Antibiotic prescribing pattern of physicians at the general out-patient pharmacy of Lagos University Teaching Hospital, Nigeria

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ABSTRACT

Background: Abuse of antibacterial drugs has contributed greatly to the development of resistant strains globally. Prescribing pattern monitoring studies are drug utilization studies that focus on prescribing, dispensing, and administering drugs to promote rational use of medicines.

Objective: To assess antibiotic prescribing pattern of physicians at the general out-patient pharmacy of Lagos University Teaching Hospital, Idi-araba. Lagos, Nigeria.

Methods: A one year Prescription audit was carried out for all prescriptions (N) with antibiotics, assessed for drug/antibiotic prescribing patterns and compliance with WHO prescribing indicators.
Ethical approval (ADM/DCST/HREC/APP/2877) was obtained from the Hospital's Health Research and Ethics Committee.

Results: A total of 12,619 prescriptions (N) were audited with 1,416 (11.2%) antibiotic encounters (n). Demographic data revealed higher figures for male (56.2%) and adults (80.6%) patients. The mean number of antibiotics per prescription was 1.1±0.3 while the antibiotic mostly prescribed was the penicillin group (40.0%). Generic prescribing was 77.5% and the number of drugs per prescription was 3.2±1.5 compared with WHO standards of 100% and 1.6-1.8% respectively. The percentage encounter with injectables was 0.1%. There was a significant difference in the number of drugs and antibiotics prescribed per encounter between adults and children as (p=0.006) and (p=0.000) respectively. There were copies of the National Essential Drug List and Standard Treatment Guidelines in the facility.

Conclusion: The study showed antibiotic/drug prescribing pattern of the physicians and some gaps to be bridged. There is need to promote rational use of antibiotic/drugs in the facility through functional Antimicrobial Stewardship Committee and Drug and Therapeutics Committee of the Hospital.

Keywords: Antibiotics, prescribing pattern, bacteria resistance, rational drug use, outpatient.

Schéma de prescription d'antibiotiques par les médecins à la pharmacie générale du centre hospitalier universitaire de Lagos, Nigeria.

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RÉSUMÉ

Contexte : L'abus de médicaments antibactériens a largement contribué au développement de souches résistantes à l'échelle mondiale. Les études de surveillance des habitudes de prescription sont des études sur l'utilisation des médicaments qui portent sur la prescription, la délivrance et l'administration des médicaments afin de promouvoir l'utilisation rationnelle des médicaments.

Objectif : Évaluer les habitudes de prescription d'antibiotiques des médecins à la pharmacie générale des patients externes du centre hospitalier universitaire de Lagos, Idi-araba. Lagos, Nigeria.

Méthodes : Un audit de prescription d'un an a été effectué pour toutes les prescriptions (N) avec des antibiotiques, évaluées pour les modèles de prescription de médicaments/antibiotiques et la conformité avec les indicateurs de prescription de l'OMS.
L'approbation éthique (ADM/DCST/HREC/APP/2877) a été obtenue auprès du Comité de recherche et d'éthique en santé de l'hôpital.

Résultats : Un total de 12 619 ordonnances (N) a été audité, dont 1 416 (11,2 %) rencontres avec des antibiotiques (n). Les données démographiques ont révélé des chiffres plus élevés pour les hommes (56,2%) et les adultes (80,6%). Le nombre moyen d'antibiotiques par ordonnance était de 1,1±0,3 et l'antibiotique le plus prescrit était le groupe des pénicillines (40,0 %). La prescription de médicaments génériques était de 77,5 % et le nombre de médicaments par ordonnance était de 3,2±1,5, alors que les normes de l'OMS sont respectivement de 100 % et de 1,6-1,8 %. Le pourcentage de rencontre avec les injectables était de 0,1%. Il y avait une différence significative dans le nombre de médicaments et d'antibiotiques prescrits par rencontre entre les adultes et les enfants, respectivement (p=0,006) et (p=0,000). Des copies de la liste nationale des médicaments essentiels et des directives de traitement standard étaient disponibles dans l'établissement.

