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Pattern of antibiotic prescription at the general practice clinic of the University of Benin teaching hospital

VALENTINE U ODILI*, AWHONUKEH I AKPE, MICHEAL E ARIGBE-OSULA, [1]PATRICK O IGBINADUWA

Department of Clinical Pharmacy & Pharmacy Practice,Faculty of Pharmacy, University of Benin.
[1]Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Benin.

ABSTRACT

To assess the prescribing pattern of antibiotics used in the treatment of prevalent diseases in the general practice clinic, (GPC) University of Benin Teaching Hospital. A retrospective study of 406 case notes of patients who had an antibiotic prescription and attending the GPC for the first time between February 1 and April 30, 2007 was carried out.Demographic data, patient's complaints, physician's diagnosis and antibiotic prescription was loaded into Microsoft Office Excel 2003 and the descriptive statistics reported.The total number of antibiotics prescribed for the 406 patients involved in the study was 464 with an average number of 1.15 per patient. Three hundred and forty eight (85.71%) patients were prescribed a single antibiotic, 55 (13.55%) had two antibiotic prescriptions while the remaining two (0.49%) were prescribed three antibiotics. Penicillin was the most prescribed class of antibiotics 224(48.28%). Among the penicillins, amoxicillin was used most (22.63%) followed by amoxicillin plus clavulanic acid combination (21.55%). Of the 464 patient antibiotics prescribed, 301 (64.87%) prescribed using brand names. Three hundred and ninety eight (85.78%) of the prescriptions were from the hospital formulary. No parenteral antibiotic was prescribed, and there was no microbiological evaluation carried out before the prescription of antibiotic in any of the cases. There was a high prevalence of empiric treatment with orally administered antibiotics in this study. Prescribers showed a fondness for amoxicillin, either alone or in combination with clavulanic acid for most cases of infection. Brand name prescribing was rife and there was a wide variation between defined recommendations in standard treatment guidelines and the clinical use of antimicrobial agents in the clinic. Establishing an appropriate and restrictive guide to antibiotic use should therefore be a high priority to the hospital.

Key words; Antibiotics, General Practice Clinic, Pattern, Prescription.

Corresponding author
Email: vuodili@yahoo.com

INTRODUCTION

The discovery of compounds with antimicrobial activity was a major advancement in medicine and patient care. These compounds provide doctors with an adjunctive therapy to patients own immune system the principal and perhaps best defense for fighting infectious diseases [1] Antibiotics are the most frequently prescribed drugs among hospitalized patients [2-4] Not too long after the first discovery of penicillin, resistance to the drug emerged and as more antibiotics were discovered and used more resistant bacteria evolved. Over the past 3 decades the problem of bacteria resistance has grown worldwide and has been documented by many authors [5-8].

Extravagant use of antibiotics without careful considerations of their appropriate indications leads more rapidly to the emergence of resistant strains.[9] The recent emergence of antibiotic resistance in bacterial pathogens both nosocomialy and in the community is a very serious development that threatens antibiotic use. [10] The rampant spread of antibiotic resistance mandates a more responsible approach to antibiotic use, though it is often difficult to quantify the role of inappropriate antibiotic use in the emergence of antibiotic-resistant bacteria. However, the selection pressure of high levels of exposure to these drugs is probably the factor leading to bacterial mutations responsible for many mechanisms of resistance [11].

It is important to note that the development of resistance is not necessarily related to the choice of a specific antibiotic or antibiotic class. Even when antibiotic use is appropriate, the choice of particular agents has been shown to promote the development of resistance [12].

Information about antibiotic use patterns are therefore necessary for constructive approach to problems that arise from indiscriminate use of multiple antibiotics available.[13] such information on antibiotic use pattern and the illnesses for which they are prescribed are generally lacking in hospitals in developing countries. Hence this study was carried out to evaluate prescribing patterns of general practitioners to ascertain whether or not antibiotics are properly utilized.

METHODS

SETTING

The study was carried out at the General Practice Clinic (GPC) of the University of Benin Teaching Hospital, Benin City, Edo State. The hospital is a federal government owned tertiary health care institution, and it serves as a referral centre for other hospitals in Edo and her adjoining states.

STUDY POPULATION AND SAMPLE SIZE

All patients that visited the GPC from February 1 to April 30, 2007 constituted the study population. A total of 406 case notes of patients having at least one antibiotic in their prescription were used in the study.

- **Inclusion criteria:** Patients included in the study were those who came to the hospital for the first time from February 1 to April 30, 2007
- **Exclusion criteria:** Patients excluded from the study were those that had antibiotic prescriptions but were not first timers at the clinic.

First time patients at the hospital with antibiotic prescriptions but having in complete data on case-notes were also excluded from the study.

