EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 10
Issue: 2
439-447
Year: 2023

ANTIBIOTICS UTILIZATION PROFILE IN COMMUNITY PHARMACIES IN RIVERS STATE, NIGER DELTA, REGION, NIGERIA

***[1]Mgbahurike Augustina Amaka and [2]Biibaloo Bariweremelo Blessing**

[1,2]Department of Clinical Pharmacy & Management, Faculty of Pharmaceutical Sciences, University of Port Harcourt, Rivers State, Nigeria.

***Corresponding Author: Dr. Mgbahurike Augustina Amaka**
Department of Clinical Pharmacy & Management, Faculty of Pharmaceutical Sciences, University of Port Harcourt, Rivers State, Nigeria.

Article Received on 20/12/2022 **Article Revised on 10/1/2023** **Article Accepted on 30/1/2023**

ABSTRACT

Introduction: Antibiotics are types of antimicrobial drugs/agents used in the prevention and treatment of bacterial infections. The misuse of these agents could lead to development of resistant strains of bacteria as well as increase in therapeutic cost. Th**e objective** of this study is to determine the antibiotic distribution/utilization profile in community pharmacies in Rivers State, and to assess the pharmacists' practice towards antibiotic distribution. **Method**: The study was carried out in 75 randomly selected community pharmacies spread across the State. Sales records of these pharmacies were reviewed and relevant information extracted, with the pharmacists' consent, for 6months. Contact was made with the superintendent pharmacists to assess their attitude/practice towards antibiotics utilization, using structured self- administered questionnaire. **Result**: The penicillins (19.5%), fluoroquinolones (13.9%), macrolides(12.8%), were the most commonly dispensed antibiotics, while lincosamide (2.6)% ,were the least dispensed. The common conditions for which the antibiotics were dispensed were STIs(30%), UTI(28%) Cough (18%), Sinuses infection (10%), Pneumonia (7%), sore throat (3%), and other conditions such as dental cases and influenza (4%). Zone (B) dispensed the highest number of antibiotics 11823 (mean 5911.5±47 while Zone F Elemen/Elelenwo dispensed the least number of antibiotics 7590 (mean 3795±23). It was observed that most of the antibiotics dispensed (54%) was based on pharmacists' recommendation while 23% each, was based on physicians' prescriptions and patients' demand respectively. More than half (57%) of the community pharmacists recommend and give broad spectrum antibiotics, 23% gave antibiotics similar to physicians prescription, while 13% refer patient to a physician. 87% of community pharmacists gave patients advice on dose compliance while 17% educate patients on potential side effects of antibiotics dispensed. As 50% admitted to appropriateness of antibiotic prescription that comes to the Pharmacies, 33% claimed that it's only sometime. **Conclusion:** Antibiotic utilization is high in community pharmacy in Rivers State with its attendant consequences, but the appropriateness of antibiotic prescription and recommendation is in line with the common conditions within the environment.

KEY WORDS: Antibiotics Utilization, Community Pharmacies, Rivers State, Nigeria.

INTRODUCTION

Antibiotic is a type of antibacterial drug/agent used in the prevention and treatment of bacterial infections. They are commonly dispensed medications from community pharmacies and are often accessible with or without prescription. The inappropriate use of antibiotics results in emergence of resistant strains of bacteria, which represents a considerable public health problem, particularly in developing countries. Irrational use of antibiotics is a key reason for increased and spread of antibiotic resistance.[1,2] Antibiotics are the most widely used category of drugs in the world.[3] Despite the enormous gains prudent use of this class of drugs would have had on World health, the irrational use of antimicrobial has driven the relentless expansion of resistant microbes leading to a loss of efficacy of these drugs.[4]

In 2011, the World Health Day theme was "Combat drug Resistance: no action today means no cure tomorrow" and for this occasion the WHO introduced a six point policy package to fight against the spread of antimicrobial resistance.[5]

There may be various factors which may influence irrational antibiotic use. Many studies have reported that antibiotic regimen non adherence and inappropriate antibiotic use are strongly associated with public awareness and knowledge of antibiotics.[6] Factors associated with public knowledge of antibiotics have

been reported to be demographic characteristics, including gender, age, race, educational level, family income, place of residence, as well as other factors such as lack of advice regarding rational antibiotic use given by a physician or pharmacist.[7]

In a study on antibiotic self -medication among Iranian University students by[8], amoxicillin was the most commonly used antibiotic in that region. Another study in Central India, in Medicine intensive care Unit of the Teaching hospital, found that the most dispensed was Cefotaxime (32%), followed by Metronidazole (24%) and Ampicillin (17.29%).[9]

In a retrospective study carried out in Ethiopian Hawassa University Referral Hospital, on pattern of antibiotic use, the authors found that the most frequently prescribed single antibiotic was Penicillin G crystalline, while the most common multiple antibiotic prescription was ampicillin injection plus gentamycin injection followed by Chloramphenicol injection and Cloxacillin injection.[10] In a study of antimicrobial drug use pattern in a Nigerian metropolitan city[11] the authors observed that frequency of antimicrobial use profile was, Metronidazole(19%); Ampicillin/Cloxacillin (19%); Amoxicillin (16%); and Co-trimoxazole (12%). Further, they identified malaria (21%); upper respiratory tract infection (URTI (19%) were the most frequent medical condition for which antimicrobial were used.