Conclusion : L'étude a montré les habitudes de prescription d'antibiotiques/médicaments des médecins et certaines lacunes à combler. Il est nécessaire de promouvoir l'utilisation rationnelle des antibiotiques/médicaments dans l'établissement par le biais d'un comité fonctionnel de gestion des antimicrobiens et d'un comité des médicaments et de la thérapeutique de l'hôpital.

Mots Clés : Antibiotiques, habitude de prescription, résistance des bactéries, usage rationnel des médicaments, patients externes.

INTRODUCTION

Medicine has played a vital role in the treatment of diseases, and antibiotics have contributed greatly to the survival of human race since discovery. The concept of rational use of medicines can be dated back to the statement of Alexandrian physician, Herophilus, in 300 B.C on the use of drugs. He said that "Medicines are nothing in themselves but are the very hands of God if employed with reason and prudence".[1] Antibiotics are types of antimicrobial substances active against some bacterial infections and are widely used in the treatment and prevention of such infections.[2] Globally, it has been estimated that 80% of antibiotics is used in the community, out of which 20-50% are used inappropriately,[3] causing a significant impact on the quality of care, cost of therapy, and incidence of adverse drug reactions experienced by patients. Literature also shows that up to 50% of antibacterials used in the Hospital are inappropriately prescribed.[4] Overuse, inappropriate use, self-medication, prescribing without routine susceptibility testing, and antibiotic guidelines are some of the causes of antibiotic resistance.[5] The consequent effect of this is seen in the emergence of resistant strains of the agents, a phenomenon that was first observed in 1947 when microorganisms (Staphylococcus species) showed resistance against penicillin.[6] This has made infectious diseases a significant threat to public health, posing risks to individuals regardless of age, sex, ethnic background, socioeconomic status, or lifestyle, and leading to an increase in morbidity and mortality.[7]

Prescribing pattern monitoring studies are drug utilization studies that focus on prescribing, dispensing, and administering drugs to promote rational use of drugs; this is a great tool in combating the emergence of resistant strains of bacteria. This study aimed at using selected WHO/INRUD core prescribing indicators for the assessment, comparing it with the standard values[8,9] as shown below:

- ✓ The average number of drugs prescribed per encounter (standard value 1.6-1.8)
- ✓ Percentage of encounters with an antibiotic prescribed (standard value 20.0-26.8%)
- ✓ Percentage of drugs prescribed by generic name (standard value 100.0%)
- ✓ Percentage of drugs prescribed from the essential drug list (standard value 100.0%)

Studies on prescribing patterns with regards to antibiotics in the study site have been scarce in recent time, hence the need for this study.

METHODS

Study site

Lagos University Teaching Hospital (LUTH), a 761 bedded Hospital located in Idi- Araba, Lagos, Nigeria was established in 1961 to provide tertiary level health care service.[9] The hospital has three supplementary and specialist clinics located outside Idi-Araba in Yaba (Dermatology and Psychiatry Clinics) and Pakoto (Primary Health Care Centre). The hospital offers various clinical services and cares to all their patients, which include emergency, inpatient, outpatient, intensive care, surgical, paediatrics, geriatric, family medicine, and pharmaceutical services among others.[10]

This study was carried out at the Pharmacy Outpatient Unit, where all outpatients, except from NHIS/ Family Health, APIN (HIV), and DOT (TB) Clinics are attended to. The Clinics that are serviced by the Pharmacy Outpatient Unit include Obstetrics & Gynaecology, Surgical outpatients, Paediatric outpatients, Gastroenterology clinic, Ear Nose & Throat clinic, and Medical Out-patient clinics (Cardiology, Endocrine, Haematology, Respiratory, Urology, Neurology etc)

Study design and population

A retrospective observational study of the prescribing pattern of physicians with regards to antibiotic medications in the out-patient department of the hospital was carried out to assess selected WHO/INRUD core prescribing indicators with standard values.[8,9]

Sample size calculation

This was done using Cochran's sample size formula.[11]

$n=Z^2P(1-P)/d^2$

Where:

Z is the desired level of precision (i.e., the margin of error),

p is the (estimated) proportion of the population that has the attribute in question base d on the previous study as 0.835.[12] q is 1 – p cqrr3 $Z^2 = 1.96^2$ p = 0.835 $d^2=0.05^2$

Substituting the value into the formula - $n=1.96^2x0.835x0.165/0.05^2=211.71$.

