Prevalence of Antimicrobial Use in Major Hospitals in Owerri, Nigeria

Chijioke A. Nsofor[1]*, Ekperechi S. Amadi[3], NCD Ukwandu[1], Cynthia E. Obijuru[2] and Chika V. Ohalete[2]

[1]*Department of Biotechnology, Federal University of Technology Owerri, Nigeria*
[2]*Department of Microbiology, Imo State University of Owerri, Nigeria*
[3]*Department of Microbiology, Federal University of Technology Owerri, Nigeria*

*Corresponding Author: Dr Chijioke A. Nsofor, Department of Biotechnology, Federal University of Technology Owerri, Nigeria.

Abstract

The inappropriate use of antibiotics is considered a major determinant of the development of resistance in pathogens. This study assessed current patterns of antibiotic prescription and provides background for quality improvement in hospitals. A point prevalence survey was conducted in nine major hospitals within Owerri metropolis, Imo state, southeast Nigeria. Antimicrobial use prevalence was defined as the number of patients receiving antimicrobial drugs at the time of the survey divided by the total number of surveyed patients. A total of 1585 patients were surveyed and 55.9% received at least one antibiotic, of which 548 patients (61.9%) were receiving combination therapy. Comparative prevalence rate of antimicrobial use was not significantly different in any of the 9 hospitals surveyed P < 0.05. The most prevalence use was among persons < 12 years (58.9%). Among the 886 patients that received antibiotics, 726 (81.9%) received Penicillins (including 29.3% Ampicillin, 28.9% Amoxicillin and 23.8% Penicillin G), while 650 patients (73.4%) received antimalarial drugs (including 26.2% Artesunate, 24.3% Sulphadoxine/pyrimethamine and 2.9% Artemissin based combination therapy). 33.2% and 33.3% of the patients received Tetracycline and Chloramphenicol respectively while 23% and 24.5% received Aminoglycosides and Fluoroquinolones. Erythromycin and Trimethoprim/Sulfonamides were administered to 26.4% and 24.9% of the patients respectively. The most common diagnosis for which antimicrobial drugs were used included malaria (23.7%), lower respiratory tract infections (16.9%), gastrointestinal tract infections (12.4%) and typhoid fever (9%) while 100 patients (11.3%) received antibiotics for surgical prophylaxis. Our data indicated a high rate of antimicrobial use in hospitals; these findings suggest important areas for intervention and the need to develop effective antibiotic surveillance and management programs in Owerri and Nigeria in general. A multi-faceted strategy should be implemented at the national level and should include education, regulation, and greater financial support from the government and other relevant agencies.

Keywords: Point Prevalence; Antimicrobial Use; Penicillin; Malaria

Introduction

Antimicrobial drugs have saved countless lives over the past century, and studies show that timely administration of appropriate antimicrobial therapy to severely ill, infected patients is essential to avoid infection-related morbidity and mortality [1-3]. Despite the evidence supporting early, appropriate therapy, a substantial proportion of antimicrobial use in hospitals may be inappropriate, based on factors such as lack of indication or incorrect drug selection, dosing levels, or treatment duration. Thus, excessive and inappropriate use of antimicrobials is highly associated with the emergence of antimicrobial resistance [4], which presents a major threat to global public health. Antimicrobial resistance reduces the effectiveness of and number of options for antimicrobial treatment, leading to increased morbidity, mortality, and health care expenditures [5].

One aspect of a multifaceted approach to reducing antimicrobial-resistant infections is improving antimicrobial use [6,7]. To improve use and reduce preventable harm in hospitals, it is necessary to understand inpatient antimicrobial-drug–use epidemiology. Surveillance of antimicrobial use in hospitals is important for identifying prescribing trend to identify areas for improvement. Point prevalence survey is a practical surveillance tool for providing information about antimicrobial use and for assessing the effects of interventions such as antibiotic policies.