This study, thus, aimed to determine the antibiotic distribution profile in registered community pharmacies in Rivers State, in Niger Delta region. Also to identify the most common medical condition for which the antibiotics was dispensed as well as assess the pharmacists' attitude towards antibiotics demand by patients.

METHOD

Study area

The study was carried out in Rivers State which is located in the South - South geopolitical zone of the Federal Republic of Nigeria, in Niger Delta region.The study was conducted in 75 randomly selected registered community pharmacies across the State.

Study design

The study was carried out in two parts. Part I involved direct review and extraction of relevant information from the records in the selected community pharmacies, with the consent of the superintendent pharmacists, for a period of 6 months(January - June 2017) Information obtained include: Name of antibiotic, class, quantity, condition for which it was dispensed (where available), information on mode of dispensing i.e. through physician' prescription, or pharmacist's recommendation or patient's demand.

Part II was carried out using self- administered pretested structured questionnaire to obtain relevant information on the attitude of the pharmacist as it concerns antibiotic utilization. The questions covered:

- ✧ Knowledge on appropriate use of antibiotics
- ✧ Attitude to antibiotic demand by patients
- ✧ Advice given to patients on antibiotic regimen adherence and compliance
- ✧ When/how antibiotics are dispensed in community pharmacies.

Sample size

Information obtained from Rivers State Ministry of health showed that 298 community pharmacies had renewed their practice registration as at the time of this study. The pharmacies were grouped in zones according to their geographical location and each Zone was allocated the letter A - U. There were 20 zones and each zone has 10 to 30 pharmacies within. With systematic sampling, a total 15 zones were selected. For each selected zone, convenient sampling was used to select the community pharmacy studied. A total of 75 community pharmacies were selected for this study.

Yamane's[12] formula was used to calculate the sample size and a total of 75 pharmacies were obtained as sample size.

$$n = N/1 + N(e)^2$$

Where n = sample size; N = population size (298); e = sampling error. Assuming 90% confidence interval, n was calculated and approximately 75community pharmacies was obtained.

Inclusion criteria

- ◆ Registered community pharmacies in Rivers State
- ◆ Superintendent pharmacist in the selected pharmacy

Exclusion criteria

- ◆ Unregistered community pharmacies
- ◆ Patent medicine stores
- ◆ Superintendent pharmacist who is not willing to participate

Data collection/ data analysis

Data were collected from a total of 75 community pharmacies. With the consent of the superintendent pharmacist relevant information were extracted from the records in the pharmacies. The information as stated in Part I were collected.

A total of 75 superintendent pharmacists responded to the questionnaire giving a respond rate of 100%. The information as given in Part II were obtained.

The data obtained were entered into a spreadsheet, cross checked and analyzed using Microsoft excel and statistical package for social sciences (SPSS) version 20 IBM Corporation on a computer. Mean and standard deviation were determined and statistical significant difference was taken at $p<0.05$.

RESULT

The result of the demographic data of the study group is given in Table 1.

Table 1. Demographic data of Community Pharmacists that participated in the study.

Variable	Frequency	Percentage
Male	52	69.3%
Female	23	30.7 %
Age		
20 - 29	17	22.7%
30 - 39	40	53.3%
40 - 49	13	17.3%
>50	5	6.7%
Educational Qualification		
B. Pharm	50	66.7%
Pharm D.	13	17.3%
M.Pharm/M.Sc	12	16%

The result showed more male 52(69.3%) than female 23(30.7%). Most 40(53.3%) of the Community pharmacists who participated in the study were with in the age of 30 -40 years while few 5(6.7%) were above 50 years. Most 50(66.7%) of the community pharmacist have B.Pharm., while 13(17.3%) have Pharm.D.

The list of various Zones where registered pharmacies are located is shown Table 2.

Table 2: The list of Zones where registered community pharmacies are located with the corresponding amount of antibiotics dispensed within the zone within study period (6months).