We arrived at 211 as the minimum sample size.

Sample collection technique
All prescriptions for one year (July 2018 - June 2019) were identified using the prescription sheets stored at the outpatient pharmacy unit of the hospital. Those prescriptions with antibiotics prescribed were selected.

Data analysis
Data collected were analyzed using Statistical Package for Social Sciences (SPSS) version 21.0. Both descriptive and inferential statistical (Chi- square) tests were carried out. A probability value less than 0.05 was considered statistically significant.

Ethical clearance
This study was initiated after the approval (Reference Number- ADM/DCST/HREC/APP/2877) was obtained from the hospital's Health Research and Ethics Committee.

RESULTS

Demographic data
The total number (N) of prescriptions identified at the unit was 12,619, out of which 2,166 were for children and the remaining 10,453 were for adults. Encounters with antibiotics (n) were 1,416 (11.22%). Prescriptions for antibiotics were for male (56.2%) and female (43.8%) patients as documented on the sheets, and the antibiotic prescription was lower for children (19.4 %) than adult (80.6.%) patients (Table 1)

Table 1: Demographic data

VARIABLE	FREQUENCY (n=1416)	PERCENTAGE (%)
GENDER		
Male	796	56.2
Female	620	43.8
AGE		
Adults	1142	80.6
Children (<12)	274	19.4

Prescription pattern
The study revealed the mean number of drugs per prescription for the prescriptions with antibiotics as 3.18±1.51 with a range between one and 10, while the mean no of antibiotics was 1.09±0.29 per prescription with a range between 1 and 2. The study also showed the average duration of antibiotic prescription as 9.86 days, with the least duration of one day and the highest being 180 days (as seen in prescriptions of Penicillin V for sickle cell patients). Out of the 1416 antibiotic encounters, with the total number of antibiotics prescribed being 1521, generic prescribing accounted for 1179 (77. 51%) and the rest 342 (22.49%) were written in brand names (Table 2)

Table 2: Prescription pattern

No of encounters /prescription sheet	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Drugs	196	296	367	328	130	58	30	7	3	1
%	13.8	20.8	26.2	23.2	9.2	4.1	2.1	0.5	0.2	0.1
Antibiotics	1285	131	0	0	0	0	0	0	0	0
%	90.7	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Duration (days)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**12**	**14**	**15**
Frequency	1	2	26	3	294	1	500	1	264	1	235	7
Duration (days)	**18**	**19**	**20**	**21**	**28**	**30**	**42**	**60**	**70**	**90**	**180**	**-**
Frequency	1	1	1	35	7	9	7	1	2	8	2	-

Antibiotic	Levo	Clavu	Cefu	Cefp	Oflo	Tinifl	Amp	Cotrim	Others	**Total**	%	-
Generic	278	180	161	20	8	163	0	0	369	**1179**	77.51	-
Brand	1	242	45	32	1	5	12	4	0	**342**	22.49	-
Total	279	422	206	52	9	168	12	4	369	**1521**	100	

key: levo-levofloxaxin, clavu-amoxyclavulanic acid; cefu-cefuroxime; cefp-cefpodoxime; oflo-ofloxacin; tinifl-tinidazole/norfloxacin; amp- ampiclox and cotrim- cotrimoxazole

Most frequently prescribed antibiotics

Figure 1 shows the most prescribed antibiotics as Amoxil-clavulanate (27.7%)}, levofloxacin (18.3%), cefuroxime (13.5%), Ciprofloxacin (10.7 %), and Amoxicillin (10.3%). Only 0.1% injectable drug (Ceftriaxone) was recorded as others were in oral form.