A recent prevalence survey in the United States found that 49.9% of hospitalized patients received at least one antimicrobial drug at the time of the survey [8] and a study in china showed 56% antimicrobial use in hospitals [9]. The European Surveillance of Antimicrobial Consumption Survey [10] found that the prevalence of antimicrobial use among patients in 172 hospitals in 25 European countries was 29% and identified several opportunities for improvement in antimicrobial prescribing practices [11]. In Africa, [5] showed that prevalence of antibiotic use in 18 Egyptian hospitals was 59% in 2011. However, in Nigeria, there is little information available regarding hospital antibiotic use, thus, this study was aimed to describe the prevalence and characteristics of antimicrobial use in 9 major hospitals in Owerri, Imo state, southeast Nigeria in order to provide benchmarking data and identify targets for quality improvement.

Methodology

The hospitals included in this study are nine major hospitals within the Owerri metropolis, Imo state southeast Nigeria. These hospitals provide health care services to people of Imo state and the neighboring states. The methodology and definitions used for the prevalence survey were adopted from those used by the European Surveillance of Antimicrobial Consumption (ESAC) Project [10]. Data were collected using two standardized forms. One form collected data about each hospital (date of survey, patient population, ward type (medical, surgical, pediatrics and out patients department), and number of patients on each ward on the day of the survey. The second form was used to collect data about each patient included in the survey. The source of completing the patient data collection tool was through review of patient medical records and interviewing treating physicians. Information on patient demographics, antibiotic treatment including antibiotic name, dose and number of doses per day was obtained from the medical records. The medical records were examined for the presence of documentation of the indication of antibiotic use. Additional information was collected from the records of patients receiving antibiotics for surgical prophylaxis. These data included timing of the first dose in relation to the timing of the surgical incision and the duration of prophylactic antibiotic administration as of the day of the survey. Each participating hospital identified four persons with medical background to collect the survey data who were familiar with the hospital departments, wards and staff. A specific day for data collection was pre-assigned for each hospital ward. All data collecting procedures were in accordance with guidelines of the National Health Research Ethics Committee, Nigeria (www.nhrec.net). Data were analyzed using Statistical Package for Social Science (SPSS).

Results

In all, a total of 1585 patients were surveyed and 886 (55.9%) received at least one antibiotic, of which 548 patients (61.9%) were receiving combination therapy, defined as receipt of two or more antibiotics. Among these 886 patients 56.5% were males while 55.3% were females and the most prevalence use was among persons < 12 years (58.9%). The prevalence of antibiotic use in the participating hospitals ranged from 49.5%-62.2%. Comparative prevalence rate of antimicrobial use was not significantly different in any of the 9 hospitals surveyed P < 0.05 (Table 1). As shown in table 2, the most commonly prescribed antibiotics were Penicillins and antimalarial drug. Among the 886 patients that received antibiotics, 726 (81.9%) received Penicillins (including 29.3% Ampicillin, 28.9% Amoxicillin and 23.8% Penicillin G), while 650 patients (73.4%) received antimalarial drugs (including 26.2% Artesunate, 24.3%Sulphadoxine/pyrimethamine and 2.9%Artemissin based combination therapy). 33.2% and 33.3% of the patients received Tetracycline and Chloramphenicol respectively while 23% and 24.5% received Aminoglycosides and Fluoroquinolones. Erythromycin and Trimethoprim/Sulfonamides were administered to 26.4% and 24.9% of the patients respectively. The most common diagnosis for which antimicrobial drugs were used included malaria (23.7%), lower respiratory tract infections (16.9%), gastrointestinal tract infections (12.4%) and typhoid fever (9%) while 100 patients (11.3%) received antibiotics for surgical prophylaxis Table 3.

Patients Characteristics		Total Number of Patients	Number of Patients Receiving Antibiotics	Prevalence (%)
Hospital Code	Hospital A[1]	432	249	57.6
	Hospital B[1]	198	99	50.0
	Hospital C[2]	204	101	49.5
	Hospital D[2]	161	91	56.5
	Hospital E[2]	150	87	58.0
	Hospital F[2]	143	79	55.2
	Hospital G[2]	111	66	59.5
	Hospital H[2]	98	61	62.2
	Hospital I[2]	88	53	60.2
	Total	1585	886	55.9
Gender	Male	750	424	56.5
	Female	835	462	55.3
	Total	**1585**	**886**	**55.9**
Age	0-12 years	511	301	58.9
	13-20 years	224	125	55.8
	21- 50 years	274	157	57.3
	56-80 years	576	303	52.6
	Total	**1585**	**886**	**55.9**

