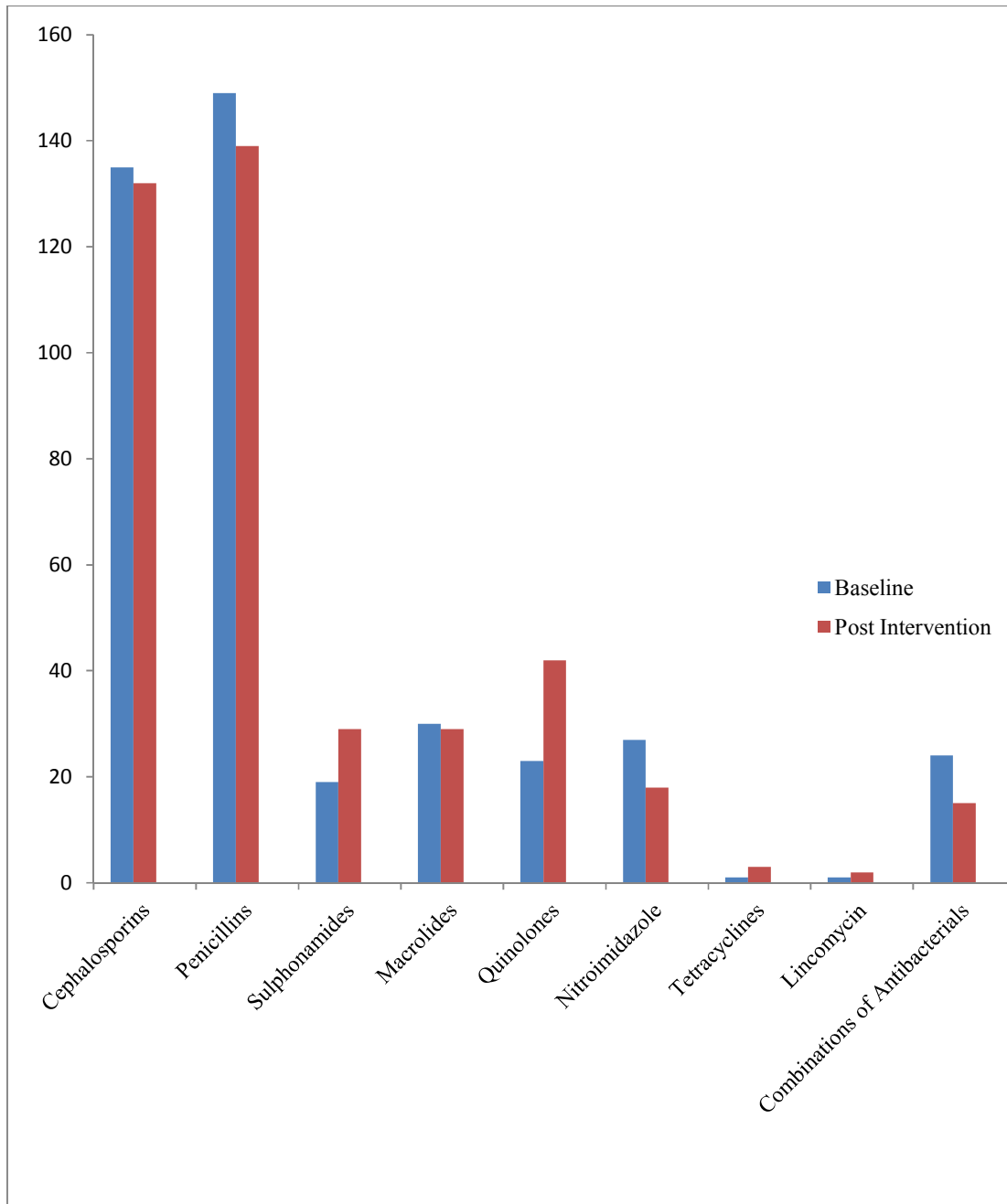
### 3.6 Baseline and Post Intervention Comparison of Means Scores

There were significant difference between the mean scores at the two phases (Table 5). There was no association between patients' demographics and the response.