Zone	Total Antibiotics Dispensed	Mean ± SD
A (Ogbunabali)	10234	5117±29
B (Port Harcourt Town)	11823	5911.5±47
C (Rumuola)	11001	5505±31
D (Rumuomasi)	11204	5602±39
E (Woji)	11412	5706±42
F (Eleme/Elelenwon)	7590	3795±23
G (G.R.A)	10986	5493 ±39
H (Diobu)	11368	5684±86
I (NTA)	11031	5515.5±47
J (AGIP)	11150	5575±57
K (Rumuokoro)	9641	4820±34
L (Rumuokwuta)	10193	5096±23
M (Waterline)	10311	5155.5±32
N (D/Line)	11386	5693±39
O(Oyigbo)	11466	5733±41

Zone B (TOWN) dispensed the highest amount of antibiotics (1,1823) within the 6 months study period, with Zone F(ELEME/ELENWO), having the least mean dispensed antibiotics (3795± 23).

The various classes of antibiotics and the frequency of their dispensing is shown in Fig 1.

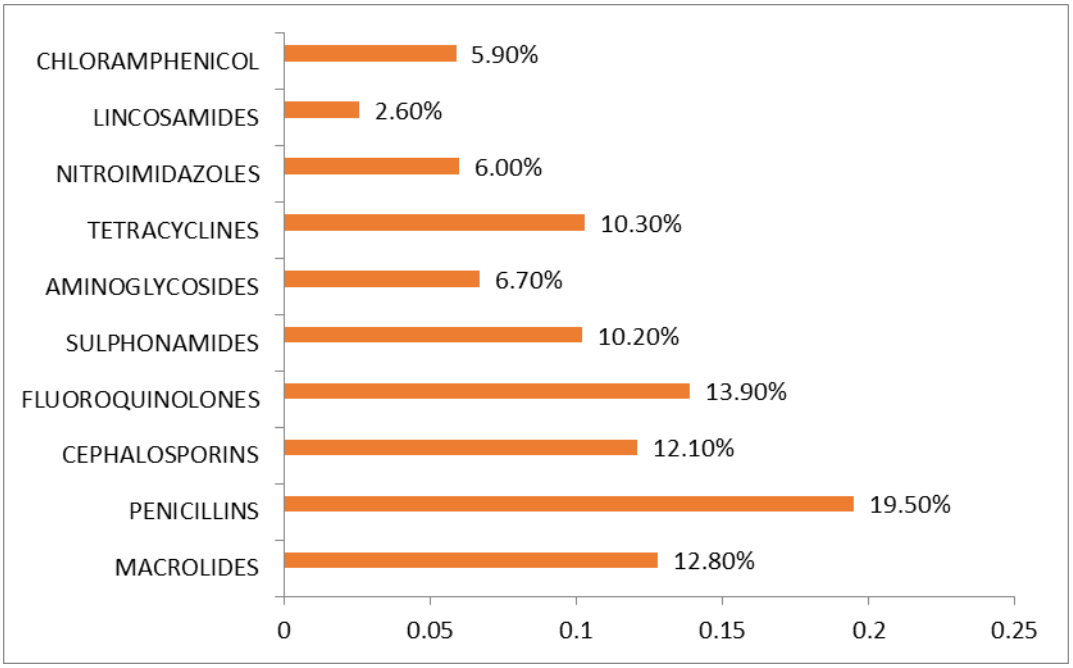

Fig. 1. Various classes of antibiotics and the frequency of distribution across the Zones.

The result showed that the Penicillins were the most dispensed followed by Fluroroquinolones, while the Lincosamides were the least dispensed.
The conditions for which the antibiotics were dispensed is given in Table 3.

Table 3: Conditions for which Antibiotics were dispensed.

Conditions	Proportion	Percentage
Urinary Tract Infection	21	28%
Cough	13	17.3%
Sore throat	2	2.7%
Pneumonia	5	6.7%
Sinus Infection	8	10.7%
Sexually Transmitted Infections (STIs)	23	30.6%
Others (dental conditions, influenza)	3	4%

The result showed that the antibiotics were mostly dispensed for sexually transmitted infections, followed by urinary tract infection (UTI), but least dispensed for sore throat. Similar scenario cut across all the zones.
Community Pharmacists mode of dispensing antibiotics is shown in Fig 2.