Table 1: *Prevalence of Antibiotic Use in Major Public and Private Hospitals in Owerri Metropolis, Nigeria.*

1= Public Hospital, 2 = Private hospital

Antibiotics	HOSPITAL WARDS										TOTAL	
	Medical (n = 275)		Surgical (n = 180)		Pediatric (n = 150)		Others (n = 70)		OPD (n = 211)		(n = 886)	
	n	%	n	%	n	%	n	%	n	%	n	%
Penicillins												
Ampicillin	86	31.3	46	25.6	52	34.7	11	15.7	65	30.8	260	29.3
Amoxicillin	79	28.7	40	22.2	61	40.7	3	4.3	72	34.1	255	28.9
Penicillin G	65	23.6	37	20.6	49	32.7	1	1.4	59	28.0	211	23.8
Cephalosporins	66	24.0	41	22.8	39	26.0		-	60	28.4	206	23.3
Erythromycin	70	25.5	45	25.0	48	32.0	10	14.3	61	28.9	234	26.4
Aminoglycosides	71	25.8	30	16.7	35	23.3	2	2.9	66	31.3	204	23.0
Tetracycline	80	29.1	81	45.0	52	34.7	19	27.1	62	29.4	294	33.2
Chloramphenicol	83	30.2	79	43.9	55	36.7	21	30.0	57	27.0	295	33.3
Fluoroquinolones	71	25.8	41	22.8	39	26.0	7	10	59	28.0	217	24.5

Trimethoprim/Sulfonamides	70	25.5	41	22.8	35	23.3	3	4.3	72	34.1	221	24.9
Anti-Malarial Drugs												
Artesunate	91	33.1	-		67	44.7	2	2.9	72	34.1	232	26.2
Sulphadoxine/ pyrimethamine combination	86	31.3	-		61	40.7	3	4.3	65	30.8	215	24.3
Artemissin- Combination Therapy (ACT)	79	28.7	-		55	36.7	3	4.3	66	31.3	203	22.9
Treated with ≥ 2 drugs	180	65.5	121	67.2	81	54.0	40	57.1	126	59.7	548	61.9

Table 2: *Number and Proportion of Patients Receiving each Type of Antimicrobial Among all Patients Receiving Antimicrobial Treatment by Type of Ward (patients may receive more than one antimicrobial).*

Others = Maternity, Accident and Emergency

Sulphadoxine/ pyrimethamine combination e.g. (Amalar, Fansdar etc.)
Artemissin-Combination Therapy (ACT) e.g. coartem, cotexcin etc.

Diagnosis	Number of patients	Percentage (%)
Malaria	210	23.7
Typhoid Fever	80	9.0
Lower Respiratory tract Infections	150	16.9
Gynaecology	71	8.1
Surgical prophylaxis	100	11.3
Gastrointestinal tract Infections	110	12.4
Urinary tract Infections	54	6.1
Ear, nose, and throat	35	4.0
Skin, Bone & Joint	27	3.0
Cardiovascular system	10	1.1
Others	39	4.4
Total	886	100

Table 3: *Distribution of Antimibrobial use by Diagnosis.*

Discussion

Point prevalence surveys might be beneficial for optimizing antibiotic therapy, monitoring the effectiveness of antibiotic policies and providing useful data on patterns of antibiotic use; thus, such studies informs and guides local and national antibiotic stewardship. We conducted this point prevalence survey of antimicrobial use at the patient level in hospitals in Owerri, Imo state Nigeria. This study provides insight into antimicrobial prescription practices in southeast Nigeria. Although antibiotic resistance is a worldwide concern, it is primarily a local problem because the spread of resistant microorganisms occurs in individual hospitals and communities [12]. The objectives of this research were first to describe the current patterns of antibiotic prescribing in hospitals and second to determine targets for improving the quality of antibiotic prescribing in these hospitals.