**Table 1. Socio-demographic characteristics of patients at baseline and post intervention surveys (N = 409)**

Variables		Baseline N (%)	Post intervention N (%)	X <sup>2</sup> P- value
<b>Gender</b>	Male	154 (37.7)	173 (42.3)	0.12
	Female	255 (62.3)	236 (57.7)	
<b>Age group (years)</b>	18 – 40	178 (47.5)	186 (45.5)	0.39
	>40 -60	175 (42.8)	169 (41.3)	
	>60 – 80	47 (11.5)	42 (10.3)	
	>80	9 (2.2)	12 (2.9)	
<b>Mean Age <math>\pm</math> SD</b>		43.9 $\pm$ 14.9	44.1 $\pm$ 15.7	
<b>Age Range (years)</b>		19 -87	18 – 91	0.37
<b>Marital status</b>	Single	114 (27.9)	122 (20.8)	
	Married	295 (72.1)	287 (70.2)	
<b>Educational qualification</b>	Pry. six and below	89 (21.8)	86 (21.0)	0.17
	SSCE/NECO/GCE OL	131 (32.0)	134 (32.7)	
	OND/NCE	105 (24.7)	98 (24.0)	
	HND/BSc/BA and above	84 (20.5)	91 (22.2)	
<b>Occupation</b>	Trading	132 (32.3)	123 (30.0)	0.13
	Civil Servant	95 (23.2)	93 (22.7)	
	Artisan	89 (21.8)	92 (22.5)	
	Student	51 (12.5)	60 (14.7)	
	Retired civil servants	16(3.9)	14 (3.4)	
	Farming	14 (3.4)	12 (2.9)	
	Medical/Health worker	12(2.7)	15 (3.7)	

SSCE = Senior Secondary School Certificate, OND = Ordinary National Diploma, NCE = National Certificate in Education, HND = Higher national diploma, BSC = Bachelor of Science, BA = Bachelor of Art



**Fig. 1. Comparison of classes of antibacterials dispensed to the patients at baseline and post intervention surveys**

**3.7 The Effect of MR. CS DAFT Intervention on Patients’ Knowledge of Antibacterial Usage**

Thirty eight patients (9.3%) and 265 (64.8%) believed on the importance of regular dosing of antibacterials at the baseline and post intervention surveys respectively. Seventeen

patients (4.2%) at the baseline survey held the view that completion of course of antibacterial treatment must be ensured even when already relieved while 171 (41.8%) had the same belief at the post intervention. Patients’ mean knowledge scores at the two phases was  $2.0 \pm 1.0$  and  $4.7 \pm 1.2$  ( $p < 0.001$ ) (Table 6).

**Table 2. Patients' knowledge of antibacterial usage at baseline and post intervention surveys (N=409)**

Statements	Baseline		Post Intervention		Mc Nemar
	Yes N (%)	No N (%)	Yes N (%)	No N (%)	P - value
Were you aware of any antibacterial drug in your prescription?	162 (39.6)*	247 (60.4)	338 (82.6)*	71 (17.4)	< 0.001
The Pharmacist informed me about the presence of antibacterial agent in my medication	83 (20.3)*	326 (79.7)	272 (66.5)*	137 (33.5)	< 0.001
Patient identified the antibacterial drug(s) correctly among the drugs. (patient asked to identify the antibacterial drug amidst others)	161 (39.4)*	248 (60.6)	335 (81.9)*	74(18.1)	< 0.001
Antibacterials should not be used at regular intervals	371 (90.7)	38 (9.3)*	144 (35.2)	265 (64.8)*	< 0.001
Patients had correct knowledge of how long to be on the antibacterial drug(s)?	105 (25.7)*	304 (74.3)	376 (91.9)*	33 (8.1)	< 0.001
Patients claimed to be counselled by pharmacist and were able to explain correctly how to use the antibacterial drug in relation to meals	56 (13.7)*	353 (86.3)	141 (34.5)*	268 (65.5)	< 0.001
Patients asserted to pharmacist's counselling and rightly recalled other drugs to avoid while on the antibacterial(s)	82 (20.0)*	327 (80.0)	141 (34.5)*	268 (65.5)	< 0.001
Patients affirmed to be counselled to report at the hospital in case of delay in perceiving relief from the symptoms of the ailment within a specified time	156 (38.1)*	253 (61.9)	171 (41.8)*	238 (58.2)	0.326
<b>Mean knowledge score</b>	<b>2.1 ±1.8</b>		<b>5.0 ± 1.6</b>		<b>(p &lt; 0.001)</b>
<b>Cut off of patients' % score on knowledge of antibacterial use</b>	<b>N (%)</b>	<b>Remark</b>	<b>N (%)</b>	<b>Remark</b>	
< 70%	398 (97.3)	Poor Knowledge	147 (35.9)	Poor Knowledge	
≥ 70%	11 (2.7)	Good Knowledge	262 (64.1)	Good Knowledge	