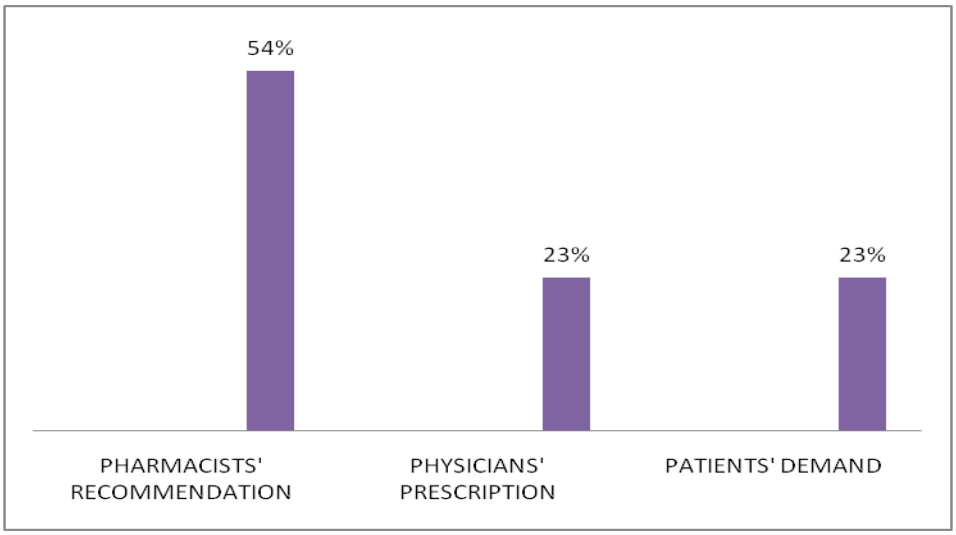

Fig 2: Mode of dispensing antibiotic in community pharmacies.

The result showed that most (54%) of the antibiotics dispensed in community pharmacy is based on the pharmacists' recommendation, while, 23% was based on patient's demand.

Pharmacists' response /reaction to patients' demand for antibiotics is shown in Fig 3.

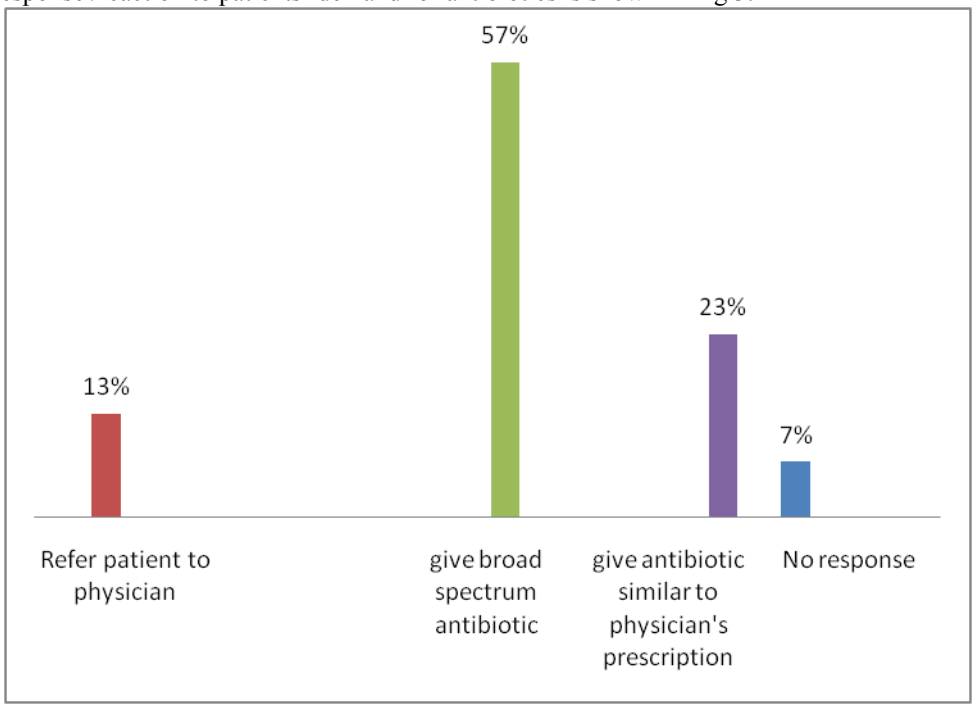

Fig. 3: Pharmacists' reaction to patients' demand for antibiotics.

The result revealed that most (57%) community pharmacists give broad spectrum antibiotics, while 13% refer the patient to the physician.
The result of the pharmacists' response to giving advice to patients on compliance and on side effects of antibiotics is given in Fig 4.