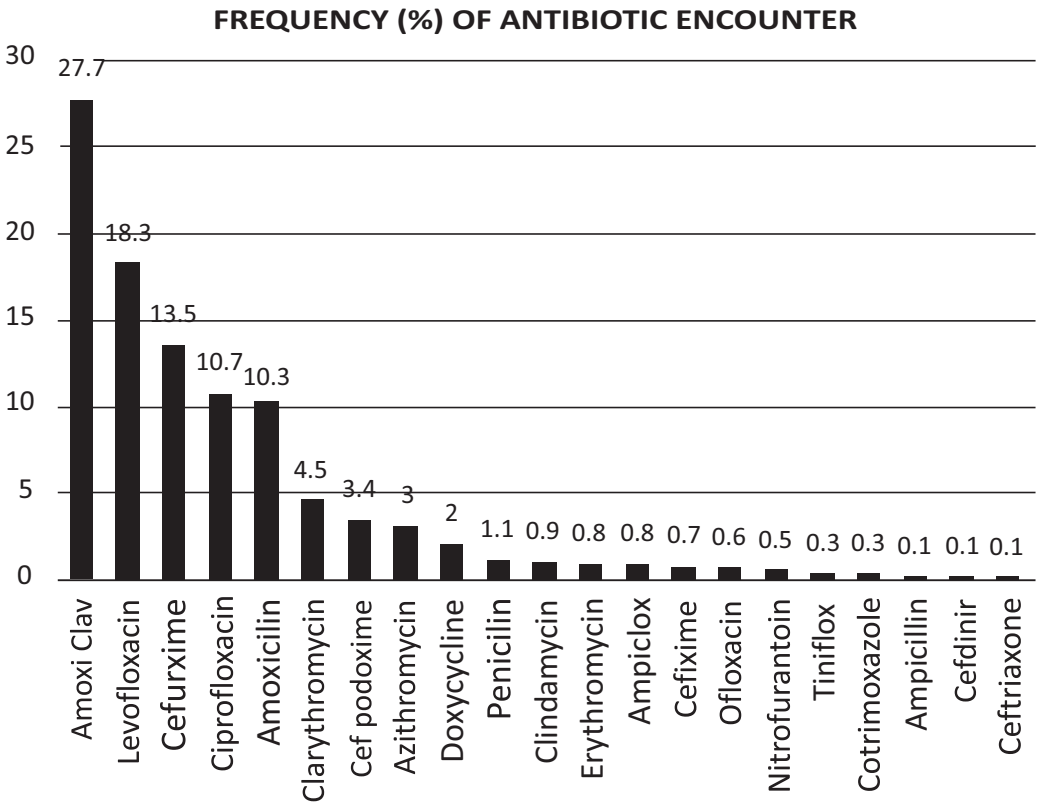

Figure 1: Frequency of prescription of antibiotics

WHO/INRUD Core Drug Use indicators

The result shows generic prescribing as 77.5% and the average number of drugs per prescription as 3.2±1.5. The facility indicators were available.

Table 3: Drug Use indicators

Indicators	WHO Standard	Result
1. Drug prescribing indicators:		
Average number of drugs prescribed per encounter	1.6–1.8%	3.18±1.51
Percentage of encounters with antibiotics prescribed.	20.0–26.8%	11.2%
Percentage of drugs prescribed by generic name	100.0%	77.5%
Percentage of drugs prescribed from the Essential Drugs List	100.0%	100%
Percentage of encounters with injectable	13.4-24.1%	0.1%
2. Facility indicators		
Copy of Essential Drugs List (EDL)	Available	Copies of National EDL, STGs and Monthly e-Drug list available

Inferential analyses

a. Demographic characteristics and number of drugs/antibiotics per prescription.

The result showed a significant difference in the total number of drugs per prescription between adults and children (p=0.006), and between genders (p=0.000) at a 95% degree of confidence (Table 4).