\*Correct response = 1, incorrect response = 0, maximum obtainable score = 8, % individual knowledge score = (score obtained by individual ÷ total obtainable score) × 100

**Table 3. Patients knowledge of drugs at home and antibacterial usage (N = 409)**

Variables		Baseline	Post intervention
		N (%)	N (%)
The drug(s) I have at home/at hand are:			
Paracetamol/Artemether/Lumefantrine		58 (14.2)	38 (9.3)
Paracetamol, Ferrous sulphate, Vit. C, Vit. B Co.		29 (7.1)	47 (11.5)
Ibuprofen, Diclofenac		8 (2.0)	46 (11.3)
Moduretic, Amlodipine, Nifedipine, Methyl dopa		18 (4.4)	48 (11.7)
Ampiclox, Amoxicillin. Co-trimoxazole. Metronidazole		19 (4.6)	30 (7.3)
Metformin, Glimepiride		4 (1.0)	16 (3.1)
Lamivudine, Nevirapine		21 (5.1)	33 ( 8.9)
Mist. Mag. trisilicate		1 (0.2)	0 (0.0)
I have no drug at home		251 (61.4)	151 (36.9)
Did the pharmacist asked you about drugs you have at home?	Yes	20 (4.9)	263 (64.3)
	No	389 (95.1)	146 (35.7)
The pharmacist counselled me to:	Continue with the drug at home	11 (2.7)	204 (49.9)
	stop the use of the drug at home	9 (2.2)	59 (14.4)
	No counsel	389 (95.1)	146 (35.7)
Pharmacist counselled me on likely side effect of the antibacterial drug(s)	Yes	19 (4.6)	355 (86.8 )
	No	390 (95.4)	54 (13.2)
In case of side effects, pharmacist counseled me to:	report to the doctor	11 (2.7)	161 (39.4)
	report to the pharmacist	3 (0.7)	7 (1.7)
	ignore the side effect	5 (1.2)	187 (45.7)
	No counsel	390 (95.4)	54 (13.2)
If I missed any dose, pharmacist counseled me to:	take it immediately I remember	18 (4.4)	293 (71.6)
	wait until next due time	2 (0.5)	13 (3.2)
	No counsel	389 (95.1)	103 (25.2)
Pharmacist counselled me to use the antibacterial drug completely even if there is apparent relief	Yes	17 (4.2)	171 (41.8)
	No	392 (95.8)	238 (58.2)

*Vit C= vitamin C (Ascorbic acid), Vit B Co = vitamin B complex*



**Table 4. Patients' opinion and rating of pharmacists' counselling at baseline and post intervention surveys (N = 409)**

Statement	Response	Baseline	Post Intervention
		N (%)	N (%)
Counselling on medication (e.g. antibacterials) is better handled by:	Physicians	113 (27.6)	67 (16.4)
	Pharmacists	284 (69.4)	319 (78.0)
	Nurses	12 (2.9)	23 (5.6)
What informed your choice of drug counsellor?	Physicians are well knowledgeable on drugs	17 (4.2)	4 ((1.0)
	Pharmacists are in charge of drugs	245 (59.9)	212 (51.8)
	Physicians are the prescribers so they should know better	87 (21.3)	24 (5.9)
	Physicians are in charge of health care	9 (2.2)	39 (9.5)
	Pharmacists dispensed the drugs and should give appropriate counsel	39 (9.5)	107 (26.2)
	Nurses takes care of patients	12( 2.9 )	23 (5.6)
Will you prefer to see your doctor for further counselling?	Yes	93 (22.7)	64 (15.6)
	No	316 (77.3)	345 (84.4)
Why do you prefer to see your doctor after pharmacists' counselling?	Doctor asked me to come back	37 (9.0 )	15 (3.7)
	Doctors are friendlier	11 (2.7 )	24 (5.9)
	For better understanding of how to use the drugs	45 (11.0)	25 (6.1)
	I don't need to see him, I am okay	316 (77.3)	345 (84.5)
Why do you choose not to see your doctor after pharmacist's counselling?	I am satisfied with the pharmacist's counsel	83 (20.3)	180 (44.0)
	Pharmacists are better counsellors on drugs	52 (12.7 )	19 (4.6)
	I understand the pharmacist's counsel very well	181 (44.3 )	146 (35.7)
	I prefer to see the Doctor	93 ( 22.7)	64 (15.6)
How will you rate your satisfaction on the counselling you received from the pharmacist?	< 70.0%	183 (44.7)	147 (35.9)
	≥70%	226 (55.3)	262 (64.1)
<b>Cut off of patients' rating of pharmacists' counselling</b>	<b>Remark</b>	<b>N (%)</b>	<b>N (%)</b>
< 70%	Poor counselling	183 (44.7)	147 (35.9)
≥70%	Good counselling	226 (55.3)	262 (64.1)
<b>Mean Rating of Counselling (Independent sample T-test)</b>	<b>p &lt; 0.001</b>	<b>3.3 ± 1.5</b>	<b>3.7 ± 1.3</b>