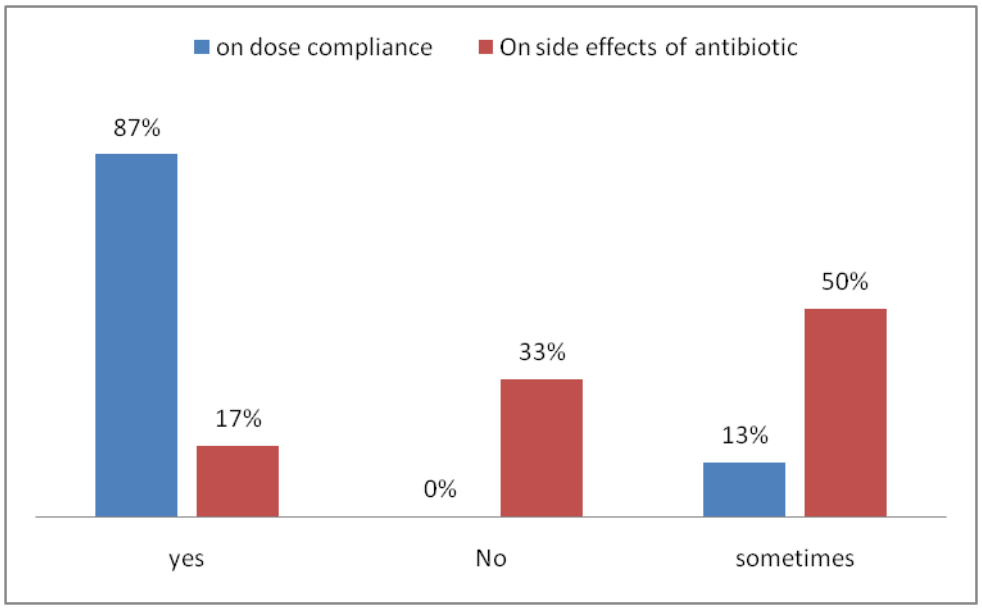

Fig 4.: Pharmacists' response to giving advice to patient on dose compliance and side effect of antibiotics.

Eighty-seven percent (87%) of the respondents always give advice to patients on dose compliance of the antibiotic while 13% sometimes give advice on dose compliance. Meanwhile, 13% educate patients on side effects of the antibiotics and 50% sometimes educate patients on the side effects of the antibiotics while 33% do not educate patients of side effects at all.

The respondents response to the appropriateness of prescriptions for antibiotics that come to the pharmacy is shown in Fig 5.

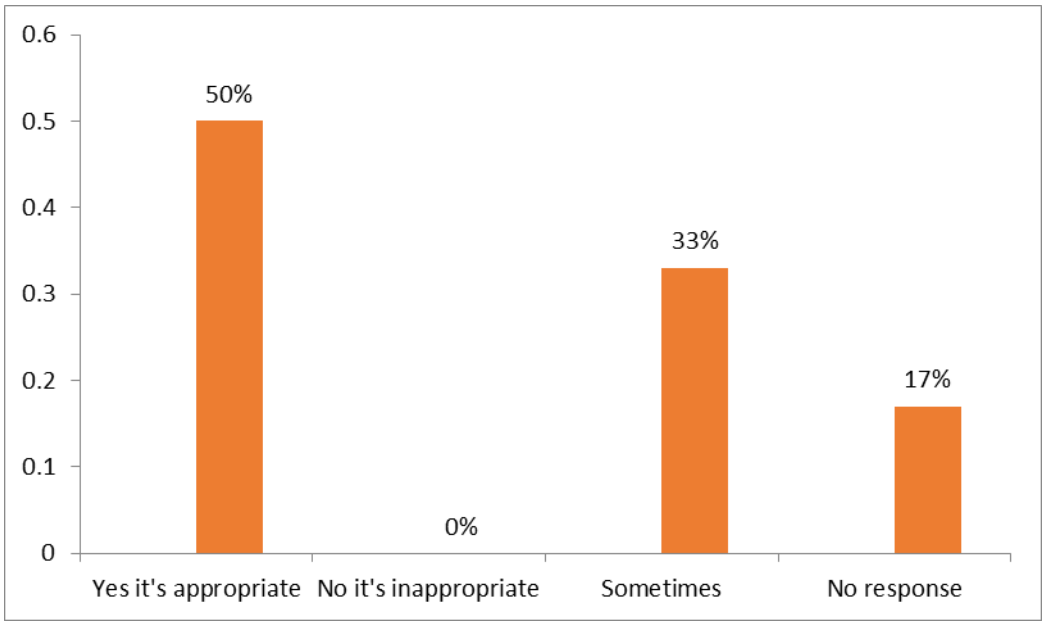

Fig. 5: Respondents' response to appropriateness of antibiotic prescription that comes to the pharmacy.

50% of the respondents agreed that the antibiotic prescription that comes into pharmacy is appropriate while 33% said that it's only sometime, but none disproved with the appropriateness of the prescriptions. Meanwhile all the respondents disagreed to the effectiveness of antibiotics against viral infections.

DISCUSSION

Antimicrobial are reported as some of the most frequently used medications in modern medicine. Irrational use of antibiotics and weak regulatory enforcement of drug sales are serious issues in developing countries that contribute significantly to bacterial resistance.[13] The result from this study showed that Penicillins (19.5%) were the most frequently dispensed antibiotic from the Community Pharmacies in Rivers State. This pattern is similar to previous reports in Benin City, Nigeria.[14] and elsewhere.[15, 8,16]

Demographic data of the superintendent pharmacists showed that 66% of them were practising with B. Pharm. degree, while 17% each were M.Sc. and Pharm D. holders. There may be need for training upgrade for more effective medication management. Again, there were more male (70%) than female. This may call for wonder, if antibiotic management may be gender related.