DATA COLLECTION

The medical record of each patient included in the study was reviewed and information pertinent to the objective of the study was collected. Patient characteristics such as age, sex, body weight (in pediatrics), presenting complaints and physician's diagnosis were noted. Drug data including name of antibiotic prescribed, dosage regimen (form, route, frequency and duration of administration), use of antibiotic combination, and generic, and brand names were also noted.

DATA ANALYSIS

The data obtained was carefully fed into the computer and analyzed using Microsoft Excel Office, 2003. Results were expressed using descriptive statistics (frequency and percentages).

RESULTS

Of the 406 patients involved in this study, 178 (43.8%) were males and 228 (56.2%) females with mean age of 22.3. Patients aged 1-10 constituted the largest group. The total number of antibiotics prescribed was 464. Of this number 398 (85.8%) were prescribed from drugs contained in the hospital's formulary.

Three hundred and forty eight (85.7%) patients were prescribed a single antibiotic, 56(13.8%) had two antibiotic prescriptions while the remaining two (0.49%) were prescribed three antibiotics.

The most common condition for which an antibiotic was prescribed was upper respiratory tract infection (URTI) 149 (36.7%), (Table 1).

Of the URTIs, the most frequent presenting complaint was cough and catarrh accounting for 98 (65.8%) cases and the highest occurrence of this was in children aged 0-10 years with 62 (63.3%) of the 98 episodes. The most frequently prescribed antibiotic for this case was a penicillin 45(45.5%) of which amoxicillin accounted for 24.3% of the 99 antibiotics prescribed. Other antibiotics used were cephalosporins 20 (20.2%), macrolides 13 (13.1%), quinolones 10(10.1%), sulphonamides 9 (9.1%), and metronidazoles 2 (2.0%). The other common infections were skin and soft tissue infections 69 (17%), gastrointestinal infections 67(16.5%) and lower respiratory tract infections 34(8.4%), (Table 1). Thirty-five (52.2%) of the 67 episodes of gastrointestinal infections were peptic ulcer disease, 27 (77.1%) of which were treated with combination of metronidazole and penicillins. Antibiotics were prescribed for malaria in 19 cases and here again the penicillins were the most commonly used.

Overall, the penicillin antibiotics was the most prescribed class of antibiotics 224(48.3%). Among the penicillins, amoxicillin was used most frequently (22.6%) followed by amoxicillin plus clavulanic acid combination (21.5%), (Table 2).

Other classes of antibiotics used include quinolone, cephalosporin, metronidazole, macrolide, sulphonamide and tetracycline accounting for 14.9%, 12.9%, 12.7%, 6.0%, 3.4% and 1.7% respectively, (Table 1). Aminoglycosides noticeably were not prescribed in any of the cases.

Of the 464 antibiotics prescribed, 301 (64.9%) were prescribed using brand names. The most commonly prescribed brand of antibiotic was augmentin which was prescribed in 91(19.6%) of the 464 prescriptions. It was encountered in 20 (60.6%) of the 33 cases of otitis media. It was also the most prescribed 21(30.4%) of the 69 cases of skin and soft tissue infections.

Three hundred and ninety eight (85.8%) of the prescriptions were contained in the hospital formulary. No parenteral antibiotic was prescribed, and there was no microbiological evaluation carried out before the prescription of antibiotics in any of the cases.

DISCUSSION

This study focused on the pattern of antibiotic prescription in the General Out-patient Clinic of the University of Benin Teaching Hospital.

A majority of the prescriptions were written from drugs contained in the hospital's formulary indicating, to a large extent, that physicians in this establishment complied with the recommendations of the hospital's formulary. However, most of these drugs were prescribed using brand names. The low rate of generic prescribing has

been linked to pressure from patients,[14] and high marketing strategy of the pharmaceutical companies[15]. Use of high cost broad spectrum antibiotics when the cheaper generic drug would have sufficed doesn't encourage compliance and this can lead to resistance.[14]

The excessive use of injectables in developing countries is very common. However, interestingly no parenteral antibiotic was prescribed during this study and this may be reflective of an improvement in this aspect of prescribing pattern as opposed to previous excessive use of injections by some physicians who hold the erroneous belief that injections are more effective and offer better patient satisfaction.[16]

Aminoglycosides were not encountered at all in this study and this may due to the fact that they are mainly available in parenteral forms. More so, being an outpatient centre, it may not be convenient and would not ensure compliance if the patient is placed on such medication which would require that they return for treatment repeatedly especially when there are available alternatives.

