International Journal of Health Research, March 2011; 4(1): 37-44

Available at http://www.ijhr.org

Original Research Article

Open Access
Online Journal

Profile of Antimicrobial Drug Use Patterns in a Nigerian Metropolitan City

Abstract

Purpose: To evaluate self-medication practices and prescribing patterns of antimicrobial agents.

Methods: The study was carried out in Port Harcourt, Nigeria in 6 hospitals/clinics, 4 community pharmacies and the campus of University of Port Harcourt. 1,200 case files or charts of outpatients treated at the selected hospitals/clinics were reviewed for relevant information. Thereafter, independent physician assessors evaluated the "appropriateness" of antimicrobial prescribing. The antibiotic self-medication practices were assessed at the university campus and selected community pharmacies.

Results: Metronidazole, ampicillin/cloxacillin (19%), amoxicillin (16%) and co-trimoxazole (12%) were the most frequently prescribed antimicrobials. Malaria (21%), followed by upper respiratory tract infection (19%), were the most frequent medical conditions in which antimicrobials were used. Over one-half (56%) of the antimicrobial prescriptions were considered "appropriate" by the physician assesors; 23% of the cases "inappropriate", while in 17% and 4% of cases, there were disagreement and query, respectively. There was a significant difference in the patterns of antimicrobial prescribing by physicians at both public and private hospitals, (χ^2 = 16.808, df = 3, P< 0.01). Cough (20%), stomach upset (20%) and boils (20%) were the most frequent conditions in which the respondents self-medicated with antimicrobials. Ampicillin (23%), co-trimoxazole (17%) and tetracycline (16%) were the frequently used antimicrobial agents.

Conclusion: Antimicrobial drug use was common. Sometimes, the agents were inappropriately used by the public and private health facilities as well as members of the public through self-medication.

Keywords: Antimicrobial drug, Prescribing patterns, Self-medication, Survey

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Introduction

The burden of illness disproportionately affects many low income countries of which infectious diseases involving HIV/AIDS, malaria, tuberculosis, respiratory and diarrhoeal diseases are most prevalent [1, 2]. Antimicrobial chemotherapy is the main stay in the prevention and control of infectious diseases, thus quality use of these agents is important from both the

clinical and public health perspectives. However, irrational use of medicines in general is prevalent in many health care systems, especially in developing countries, resulting in poly-pharmacy, overuse of antibiotics and injections and lack of compliance with the principles of essential drug concept [3-5]. Antibiotics are commonly prescribed by physicians in many health facilities, especially at the primary care level [6-11], and their patterns of use vary between public and private sectors [12-13]. In a prospective survey of two hospitals in Ujjain, India, it was found that antibiotics were prescribed in 66.3% of cases seen [6]. Upper respiratory tract infection, presumably caused by a virus for which antibiotics are not indicated, account for a majority of patients receiving antibiotic prescription [6,14-17]. Other conditions such as vaginal discharge and urinary tract infection [6] diarrhoeal disease [18], malaria [18-19] are also commonly prescribed antimicrobial agents. In addition, reports indicate that penicillins and cephalosporins are the most commonly prescribed antibiotics in many clinical settings [6,11,15,19].

There are several reports of high prevalence of self-medication, using antimicrobial agents bought without a prescription from the private sector [18-22]. However, over and/or inappropriate use of antimicrobial agents has the potential to lead to the development and spread of resistance strains of pathogens [19-20]. In order to ensure that antimicrobials are rationally used by clinicians and patients, it is important that regular utilization surveys are carried out, with a view to addressing inappropriate use patterns. Assessment of antimicrobial utilization patterns offers a simple method of monitoring antibiotic use policies (where they exist), thus, informing antibiotic stewardship [23]. The objectives of this study, therefore, were to evaluate the patterns of antimicrobial prescribing by physicians and antimicrobial self-medication practices by members of the public in a major Nigerian metropolitan City.

Methods

Setting

The study was carried out in six hospitals/clinics (two government-owned, and four privately-owned), four community pharmacies and at the campus of University of Port Harcourt, Rivers State, Nigeria. The hospitals and community pharmacies were selected from the complete lists of registered hospitals/clinics and community pharmacies with the State Ministry of Health, Port Harcourt, Rivers State.

Port Harcourt is a major commercial and industrial centre in Nigeria, with population of over 2 million persons. As at the time of the study, there were two tertiary health care facilities (University of Port Harcourt Teaching Hospital, and Psychiatric Hospital), two secondary health care facilities (a Military-based Hospital, and a state government General Hospital). In addition, there were almost 300 registered private hospitals/clinics, over 126 community pharmacies, numerous drug shops and maternity homes, and a host of traditional medical practitioners.