This study identified that 55.9% of patients in the participating hospitals were receiving one or more antibiotic agents at the time of survey completion. This is substantially higher than the prevalence of antibiotic use reported in similar studies performed in Europe and the US [13,11,14]. Although the prevalence of antibiotic use was quite variable among participating hospitals, ranging from 49.5%-62.2%, all of the participating hospitals exceeded the 29% prevalence reported in the 2009 ESAC Survey conducted in 172 hospitals representing 29 European countries [11]. It is important to note that the differences in the prevalence of antibiotic use do not necessarily indicate that there is more inappropriate use of antibiotic agents in the hospitals. Some of these differences may be due to differences in patient populations or in the prevalence of infectious diseases among hospitalized patients or to the inclusion of a larger proportion of hospitals among our participating hospitals. Our data do suggest, however, that not all of the differences can be attributed to such population differences. In fact, although specific data regarding appropriateness of individual antibiotic prescriptions were not collected, the survey data have identified a number of opportunities for improvement in antibiotic use practices. International antibiotic use guidelines were known to clinicians in only a limited number of hospitals. The translation of such guidelines into active antibiotic use policies could lead to improvements in antibiotic use practices, which could result in reductions in overall antibiotic use and its associated complications within these hospitals. The high prevalence of antibiotic use in hospitalized patients might be related to specific factors. Therefore, strengthening the training of medical staff is an obvious and important step toward the rational use of antimicrobial drugs.

Evaluation of the specific indications for antibiotic use revealed several specific opportunities for improvement. Malaria was the most common indication for antibiotic administration reported, accounting for 23.7% of all antibiotic prescriptions. Regarding choice of therapy, penicillins accounted for 81.9% of all antibiotic agents given for treatment. Broad-spectrum agents such as third-generation cephalosporins, beta-lactam, tetracycline and chloramphenicol on the other hand, accounted for 34% of surgical prophylaxis prescriptions, which might have serious implications on the emergence of multidrug-resistant organisms. Informal discussions with clinicians provided some misconceptions, e.g., prolonging the duration of antibiotic prophylaxis and selecting a broad-spectrum agent for prophylaxis were practices commonly used to reduce the risk of surgical site infections and other healthcare-associated infections in the post-operative period. In response to these findings, a quality improvement project focused on improving surgical site infection prevention practices, including surgical antibiotic prophylaxis, is being recommended in the hospitals. We also identified that a large proportion of patients receiving antibiotics for medical prophylaxis had no justification of a medically accepted indication for prophylaxis. This group of patients accounted for 10% of all antibiotic use and 50% of patients who were receiving antibiotic therapy for the purpose of medical prophylaxis. Interaction with clinicians suggested that it was relatively common practice in some of the participating hospitals for patients to be given antibiotics during their hospital stay to reduce the risk of acquiring healthcare-associated infection. This suggests that efforts to strengthen basic infection prevention practices would eventually improve clinicians' confidence in infection prevention and control program which could result in substantial reductions in the use of antibiotic agents and the associated complications among hospitalized patients.

Although this study provides novel data that will be useful for quality improvement initiatives in individual hospitals and for the state healthcare system in general, a few limitations should be noted. First, data were collected from only from hospitals in the Owerri metropolis. The data may therefore not be representative of antibiotic use in all hospitals throughout the state. In addition, the data were collected from a convenience sample rather than a random sample of the hospitals. The distribution of hospital types among those that participated in the survey is quite different from the overall distribution of hospital types in Nigeria. Finally, although all persons involved in data collection had completed a formal training program prior to participating in the survey, there was no central validation of the submitted data.

In conclusion, this is the first study to quantify and characterize antibiotic use practices in hospitals in Imo State. The information gained from this point prevalence survey has helped to prioritize limited resources by allowing identification of several specific opportunities to improve antibiotic use practices that may result in improved patient outcomes and lower healthcare costs within the hospitals. Although the data and their implications have largely been presented and discussed here in aggregate form up to the state level, data from the individual participating hospitals may prove to be even more useful for identifying more specific opportunities for quality improve-

ment within these hospitals. We intend to repeat the survey in order to assess changes in the prevalence and characteristics of antibiotic use in hospitals in Owerri over time, as we thought that the point prevalence survey implemented was an efficient and simple method for assessing antibiotic use in southeast Nigeria.

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