The average number of drugs per prescription is an important index of a prescription audit such as this study. It is preferable to keep the number of drugs per prescription as low as possible to minimize risk of interactions, development of bacterial resistance, and hospital costs.[13] This study did not however look at co-prescribed drugs and hospital costs but concentrated on prescribed antibiotics. The average number of antibiotics prescribed was 1.15. The pattern of antibiotic combination i.e. (based on the number per prescription) was comparable to that obtained in a similar study in Netherland.[17] The antibiotics frequently used in combination were Metronidazole and Penicillins 31 (7.64%) and they were used in treatment of peptic ulcer disease most probably in an attempt to eradicate *Helicobacter Pylori* (which is a major risk factor) if present [18] Three antibiotics metronidazole, doxycycline, and ciprofloxacin were co-prescribed twice for the treatment of pelvic inflammatory disease (PID). This prescribing pattern does not, however, correspond with the recommended treatment guidelines (metronidazole + ofloxacin / metronidazole + ciprofloxacin/ metronidazole + doxycycline/ metronidazole + doxycycline + cefriaxone IM). [19-21] This is because both tetracyclines and quinolones have a similar spectrum of activity.

Although a majority of common childhood diseases are caused by viruses which do not require antibiotic therapy [22] this study reveals that most children presenting with such diseases as common cold, pharyngitis and tonsillitis were prescribed antibiotics. This may be a reason for the increased frequency of antibiotic prescription in children aged 10 and below in this study. This finding is different from other reports where elderly patients were seen to be prescribed antibiotics more frequently [17,23]

In this study, it was found that the presence of fever seemed to increase the likelihood of prescribing an antibiotic. This may likely be due to the fact that some physicians tend to consider fever as a sign of bacterial infection which is not always the

case. A similar occurrence was observed in a research carried out in India on factors affecting prescribing patterns in paediatrics.[22]

Standard guidelines recommend that treatment of most upper respiratory tract infections (such as pharyngitis, common cold, tonsillitis, otitis media) with antibiotics be delayed as most of them are viral (but there may be clinical overlap between viral and streptococcal infections), hence self limiting.[19,24,25]   Antibiotics have proven to be minimally beneficial and a recent study shows that they only shorten duration of symptoms by 8hours. [19] However, in severe cases and in patients with recurring episodes or with a history of otitis media, penicillin V or erythromycin may be prescribed instead of broad spectrum antibiotics.[19]

From our study, this is obviously not the case at the GPC as antibiotics including cephalexin and cefuroxime (1st and 2nd generation cephalosporins respectively), and ciprofloxacin were prescribed for most cases of upper respiratory tract infections.

The high prescription of co-amoxiclav in the treatment of otitis media, does not also comply with recommended guidelines. It was prescribed for 20 of the 33 cases of otitis media. According to the Standard Medical Advisory Committee subgroup on antibiotic resistance, antibiotics are probably unnecessary in acute otitis media.[25]

This is also the conclusion of several studies geared towards providing evidence for health care decisions [26,27]

Except in chronic cases, reassurance, time and adequate pain relief using analgesics such as paracetamol is sufficient [19,24,25] if antibiotics are indicated the first line drug should be amoxicillin.[19]

Penicillin was the most prescribed antibiotic 48.48%, and amoxicillin 22.63% was the most frequently prescribed penicillin. This is similar to a study that was carried out in India.[22] Co-amoxiclav 21.5% was the second most used single antibiotic as observed in this study and this is comparable to results obtained from a similar study in western Nepal. [13] Its use as a common broad spectrum antibiotic without prior bacteriological tests may result in increased resistance. For this reason, it is recommended that it should be reserved for those bacterial infections, likely or known to be caused by amoxicillin- resistant beta lactamase producing strains.[19]

For treatment of uncomplicated cystitis as the case in this study, limiting prescription to a three day course of trimethoprim rather than the combination of quinolone and metronidazole used would help reduce the selection pressure for resistance [19,21,24.]The use of antibiotics in the treatment of malaria is not justified since this is not consistent with recommended treatment guidelines for treatment of malaria using appropriate antimalarial drugs to which the plasmodium parasite is

susceptible. The only antibiotic class acceptable for use in treating malaria is the tetracycline as a combined therapy with quinine which was not used at all.

As opposed to similar studies in Western Nepal [13] and Netherland [17] where microbiological tests were carried out in nearly all cases, no microbiological tests were done before any prescription was given in this study. This practice which may be done in an attempt to take care of all possible infecting organisms at once could result in resistance to the prescribed antibiotics.

LIMITATIONS

The results have some limitations. Due to the limited duration of this study, seasonal variation in prescribing patterns could not be taken into consideration. Furthermore, because results were not collected per physician, the results obtained represent a generalization of the prescribing trends of all the physicians at the GPC, and it is possible that some prescriptions generated within the time frame of the study were not available.

CONCLUSION

Antibiotic resistance among pathogenic microorganisms is a matter of worldwide concern. Selective pressures by antimicrobial drugs are by far the most important driving force for the development of such resistance.