Study design

Retrospective medical records were used for antimicrobial prescribing patterns while a cross sectional survey was undertaken for assessment of anti-microbial self-medication practices by members of the public. A total of 1,200 medical records were selected and evaluated, while 960 out of 1200 persons were consecutively approached and interviewed in respect of their antimicrobial self-medication practices. The medical records were assessed on weekly basis. One in every five case files/chart attended to at the hospitals/clinics within the study period was selected; however, where the medical case file did not involve antimicrobial drug use the next medical case file was selected until the sample size was obtained. Three hundred medical records from each public hospitals and 150 each from the private hospitals were selected for the study. The study was carried out between January and December, 2003.

Data collection process

Data collection was undertaken by abstracting relevant information from the medical records or charts from the hospitals, and by use of questionnaire administered to respondents. Data abstracted from the medical records included: patients' diagnosis; antimicrobials prescribed, including dose, route, interval and duration of administration. The abstracted data were entered into a prepared data collection form. No attempt was made to either verify the accuracy of clinical diagnosis of the clinicians or the actual consumption of the prescribed medications by the patients.

The antibiotic self-medication practices of the general public were evaluated, using a self-administered questionnaire. A pilot-tested questionnaire was designed by the authors, based on extensive review of relevant literature and previous academic and professional experiences on medication utilization studies. The first part collected information on socio-demographics of the respondents, while the second part collected information on respondents' self-medication practices. Participants from 4 community pharmacies were approached consecutively as they came to the pharmacies to purchase their medications; on the other hand, a convenient sampling method was adopted for respondents drawn from the university campus. One of the investigators (CFU) or trained research assistants administered the questionnaire to the respondents. Prior to the commencement of the survey, the study was approved by the six participating hospitals/clinics and the four community pharmacies.

Data analysis

Data from the study were entered into Microsoft Excel spreadsheet and rechecked prior to sorting. Thereafter, it was loaded into Graph Instat® version 2.05a for data analysis. Percentage frequencies were calculated, and the differences between proportions determined using Chi-Squared test statistics. Furthermore, we use peer review system to assess the "appropriateness" of antimicrobial prescribing. This was done by using a completed data sheet, copied into quadruplicate and submitted to four independent consultant physicians, drawn from both government (two) and private (two) hospitals. The physicians were each required to record "Yes" to indicate "appropriate" antimicrobial prescribing, "No" for "inappropriate" prescribing or "Query" when antimicrobial prescribing was unassessable or assessable, but not ideal [19]. A clear majority of two "Yes" or two "No" responses was used to obtain an overall verdict of the "appropriateness" of anti-microbial prescribing in the six studied hospitals/clinics. Where this clear verdict could not be obtained from the assessors, it was regarded as disagreement. Appropriateness of clinical indication and the dosage regimen of the prescribed antimicrobials were used by the assessors in arriving at their verdicts.

Results

Antimicrobial prescribing by physicians

A total of 1,200 medical case files were used for this study. Metronidazole, ampicillin/cloxacillin (19%), amoxicillin (16%) and co-trimoxazole (12%) were the most frequently prescribed antimicrobials, (Table 1). Malaria (21%), followed by upper respiratory tract infection (19%), otitis media (5%) and urticaria rash/skin infections (5%) were the most frequent diagnoses in which antimicrobials were used, (Table 2).

Physicians' assessments of the "appropriateness" of antimicrobial prescribing showed slightly above one-half (56%) of the prescriptions were appropriate, while in 23% of cases, prescription of antimicrobials were considered inappropriate. The physicians disagreed on 17% of the prescriptions and 4% were queried. There was a significant difference in antimicrobial prescribing by physicians at both government and private hospitals, $\chi^2 = 16.808$, df = 3, P< 0.01), (Table 3). Malaria (25%), followed by urinary tract infection (11%), upper respiratory tract infection (10%), gastritis (6%), and peptic ulcer disease (5%) were the most frequent medical conditions in which antimicrobials were considered "inappropriate" by the physician assessors.

Table 1: Profile of antimicrobials prescribed at the hospitals/clinics

Antimicrobial prescribed	Public Hospital (%)	Private Hospital (%)	Total (%)
Metronidazole	173 (24.4)	87 (13.7)	260 (19.3)
Ampicillin+ Cloxacillin	96 (13.5)	157 (24.7)	253 (18.8)
Amoxicillin	106 (15.0)	115 (18.1)	222 (16.4)
Cotrimoxazole	63 (8.9)	104 (16.4)	167 (12.4)
Ciprofloxacin	49 (6.9)	41 (6.4)	90 (6.7)
Erythromycin	32 (4.5	56 (8.8)	88 (6.5)
Other	190 (26.8)	76 (11.9)	266 (19.8)
Total	*709 (100)*	*636 (100)*	*1345 (100)*