Table 4: Age and gender versus drugs per prescription

No. of Drugs	Adult (%)	Child (%)	Chi-Square	df	*P*-Value
1	154 (13.5)	41 (15.0)			
2	255 (22.3)	40 (14.6)			
3	294 (25.7)	74 (27.0)			
4	262 (22.9)	67 (24.5)			
5	91 (8.0)	39 (14.2)	22.928	9	.006*
6	48 (4.2)	10 (3.6)			
7	29 (2.5)	1 (0.4)			
8	5 (0.4)	2 (0.7)			
9	3 (0.3)	0 (0.0)			
10	1 (0.1)	0 (0.0)			

No. of Drugs	Male	Female	Chi Square	df	*P*-Value
1	107 (13.4)	88 (14.2)			
2	192 (24.1)	103 (16.6)			
3	213 (26.8)	155 (25.0)			
4	181 (22.7)	148 (23.9)			
5	67 (8.4)	63 (10.2)			
6	22 (2.8)	36 (5.8)	32.821	9	0.000*
7	12 (1.5)	18 (2.9)			
8	0 (0.0)	7 (1.1)			
9	2 (0.3)	1 (0.2)			
10	0 (0.0)	1 (0.2)			

a. Age and gender versus no of antibiotics per prescription

The result showed the difference in the total number of antibiotics per prescription between adults and children (p=0.000) to be significant at a 95% degree of confidence (Table 5).

Table 5: Age and Gender versus no of antibiotics per prescription

No of Antibiotics	Adult	Children	Chi-Square	Df	P-Value
1	1021(89.4)	264 (96.4)			
2	121 (10.6)	10 (3.6)	12.698	1	0.000*
	Male	**Female**	**Chi-Square**	**Df**	**P-Value**
1	739 (91.6)	556 (89.7)			
2	67 (8.4)	64 (10.3)	1.507	1	0.217

DISCUSSION

The usefulness of antibiotics in the prevention/treatment of infections in developed and developing countries cannot be over-emphasized. A previous comparative study carried out in the same unit (out-patient pharmacy) of the Institution and another tertiary institution in Lagos[13] showed the number of drugs prescribed ranged from one to eleven drugs with most ranging from two to four drugs for both health facilities. The result of this study is similar because it shows the number of drugs prescribed also range from 1 to 10, and with the most ranging from 2 to 4 drugs. The mean number of drugs prescribed per encounter in this study was 3.18±1.51. This is consistent with the study carried out in northern Nigeria which showed the average number of drugs prescribed as 3.04±1.39.[14] This is a bit lower than a previous study that involved the same study centre and the average number of drugs prescribed was 3.4113. A study carried out in India showed that the most common number of drugs per prescription ranged between 2 and 4 while 3 drugs (52.15%) were commonly prescribed followed by 4 (19.78%).[15] This was also seen in a study carried out in Pakistan, where the average number of drugs prescribed per encounter was 2.3±1.310. The results shown above are higher than the WHO standard value of 1.6-1.8. This further proves that polypharmacy is an issue in health care systems. Factors responsible include concomitant illness, consulting multiple physicians, and unclear diagnosis, thereby leading to treatment of symptoms and/or prevention of side effects. The effect includes the risk of drug interactions, adverse drug effects, and noncompliance.[16] However, a study carried out in Ethiopia showed the mean number of drugs prescribed as 1.58±0.74[17] which is comparable with the WHO standard. Thus, achieving the WHO standard for prescribing indicators is an achievable feat. Adequate training on diagnosis, selection of appropriate medication with the use of standard reference books and manuals by the prescribers can be of great help.

Due to the prevalence of infectious diseases in developing countries, the WHO anticipates that 20.0-26.8% will be adequate for the percentage of encounters with an antibiotic.[18] In this study, the percentage of encounters with an antibiotic prescribed was 11.2%, as compared with other studies done in Nigeria and Pakistan (34.4% and 52.4% respectively).[9,14] This low percentage may be partly due to the exclusion of drugs like anti-tubercular agents and exclusion of some clinics like the staff clinic and NHIS services from the OPD Pharmacy.

In this study, it was revealed that 9.3% of the patients received two antibiotics for their treatment. This is low compared with a study done in northwest Nigeria which recorded 46.2%.[19]

Out of the 6.2% (n =1416) prescription sheets with antibiotics prescribed, 90.7% (n=1285) had one antibiotic and the remaining 9.3% (n=131) had two antibiotics. The

prescription sheets with one antibiotic were higher in this study compared with the study carried out in Pakistan.[9] Out of 52.4% (n=2262) prescriptions with antibiotics prescribed, 77.7% (n = 1758) had one antibiotic, 22.1% (n = 499) had two antibiotics, and 0.2% (n = 5) had three antibiotics. There may be possibilities of the synergistic effect that may warrant combinations of antibacterial in certain conditions,[20] like treatment of H. pylori as seen in this study.