The present survey on antibiotic use on first time patients at the general practice clinic in UBTH , under the circumstances tested, provides four characteristics of antibiotic prescribing: (1) in the majority of cases treatment was empirical, with antibiotic prescription based on a clinical suspicion of infection without objective criteria of infection; (2) all antibiotics were administered orally and parenteral administration never occurred, (3) irrespective of the site of infection and the most likely pathogen causing that infection, a single broad-spectrum antibiotic, usually amoxicillin or amoxicillin-clavulanic acid, was prescribed and in most cases, brand names were used in prescribing; (4) Most of the drugs prescribed were drugs in the essential drug list however, treatment was not in accordance with standard prescribing guidelines. The trend that emerges from these observations is that antibiotic use is nonrestrictive.

This study has revealed significant flaws in the prescribing pattern of physicians at the General practice clinic in the University of Benin Teaching Hospital. The findings of this study suggest that there is wide difference between defined recommendations in standard treatment guidelines and the clinical use of antimicrobial agents. Establishing an appropriate and restrictive guide for antibiotic use should therefore be a high priority to this hospital.

A standard treatment guideline should be established in the hospital for antibiotic prescription and a drug utilization program should be setup alongside as a means of checking the practices of physicians on a regular basis.

TABLE 1: PRESCRIPTION OF ANTIBIOTICS ACCORDING TO CLASSES BASED ON DISEASE STATE

DISEASE	N=406 FREQ (%)	Average No of antibiotics	N=464						
			PEN	CEPHA	MACRO	QUINO	SULPHA	TETRA	METRO
Upper respiratory tract infection	149(36.70)	1.01	79(17.03)	28(6.03)	18(3.88)	14(3.02)	9(1.94)	0(0)	2(0.43)
Skin and soft tissue	69(17.00)	1..01	46(9.91)	14(3.02)	5(1.08)	4(0.86)	0(0)	0(0)	1(0.22)
Gastro intestinal tract	67(16.50)	1.55	49(10.56)	0(0)	0(0)	11(2.37)	3(0.65)	1(0.22)	40(8.62)
Lower respiratory tract infection	34(8.37)	1	14(3.02)	12(2.59)	3(0.65)	4(0.86)	1(0.22)	0(0)	0(0)
Genital tract infection	22(5.42)	1.68	4(0.86)	0(0)	0(0)	14(3.02)	0(0)	7(1.51)	12(2.59)
Malaria	19(4.68)	1	11(2.37)	0(0)	1(0.22)	3(0.65)	3(0.65)	0(0)	1(0.22)
Urinary tract infection	15(3.70)	1.07	5(1.08)	0(0)	0(0)	10(2.16)	0(0)	0(0)	1(0.22)
Pulmonary tuberculosis	8(1.97)	1	4(0.86)	2(0.43)	0(0)	2(0.43)	0(0)	0(0)	0(0)
Bone and joint infection	5(1.23)	1	2(0.43)	0(0)	0(0)	3(0.65)	0(0)	0(0)	0(0)
Others	18(4.43)	1.16	10(2.16)	4(0.86)	1(0.22)	4(0.86)	0(0)	0(0)	2(0.43)
TOTAL	406(100)	1.15	224(48.28)	60(12.93)	28(6.03)	69(14.87)	16(3.45)	8(1.72)	59(12.72)

KEY: **Pen:** Penicillin, **Cepha:** Cephalosporin, **Macro:** Macrolide, **Quino:** Quinolone, **Sulfo:** Sulphonamide, **Tetra:** Tetracycline, **Metro:** Metronidazole.

TABLE 2: PROFILE OF PRESCRIBED ANTIBIOTICS

ANTIBIOTIC (N=464)	FREQUENCY(%)
PENICILLIN	**224 (48.28)**
Amoxicillin	105 (22.63)
Amoxicillin plus Clavulanic acid	100 (21.55)
Ampicillin	2 (0.43)
Ampicillin plus Cloxacillin	17 (3.66)
CEPHALOSPORIN	**60 (12.93)**
Cefaclor	4 (0.86)
Cefuroxime	24 (5.17)
Cephalexin	32 (6.90)
MACROLIDE	**28 (6.03)**
Erythromycin	26 (5.60)
Clarithromycin	2 (0.43)
QUINOLONE	**69 (14.87)**
Ciprofloxacin	41 (8.84)
Ofloxacin	28 (6.03)
SULPHONAMIDE	**16 (3.45)**
Cotrimoxazole	16 (3.45)
TETRACYCLINE	**8 (1.72)**
Tetracycline	1 (0.22)
Doxycycline	7 (1.50)
METRONIDAZOLE 59(12.72)	
Metronidazole	59(12.72)

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