Table 2: Clinical conditions for antimicrobial usage

Indication	Public Hospital (%)	Private Hospital (%)	Total (%)
Malaria	107(16.2)	191 (26.1)	298 (21.3)
Upper respiratory tract infection	95 (14.4)	176 (23.9)	271 (19.4)
Otitis media	62(9.4)	7(1.0)	69 (4.9)
Pelvic inflammatory disease	33 (5.0)	8 (1.1)	41 (2.9)
Pneumonia	28 (4.2)	14 (2.0)	42 (3.0)
Urticaria /Skin infection	26 (3.9)	39 (5.3)	65 (4.7)
Urinary tract infection	23 (3.5)	35 (4.8)	58 (4.2)
Peptic ulcer disease	19 (2.9)	12 (1.6)	31 (2.2)
Appendicitis	15 (2.3)	10 (1.4)	25 (1.8)
Primary& secondary fertility	15 (2.3)	1 (0.1)	16 (1.1)
Hemorrhoid	15 (2.3)	3 (0.4)	18 (1.2)
Diarrhea/dysentery	15 (2.3)	5 (0.7)	20 (1.4)
Tonsillitis	14 (2.1)	10 (1.4)	24 (1.7)
Gastroenteritis/vomiting	10 (1.5)	38 (5.2)	48 (3.4)
Mastitis	10 (1.5)	3 (0.4)	13 (0.9)
Asthma	9 (1.4)	9 (1.2)	18 (1.3)
Threatened /incomplete abortion	7 (1.1)	0 (0.0)	7 (0.5)
Eye infections	4 (0.6)	7 (1.0)	11 (0.8)
Others	154 (23.2)	167 (22.7)	321 (22.1)
Total	*661 (100)*	*735 (100)*	*1396 (100)*

Table 3: Appropriateness of antimicrobial prescribing at both public and private hospitals/clinics

Assessment	Public Hospital (%)	Private Hospital (%)	Total (%)
Appropriate	311 (51.8)	358 (59.7)	669 (55.8)
Inappropriate	162 (27.0)	113 (18.8)	275 (22.9)
Disagreement	110 (18.3)	98 (16.3)	208 (17.3)
Query	17 (2.8)	31 (5.2)	48 (4.0)
Total	*600 (100)*	*600 (100)*	*1200 (100)*

$\chi^2 = 16.808$, $df = 3$, $P<0.01$

Table 4: Medical conditions self-treated and anti-microbial agents used by members of the public, Port Harcourt, Nigeria

Item	Community Pharmacy (%)	University Campus (%)	Total (%)
Medical condition			
Cough	246 (17.9)	199 (24.1)	445 (20.2)
Stomach upset	265 (19.2)	173 (20.9)	438 (19.9)
Boils	261 (18.9)	169 (20.4)	430 (19.5)
Sore throat	214 (15.5)	116 (14.0)	330 (15.0)
Sexually transmitted disease	151 (11.0)	58 (7.0)	209 (9.5)
Fever	166 (12.0)	102 (12.3)	268 (12.2)
Other	75 (5.4)	10 (1.2)	85 (3.9)
Total	*1378 (100)*	*827 (100)*	*2206 (100)*
Antimicrobial agent used			
Ampicillin	291 (21.4)	207 (25.0)	498 (22.8)
Tetracycline	209 (15.4)	146 (17.7)	355 (16.3)
Co-trimoxazole	206 (15.2)	163 (19.7)	369 (16.9)
Amoxicillin	100 (7.4)	46 (5.6)	146 (6.7)
Erythromycin	75 (5.5)	9 (1.1)	84 (3.8)
Chloramphenicol	52 (3.8)	26 (3.1)	78 (3.6)
Ampicillin+ cloxacillin	42 (3.1)	0 (0.0)	42 (1.9)
Lincomycin	25 (1.8)	9 (1.1)	34 (1.6)
Metronidazole	25 (1.8)	9 (1.1)	34 (1.6)
Amoxycillin+clavulanic acid	15 (1.1)	7 (0.8)	22 (1.0)
Phthalylsulphathiazole	9 (0.7)	2 (0.2)	11 (0.5)
Other	143 (10.5)	65 (7.9)	208 (9.5)
Cannot remember	165 (12.2)	138 (16.7)	303 (13.9)
Total	*1357 (100)*	*827 (100)*	*2184 (100)*

Antimicrobial self-medication

The questionnaire-based survey achieved a response rate of 80%, (960/1200). Of those who responded, a majority were males (51%), in age group 20 – 24 years old (38%), single (75%) and had post secondary education (76%). Most respondents were students (57%), and on average monthly income of less than ₦10,000.00, (48%). Sixty five percent of the respondents said that they had recently self-medicated with antimicrobial agents for a variety of illnesses. The most frequent medical conditions in which members of the public used antimicrobials for self-medication were cough (20%), stomach upset (20%), boils (20%) (Table 4). Ampicillin (23%) was the most frequently used antimicrobial for self-medication, followed by co-trimoxazole (17%) and tetracycline (16%) (Table 4).