Maximum obtainable score = 5; % rating = rating ÷ maximum obtainable score × 100

**Table 5. Baseline and post intervention comparison of means scores**

Variables	Baseline survey	Post intervention	p. value
<b>Patients' Mean Scores</b>	<b>Independent sample T- test</b>		
Patients' knowledge of Antibacterial Usage as Counselling by Pharmacist	2.1 ± 1.8	5.0 ± 1.6	< 0.001
Patients opinion and rating of counselling received from pharmacist	3.3 ± 1.5	3.7 ± 1.3	< 0.001

*Significant difference p < 0.001*

## 4. DISCUSSION

### 4.1 Patients' Knowledge of Antibacterial Usage Due to Pharmacists' Counselling

Generally, the patients' knowledge of antibacterial use at the baseline of this study was poor. Eleven, 11 (2.7%) had good knowledge at the baseline survey. A study conducted in Malaysia reported 36.8% of the patient to have good knowledge [10]. Another study [23] reported a somewhat higher proportion of patients (54.7%) with good knowledge. The difference observed here may be due to differences in environment and study approach. The study, [23] was carried out in Sweden which is probably a more developed society than Nigeria. It is possible that the ratio of pharmacists to patients is higher in Sweden thereby allowing more time for counselling. It is likely that pharmaceutical laws are more strictly adhered to in Malaysia than in Nigeria.

Majority of the patients in the present study claimed not to be counselled on vital issues on antibacterial use. Patients' awareness and ability to identify antibacterial agents among other drugs dispensed to them is probably a step to appropriate antibacterial usage. This is likely to make them pay special attention to pharmacists' counselling on the antibacterials and may improve compliance with dosage regimen. The current study revealed low patients' awareness. Only one hundred and sixty two (39.6%) of the patients were aware of the presence of antibacterial drugs as part of their medication and only a minority, 161 (39.4%) were able to correctly identify the antibacterial drugs. This low awareness is consistent with findings in another study [24] which stated that 27.0% of patients' were aware of their medication. The poor patients' antibacterial counselling obtained in this study may be a further confirmation of that reported by [25] in which only 20.0% of patients in deprived areas of England received pharmacists' counselling of drug usage. Patients'

antibacterial awareness and identification significantly improved at the post intervention survey. McNemar test revealed  $p < 0.001$ . The level of awareness in this study is in contrast with higher proportion (55.8%) reported in a study of effectiveness of pharmacists in improving patients' knowledge and attitude towards antibiotic usage [10]. Pharmacist-directed antibacterial stewardship programme have been shown to improve antibacterial treatment outcome [25] Pharmacists should endeavour to raise patients' awareness when antibacterials are dispensed.

Pharmacokinetic profile of drugs especially oral medications necessitate that drugs be used at regular intervals. This is particularly important in case of antibacterials. Failure to use antibacterial drugs at the due time may lead to gradual decrease in plasma concentration from the minimum inhibitory concentration (MIC) thereby exposing the bacteria to sub-therapeutic concentration (STC). Prolonged exposure of bacteria to STC may promote development of resistant strains [26]. It is therefore expedient to counsel patients to adhere to regular dosage intervals. For instance, antibacterials prescribed as two tablets tds are better taken every eight hours rather than just three times daily. In case of missed doses, patients should be counselled to take the missed dose immediately they remember and necessary adjustment should be made for regular intervals in subsequent administration. If the time for the next dose is close by, the patient may be counselled to wait till the next due time. This study showed that very few, eighteen (4.4%) of the patients were counselled on action to take when there is missed dosage. The result is different from 16.0% reported in another study [21]. It also contrasted value of 67.4% reported in a study carried out in Ethiopia [9]. The contrast may be because the study in Ethiopia was carried out in community pharmacies while the present study was in the hospital setting. There was significant improvement on the number of patients counselled on missed dosages at the post intervention survey  $p < 0.001$ .