The mean value of total antibiotics dispensed across the 15 zones visited within the study period was 5359 ± 291. The proportion of this total number occupied by penicillins was 19.5%, fluoroquinolones 13.9%, macrolides 12.8%, cephalosporins 12.10%, tetracycline 10.3%, sulphonamides 10.20%, aminoglycosides 6.7%, nitroimidazoles 6.0%, chloramphenicol 5.9% and lincosamides 2.6%. The values obtained showed penicillin, comprising amoxicillin, amoxicillin/clauvanic acid, ampicillin/cloxacillin, and penicillin) were the most dispensed antibiotics across the various zones. The least dispensed antibiotics were lincosamides (clindamycin), 2.6%.

Out of other classes of antibiotics such as the aminoglycosides, tetracycline, sulfonamides, marolide, nitroimidazoles, and cephalosporins, the fluoroquinolones which comprise (levofloxacin, ofloxacin, ciprofloxacin) about 13.9% were the second most dispensed antibiotics within he study period.

Comparison among the different zones showed that Zone B (TOWN) dispensed the highest number of antibiotics, mean value 5911.5±47, while Zone F (Eleme/Elelenwo) dispensed the least number of antibiotics with a mean value of 3795± 23, significantly different at $p>0.05$. The possible reason for the difference in number of antibiotic dispensed in these two zones could be attribute to the number of community pharmacies located within each zone. Zone F was noted to have larger number of patent medicine stores than registered community pharmacies. As such, inhabitants in such areas are more likely to patronize these patent medicine vendors more than registered community pharmacies. This could be a clear case of proximity to the registered community pharmacies which is in contrast to Zone B which has greater proportion of registered community pharmacies and easy access to the pharmacies. Another factor could be the socio- economic status of the inhabitants of these zones. The location of zone B, which is located in Port Harcourt main town, give it an edge over zone F which is

rather situated close to rural region of the state. Another factor that might give reasons for this difference might be availability of hospitals/clinics around this region (zone B). This could possibly explain why there was also a high level of dispensed antibiotic medications in Zone I (NTA) and Zone N (D/LINE). The Teaching Hospital of the State is located in Zone I, as such a good number of prescription requesting for these antibiotics could be from the hospital. Also, Zone N (D/Line) houses a number of private hospitals/clinics and prescriptions from these premises could request for these antibiotic medications.

The result obtained via the questionnaire revealed that sexually transmitted infections (STIs) 30% were the most common condition for which antibiotics were dispensed across the Zones within the study period.The other conditions for which antibiotics were dispensed across the Zones were urinary tract infections (28%), cough (18%), sinus infections (10%, pneumonia (7%), sore throat (3%), and other conditions such as dental problems, influenza, accounted for 4%.

A look at the region that dispensed the highest number of total antibiotics which as well doubled as the region that dispensed the highest number of Penicillins and Macrolides. The common condition for which antibiotics were dispensed in this region sexually transmitted infections, cough and urinary tract infections. Treatment guidelines stipulate that for UTIs, trimethoprim/sulfamethoxazole (sulfonamides) should be administered orally. This was stipulated by the Infectious Disease Society of America (IDSA) in 2010.[17] Meanwhile, guideline stipulated for sexually transmitted infections by the society is the use of Penicillin. This may explain why the high number of penicillin dispensed.

Assessing the reaction of the pharmacists towards the dispensing of antibiotics, 87% of the respondents admitted they advice patients on importance of dose compliance, while 13% offer this advice only sometimes. It is essential in the concept of Pharmaceutical care that vital information such as the essence of dose compliance should be made available to the patient while dispensing medications. This ensures that the patient derives maximum benefit required from the medication. Another notable result showed that only 17% of the respondents educate patients on the potential side effects of dispensed antibiotic and 33% do not educate the patients and 50% educate patients sometimes on the potential side effects of antibiotic dispensed. This could be compared to a study carried out in India which reported that 61% of pharmacists who participated in study considered patient counseling as professional responsibility, but only few pharmacists were offering this services.[18] It is essential to arm patient with this information as this gives patient a picture of expected event that may arise in course of the treatment.