The wrong use and overuse of antibiotics can result in the emergence of resistant strains and multi-drug resistance. It is therefore necessary to take samples for culture and sensitivity tests before the commencement of empirical treatment. A quick switch from a broad-spectrum antibiotic to a narrow spectrum agent is important once the causative organism has been identified.[21]

Only 0.1% use of injectable was seen in this study when compared with 14% recorded in Ghana[22] and WHO standard of 13.4-24.1%. Part of what might have been responsible for this is that injectables are not stocked in the unit under study except on rare occasions. The Accident and Emergency Centre is located on the ground floor of the building where all injectables are stocked; any request for injectable drug is usually carried out at the Centre. However, this is consistent with previous studies, which noted that outpatient pharmacy in tertiary institutions does not stock injectables.[23]

This study revealed the most prescribed antibiotics are the penicillin group (40.00%). This is consistent with a previous study in the unit which rated Penicillin as the first of the five commonly prescribed antibiotics,[23] and comparable with a value of 35.90% obtained in a study at Ilorin, Nigeria.[12] Another study in Uyo, Nigeria revealed that Fluoroquinolones (26.40%) were the most prescribed, followed by penicillins (24.58%).[20] A study carried out in Ethiopia also showed a similar trend in the common use of Penicillin (28.40%).[17] This study showed the use of broad-spectrum antibacterial agents (second and third generation cephalosporins - cefuroxime, cefpodoxime, cefixime, cefdinir, ceftriaxone) attributable to the level of care and the categories of patients (referral) being attended to. This is similar to the result of a study carried out in a tertiary healthcare facility in Bangladesh.[24]

Prescribing with generic nomenclature allows for rational use of drugs and lowers the cost of healthcare. However, prescribers are often influenced by medical representatives of companies[25,26] to prescribe their brand of the products. The study showed the percentage of drugs prescribed by generic name as 76%, which is lower than the WHO standard of 100%. A previous study in the southern part of Nigeria revealed that generic prescribing was generally low in both the public and private hospitals as 54% and 16% respectively.[27] This trend was also observed in the northern part of Nigeria (42.7%)[14] and in Ghana (53.4%).[22] This practice of not prescribing in generic name often leads to medication errors, an increase in the cost of drugs and overall health care cost.

The pattern of drug prescribing in this study showed a significant difference in the number of drugs prescribed per encounter between adults and children (p=0.006) and between genders (p=0.000). The antibiotic prescribing pattern only showed a significant difference between age and number of antibiotics per prescription(p=0.000). This is comparable to a study conducted in Cameroon[28] that showed a significant difference in antibiotic exposure for age, with a p-value =0.005. Other studies also showed a similar trend that age ($P < 0.001$) produced a statistically more significant effect than gender ($P < 0.05$)[29] and was also seen that children were highly exposed to antibiotics (66%) than adults (44%).[30]

The percentage of drugs prescribed from the Essential Drugs List (EDL) was 100%, this can be attributed to some copies of the current editions of the National EDL and Standard Treatment Guidelines (STG) in the Hospital and the monthly circulation of the Hospital e-Drug list based on the National EDL. The figure is higher than the one got in Cameroon and Pakistan where the facilities had EDL copy (92.8% and 94.3% respectively).[9,28]

CONCLUSION

The study revealed the prescribing pattern of physicians with respect to drugs/antibiotics in the facility and showed some gaps which include polypharmacy and a low rate of prescription with generic nomenclature. These are contributory factors to the irrational use of drugs and antibiotics. To reduce the increasing rate of antibiotic resistance both nationally and in the world at large, there is need to ensure strict compliance with rational prescribing and use of antibiotics. This can be achieved through functional Drug and Therapeutic Committee and Antibiotic Stewardship Committee of the Hospital. The committees can rise to the challenges by promoting strict compliance with rational use of drugs/antibiotics and standard treatment guidelines

through training, campaign, and advocacy to the stakeholders.

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