**Table 6. The effect of MR. CS DAFT Intervention on patients' knowledge of antibacterial usage (N=409)**

Statements	Baseline		Post Intervention		Mc Nemar
	Yes N (%)	No N (%)	Yes N (%)	No N (%)	p- value
Missing any dosage of my antibacterial medication often requires that I use the missed dose immediately I remember	18 (4.4)*	391 (95.6)	293 (71.6)*	116 (28.4)	< 0.001
Regular dosing of antibacterials is important to realize treatment outcome	38 (9.3)*	371 (90.7)	265 (64.8)*	144 (35.2)	< 0.001
Completion of course of antibacterial treatment must be ensured even when I am already relieved	17 (4.2)*	392 (95.8)	171 (41.8)*	238 (58.2)	< 0.001
Side effects of antibacterials does not always necessitate discontinuation of treatment	19 (4.6)*	390 (95.4)	355 (86.8)*	54 (13.2)	< 0.001
Duration of antibacterial treatment tells me about how long to be on the antibacterial drug(s)?	105 (25.7)*	304 (74.3)	376 (91.9)*	33 (8.1)	< 0.001
Awareness of the presence of antibacterial drug in my medication will make me pay special attention to its use	83 (20.3)*	326 (79.7)	272 (66.5)*	137 (33.5)	< 0.001
Food and drugs, when taken together may sometimes hinder the effectiveness of the antibacterials	56 (13.7)*	353 (86.3)	141 (34.5)*	268 (65.5)	< 0.001
Therapy delay or failure of antibacterial activity within a specified time should be reported at the hospital	156 (38.1)*	253 (61.9)	171 (41.8%)	238 (58.2)*	0.26
<b>Mean knowledge score</b>	<b>2.0 ± 1.0</b>		<b>4.7 ± 1.2 (p &lt; 0.001)</b>		
<b>Cut off of patients' % knowledge score of antibacterial use</b>	<b>N (%)</b>	<b>Remark</b>	<b>N (%)</b>	<b>Remark</b>	
<70%	408 (99.8)	Poor Knowledge.	303 (74.1)	Poor Knowledge	
≥ 70%	1 (0.2)	Good Knowledge	106 (25.9)	Good Knowledge	

\*Correct response = 1, incorrect response = 0, maximum obtainable score = 8, % individual knowledge score = (score obtained by individual ÷ total obtainable score) × 100.  
M= Missed dosage, R = Regular dosage intervals, C = Completion of course of therapy, S = Side effect, D = Duration, A = Antibacterial awareness and identification, F = Food and drug interactions, T = Therapy delay or failure

The current study confirmed that a minority, 17 (4.2%) of the patients were counselled on the need to complete the course of therapy which is different from findings by [27,28] who reported 47.1% and 50.0% respectively. Unlike drugs for chronic ailments, antibacterial prescriptions are often used for few days and open prescriptions are rare. It is important that patients complete the course of therapy as specified in the prescription. Non completion of course of therapy may lead to incomplete eradication of bacterial load which may encourage the growth of resistant bacterial strains.

Co-administration of some antibacterials with food has varying consequences ranging from decrease in absorption to complete loss of activity. It is therefore necessary to counsel patients on how to use their antibacterials in relation to food for those that are affected by food. Some antibacterial drugs, for example tetracycline, co-trimoxazole and azithromycin capsule should be taken one hour before or two hours after meals. Other antibacterials such as amoxicillin, ciprofloxacin and doxycycline should be taken with meals to minimize stomach upset. It is evident from the present study that only 13.7% of the patients claimed to be counselled on antibacterial-food interactions. It then means that the patients were not well counselled on antibacterial use in relation to meals and patients may not receive full activity from the drugs. The result is at variance with the 65.3% reported by [9] but the difference may be as a result of difference in study settings. The post intervention survey revealed significant increase in the proportion of patients (34.5%) counselled on antibacterial use in relation to meals  $p < 0.001$ .