It was also observed that all the respondents agreed that antibiotics should not be prescribed/ dispensed for viral infections as they are seen to be ineffective to viral infections. It is known that prescription of antibiotic for the treatment of viral infections is a major cause of antibiotic resistance. Antibiotics are ineffective against viral infections and use of this class of drugs inappropriately leads to the development of resistant strains of bacteria, treatment failure, and also has economic consequences as it increases the cost of essential healthcare. A proportion of the respondents (80%), disagreed that antibiotic resistance is peculiar to hospital pharmacy alone. This statement is incorrect because the development resistant strains of bacteria to antimicrobial agents has been seen to emanate, not only from hospital/clinical settings but also from community pharmacy setting. The dispensing of antibiotics at the request of patients not knowledgeably about drugs leads to misuse of this class of drug and this ultimately leads to resistance, increased cost as well as treatment failure. In respect to mode of dispensing antibiotics across these Zones, 23% dispensed antibiotics based on physician's prescription, another 23% dispensed based on patients' demand. A greater number, 54%, dispensed this class of drugs based on pharmacists recommendation. Dispensing antibiotics at the request of patients is a trend that should be monitored and highly discouraged. Patients' knowledge on the appropriateness of a particular antibiotic to be used in management of bacterial infection should not be relied upon when dispensing antibiotics. Certain principles govern the prescription of antibiotics: Correct diagnosis of bacterial infection for which specific antibiotics are known to be effective compared to placebo.[19] Choice of a drug that has efficacy in treating or preventing the disease but leaves other bacteria in the body intact. This minimizes the spread of resistance and leaves the other bacteria in the body intact, that act as a natural defence against invading organisms. Adherence to this principles reduces the risk of super-infection.[20] This may also be pertinent in analyzing the result obtained from this study as it relates to Pharmacists recommending broad spectrum antibiotics when patient walks int the pharmacy demanding for antibiotic to treat his/her infection. The continuous use of broad spectrum antibiotic has been related to increased level of antibiotic resistance.[21] It should be advocated that susceptibility test be carried out before antibiotics are used in treatment of bacterial infection. Narrow spectrum antibiotics should be prescribed where appropriate, and over reliance on prescription of broad spectrum antibiotics as noted in this study (57%), should be discourage. The use of antibiotics at recommended dose levels to treat confirmed bacterial infection is a type of exposure for which the benefits outweigh the risk of selecting resistant strains.[22] This type of acceptable selection pressure is high in countries like Nigeria where there is a heavy burden of community acquired bacterial infections that dictate a heavy requirement for curative therapy. Unfortunately, much of the antibiotic therapy is not laboratory individualized or even laboratory

extrapolated. This, coupled with high proportion of life threatening infections that require immediate treatment, means that antibiotic prescription, usually with first line drugs such as ampicillin, penicillin, ampiclox, tetracycline, gentamycin, metronidazole, and erythromycin is largely empirical and that resistance will only be dictated in cases of therapeutic failure.[23,24] The treatment of infected people in Africa is further challenged by the fact that prohibitive cost of new second line antibacterial such as amoxicillin - clavulanate, ciprofloxacin, cefuroxime, ceftriaxone, ofloxacin, etc, when available places them out of reach of majority of patients.[25]

CONCLUSION

The emergence of antibiotic resistance in bacterial pathogens is a serious development that threatens to end the antibiotic era. This study revealed that despite knowledge level of the community pharmacists, there is still a high level of irrational antibiotic distribution.

The most dispensed antibiotic was the Penicillins, and the highly densely populated Port Harcourt Town (Zone B) dispensed the highest quantity of antibiotics. The most common condition for which the antibiotics was dispensed was sexually transmitted infection (STIs)

Recommendation

Clearly, there is a dire need for rational and prudent use of antibiotic.

- Physicians must resist the pressure from patients to prescribe antibiotics unless a diagnosis of bacterial infection is established. In Rivers State, Nigeria, urgent measures need to be taken to sanction drug vendors who are often not trained to diagnose infections or prescribe antibiotics correctly and who also serve as unofficial outlets for many antibiotics to large proportion of the population who have little access to authorized community pharmacists.
- Proper drug storage, strict hygiene, sanitation and infection control are steps that will prevent the spread of resistance strains, reducing the need for antibiotic therapy as well as the overall cost of essential healthcare. It is imperative to educate the public about the consequence of irrational use of antibiotics.
- Where possible patients must be advised on the rational for obtaining medications from appropriate and genuine source and reputable community pharmacies, where a lot of information about the medication can be provided.
- Pharmacists should be compelled to dispense antibiotics following stipulated guidelines.