The most frequent reasons for indulging in self-medication with antimicrobial agents were the cost of seeing a medical practitioner (34%), the need to save time (30%), easy access to antimicrobial agents (24%), and because they felt that there was no need to see a medical practitioner (11%). However, the respondents mentioned community pharmacy (62%), followed by patent medicine shop (28%), and left over medications (9%), among others, as their most frequent sources of antimicrobial agents for self-medication.

Discussion

Antimicrobials are reported as some of the most frequently used medications in modern medicine. Our findings indicated that the penicillins and metronidazole were the most frequently prescribed antimicrobials by the physicians. These patterns are similar to previous reports in a study conducted in Benin City, Nigeria[19] and elsewhere [6,11,14,15,16,17,18]. In addition, malaria and acute respiratory tract infection accounted for a majority of health problems in which an antimicrobial was prescribed. Furthermore, by using physician peers as reviewers of "appropriateness" of antimicrobial use, we found that in 23% of cases antimicrobial prescriptions were considered "inappropriate." Though no attempt was made to varify the accuracy of assessors' judgements; however, the import of this finding is that inappropriate anti-microbial drug use are more likely to be higher than reported in this study. Indeed, professionals are known to be less critical of themselves than external audit, and the physician assessor may not be an exception. Furthermore, the fact that in 17% of cases the physician assessors disagreed on appropriateness of antimicrobial use demonstrates the need for antimicrobial drug use policy, which should guide prescribing patterns of antimicrobials at health facilities.

It is noted that inappropriate antimcrobial prescribing patterns have several important public health implications. For example, the widespread use of common antimicrobial agents in many clinical settings may have substantially contributed to the development of resistant strains of infectious agents to these agents, thus resulting in loss of therapeutic efficacy [24,25]. Though the World Health Organization and several other (inter)national organizations have repeatedly called for stricter measures on anti-microbial usage, the actual implementation of this recommendation has been very poor, especially in many developing countries [2,24,25, 26, 27]. Furthermore, our findings, similar to previous reports elsewhere [12,13,19] showed that inapropriate anti-microbial prescribing was most common in public compared to private health facilities.

Similarly, we observed inappropriate antimicrobial selt-medication by members of the public. The repsondents mentioned that they most frequenlty self-medicated for cough, stomach upset and boils, and that ampicillin, co-trimoxazole and tetracycline were most frequenlty used. These patterns of antimicobial use are similar to reports by Odebiyi and Femi-Oyewo (1990)[21] and Obaseiki-Ebor *et al* (1987) [19] in two separate studies conducted among undergraduate students in two Nigerian universities. In many developing countries, self-medication is regarded as the norm rather than exception,[28]and the health implication of this practice has been variously described in the literature [19,21,28,30]. In addition, self-medication practices could also lead to wastage of scarce resoruces as the medical conditions are not likely to be adequatly treated, thus leading to relapse and consequnetly, treatment failure. Although the reposndents opined that they self-medicated because of the need to save cost and time, we believe that the most compelling reason for this practice is unrestricted access to antimicrobial agents, and indeed, other prescrption drugs in Nigeria. Therefore, as part of the measures to ensure rational use of this important class of medications, we recommend that measures be put in place to enforce the relevant laws governing pharmacy practice in the country, espcially at the level of the retail shops. This has become imparative considering the fact that the retail sector constitutes a major source of medications, including antimcrobials in the country [31].

Limitations exit in this study, which include use of historical medical records that may not always be complete. Secondly, the use of physicians to assess the appropriateness of antimicrobial prescribing may have resulted in under reporting of inappropriate antimicrobial prescribing patterns, as the physicians are likely to be less critical of their colleagues or they may also share similar prescribing habits. However, the fact that in 40% of cases, the physician assessors considered antimicrobial prescribing to be either inappropriate or they disagreed on their clinical use illustrates the importance of peer review system in enhancing quality use of medications.

Conclusion

Antimicrobial drugs were most frequently used, sometimes inappropriately by the public and private health facilities, as well as members of the public through self-medication. Findings from this study have important public health implications, which should urgently be considered and addressed by all concerned. In addition, further studies using standard methods of evaluating appropriateness of antimicrobial prescribing patterns are recommended.

Acknowledgements

We wish to thank the management and staff of the hospitals/clinics and the community pharmacies, where the study was carried. Also, we appreciate the contribution of the assessors for their invaluable time and efforts.

Conflict of interest

No conflict of interest is associated with this work

Authors' contribution

We declare that this work was done by the authors named in the manuscript, including study design, data collection and analysis, manuscript preparation and approval for submission.

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