Antibacterials sometimes interact with other drugs. Such interactions sometimes may have unfavourable effects. Concomitant administration of ampicillin, amoxicillin with allopurinol should be avoided as it may increase the incidence of rash. Azithromycin, ciprofloxacin, Levofloxacin and ofloxacin have their absorption reduced when administered with antacids containing Aluminium hydroxide, Magnesium hydroxide because of absorption impairment [26]. This may lead to decrease or total loss of activity due to antibacterial serum concentration below the minimum effective concentration (MEC). Only 20.0% of the patients in this study claimed to be counselled on drug-drug interactions but this improved significantly at the post intervention  $p < 0.001$ .

Probing into drugs that patients have at home or at hand may be beneficial especially to avoid drug-drug interactions. Keeping left over antibacterial drugs has also been generally viewed to be a pointer to poor compliance and the possibility of over dosage due to multiple uses [25]. One hundred and fifty eight patients (38.6%) claimed to have drugs at home/hand while 4.6% had left over antibacterials similar to 5.0% reported in another study [25]. Only 4.9% asserted to receive counselling on drugs at home, patients were thus left to decide on what to do with the drugs they had at home in relation to the present prescription. This may lead into unwanted drug-drug interactions, over dosage or undue transfer to other users. For instance some of the patients had ferrous sulphate at home. Ferrous sulphate may decrease the absorption of some antibacterials such as the tetracyclines due to complex formation. Pharmacists should endeavour to offer the right counselling on drugs at home. The post intervention witnessed significant improvement  $p < 0.001$ .

Patients on antibacterial therapy may sometimes experience delay in perceiving relief of symptoms of ailment under treatment or outright failure of treatment. Prompt report of delayed activity or seemingly failure in experiencing relief will afford the health practitioners the opportunity to reassess therapy options and take appropriate corrective measures early enough. Patients should therefore be counselled on action to take when there is perceived delay in antibacterial effectiveness. Majority, 61.9% of the patients received no counselling on action to take when delayed antibacterial activity is perceived in contrast to 46.4% reported by [9].

#### **4.2 Patients' Opinion Pharmacists' Counselling on Antibacterial Usage**

More than half, 69.4% of the patients had the opinion that pharmacists should be responsible for antibacterial counselling. Majority, 55.3% were satisfied with the counselling received from the pharmacist similar to that reported by another study [9]. The presents study revealed that 55.3% of patients rated pharmacists' counselling to be  $\geq 70\%$  which signified good counselling. The patients' good rating of pharmacists' counselling did not reflect in their knowledge of antibacterial use. The good rating however may be a reflection of patients' confidence in pharmacists' counselling. This is a welcome disposition as it may depict their willingness to be counselled by pharmacists. Pharmacists should

take advantage of the good patients' disposition to enhance good medication counselling. Generally, the post intervention survey revealed significant improvement in patients' knowledge and opinion about pharmacists' counselling on antibacterial usage. Independent sample T-test confirmed significant improvement in the mean rating  $3.3 \pm 1.5$  and  $3.7 \pm 1.3$  between the two phases respectively ( $p < 0.001$ ). This might be a further confirmation of the effectiveness of the intervention training process.

## 5. LIMITATIONS

This study is limited by the fact that the patients at the baseline survey were not likely to be exactly the same as those in the post intervention survey. This restriction was taken care of by ensuring gender and age balance between the two phases. There was no significant difference  $p > .05$  between the age and gender at the two phases. Although efforts were made at the post intervention survey, not to include patients that have participated at the baseline survey, it was not unlikely that some patients might have participated at both phases. However, this is likely to be negligible as repeated courses of antibacterial treatment are not common as in the treatment of chronic diseases except when there is therapy failure. Convenient sampling was used to select the patients and this may introduce selection bias.

The use of dichotomous Yes or No questions format in ascertaining the patients' opinion rather than the Likert scale may be viewed as a limitation. Despite these limitations, the outcome of the study revealed the current patients knowledge on antibacterial usage and their opinion on pharmacists' counselling.

## 6. CONCLUSIONS

Patients' knowledge of antibacterial usage was poor but they had good opinion about antibacterial counselling. Majority of the patients were not well counselled despite patients' willingness and this resulted in deficit of patients' knowledge of antibacterial proper usage. Patients' knowledge and opinion improved significantly post intervention signifying the importance of pharmacists' continuous training.

## CONSENT

Participants' written and informed consent was obtained by the author.

## ETHICAL APPROVAL

The study was approved by University of Ibadan/University College Hospital (UI/UCH) Health Research and Ethics Committee, approval number: UI/EC/15/038. Permission was also obtained from the pharmacy department of Ogun State Health management board (approval no: SHB/2146/DPS/201)

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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