REFERENCES

1. Nordberg P, Monnet DL, Cars O (2004). Antibacterial Drug Resistance (Background Document for the WHO Project: Priority Medicines for Europe and the World. A Public Health Approach to Innovation). WHO: Geneva, Switzerland.
2. Morgan DJ, Okeke IN, Laxminiarayan R, Perencevich EN, and Weisenberg S. Non - prescription antimicrobial use world wide: a systematic review. The Lancet Infectious Disease, 2011; 11(9): 692 – 701.
3. Gaash B. Irrational use of antibiotics. Indian Journal of Practising Doctors, 2008; 5(1): 25 – 29.
4. World Health Organization (WHO) 2014 Antimicrobial resistance. http//www.who.int/mediacentre/factsheets/fs194/en/ March 2014
5. World Health Organization (2011) Containing antimicrobial resistance: review of literature and report of WHO workshop on the development of global strategy for containment of antimicrobial resistance. Geneva Switzerland
6. Chan G. and Tang S. Parental knowledge , attitude and antibiotic use for acute upper respiratory tract infection in children attending a primary healthcare clinic in Malaysia. Singapore Med J 2006; 47(4): 266 – 270.
7. Barah F. and Gonçalves V. Antibiotic use and knowledge in the community in Kalamoon, Syrian Arab Republic: a cross-sectional study Eastern Mediterranean Health Journal (EMHJ) 2010; 16(5): 516 – 520.
8. Sawalha AF, Sweileh WM, Zyoud SH, Al-Jabi SW, Shamseh FF, Oddah A. Analysis of prescriptions dispensed at community pharmacies in Nablus, Palestine. East Mediterr Health Journal, 2010; 16(7): 788 -792.
9. Vandana AB and Sanjaykumar BN. Study of prescribing of prescribing pattern of antimicrobial agents in Medicine Intensive Care Unit of a Teaching Hospital in Central India. Journal of Association of Physicians of India 2011; 60(4): ISSN -5772.
10. Minyahil A. Woldu, Sultan Suleman, Netsanet Workneh and Haftay Berhane Retrospective Study of the Pattern of Antibiotic Use in Hawassa University Referral Hospital Pediatric Ward, Southern Ethiopia Journal of Applied Pharmaceutical Science, 2012; 3(02): 093-098. Available online at http://www.japsonline.com DOI: 10.7324/JAPS.2013.30216 ISSN 2231-3354
11. Enato E and Uwaga C. Profile of antimicrobial drug use pattern in a Nigerian metropolitan city. International Journal of Health Research, 2011; 4(1): 37 -44.
12. Yamane, Taro. (1967). Statistics: An Introductory Analysis, 2nd Edition, New York: Harper and Row.
13. Okeke IN, Kulgama KP, Zulfiqur A B, Dude AG, Philip Jenkins, Thomas F. O'Brien Ariel Pablos - Meedez, Ramanan Laxminarayan. Antimicrobial resistance in developing countries. Part II: strategies for containment. The Lancet Infectious Dis., 2005; 5(9): 568 -580.

14. Obaseki-Ebor E, Akerele JO, Ebea PO. A survey of antibiotic outpatient prescribing and antibiotic self medication. Journal Antimicrobial Chemother, 1987; 20: 75963.
15. Pathak A, Mahadik K, Dhaneria SP, Sharma A, Erikson B, Lundborg CS. Antibiotic prescribing in outpatients hospital and seasonal variations in Ujjain , India. Scand J Infec Dis., 2011; 43: 479 – 488.
16. Cohen, S. R., Friedland, G., Noon, S. B. & Glick, S. Antibiotic usage in Kupat Holim (Sick Fund) clinics: a pilot study and evaluation. Isr. J. med. Sci., 1979; 15: 811-816.
17. Infectious Diseases Society of America (IDSA) (2010).
18. Adepu R and Nagavi BG. Attitude and behaviour of practicing Community pharmacists towards patient counseling. Indian Journal of Pharmaceutical Sciences. Indian Journal of Pharmaceutical Sciences, 2009; 71(3): 285 – 289.
19. Brunton L, Parker K, Blumenthal D, Buxton I. (2008) Goodman & Gilman's Manual of Pharmacology and Therapeutics. International Edition, McGraw- Hill, New York, pp 707 – 797.
20. Goosens G. Expert proposed European strategies to monitor and control infection; antibiotic use and resistance in healthcare facilities. Lancet Infect Dis., 2011; 11(5): 338 – 340.
21. Barza M, Giuliano M, Jacobus NV, Gorbach SL,. Effect of broad spectrum antibiotics on "colonization resistance" of intestinal micro-flora of humans. Antimicrob Agents Chemother, 2008; 31(5): 723 – 727.
22. Rafailidis PI, Pitsomunis, AI, Falagas ME. Meta-analyses on the optimization of the duration of antimicrobial treatment for various infections. Infect. Dis. Clin. North Am., 2009; 23: 269-276.
23. Gordon MA and Banda HT. Non- typhoidal bactereamia among HIV infected Malawian adults: High mortality and frequent recrudescence. 2002; AIDS 16: 1633 -1641.
24. Iwe P ed. (2006). Textbook of Pharmacology. African First Publishers Ltd, Onitsha, Nigeria, PP: 480-495.
25. Okeke IN and Sosa. Antibiotic resistance in Africa - discerning the enemy and plotting a defence. African Health 2003; 25(3): 10 -14.