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PROFILE OF ANTIBIOTIC USES IN HEALTHCARE

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Abstract

The indiscriminate use of antibiotics has become a global problem with implications for effective therapy of infections and dose resistance. The objective of this study is to determine the profile of antibiotic use at the health center of Delta State University, Abarca. This study was a retrospective study of 592 patient prescriptions from January – June 2015. The data used for this study was obtained by assessing patients' medical record files from the Medical Record Department and the data obtained were analyzed with the aid of Statistical Package for the Social Sciences and presented in a percentage table. In this study, 316 (53.38%) were female and 276(46.62%) were male. The age group of the patient were in category, 110(18.58%) were between 15-20 years, 20(33.95%) were between 21-25yrs, while 99(16.72%) were between 26-30years while 96(16.22%) were between 31-35 year and 86(14.53%) were greater than 36 years. Out of 592 patient evaluated, a total of 12 different single antibiotic were used, amoxyl 108(12.89%), ampiclox 88(10.50%), doxycycline 88(10.5%), flagyl 281(33.53%), azithromycin 99(11.81%) while erythromycin 38(4.53%) and sceptrin 42(5.01%) were most prescribed. Out of 1035 antibiotic that was prescribed, 197 were combined antibiotics, 38(19.29%) were amoxyl/flagyl, 33(16.75%) were doxycycline/flagyl, 46(23.35%) were azithromycin/ flagyl, 9(4.57%) were ciprofloxacin/ doxycycline/ flagyl/ azithromycin while 8(3.55%) were ciprofloxacin/flagyl. The major indication for antibiotic were plasmodia is 63(10.39%), cough and fever 42(6.81%), stooling 41(8.33%), heat rashes 45(7.35%), anemia 48(7.84%), gastroenteritis 39(6.37%) while respiratory tract infection 31(5.06%) and helminthiasis 25(4.08) respectively. The factors that influence the profile of antibiotic use were drug availability 23(25.27%), laboratory result 13(14.29%) cost of drug 18(19.78%) and hours of operation by pharmacy 12(13.18%). In conclusion, the study observed appropriate use of antibiotics based on the standard for evaluation; however, rotational drug prescribing was a major challenge due to poor adherence/compliance of prescribers toward standard treatment guidelines. Polypharmacy was common.

CHAPTER ONE

1. INTRODUCTION

Antibiotics are chemical substances produced by microorganisms or synthesized chemically that inhibit the growth of or destroy bacteria. Since the discovery of penicillin, antibiotics have revolutionized healthcare by making previously fatal infections treatable. In healthcare centers, antibiotics are used extensively in outpatient care, inpatient treatment, surgical prophylaxis, and critical care units. Understanding their profile, antibacterial activity, and classification is essential for effective and safe patient management.

1.1 Background of Study

Antibiotics account for the most prescribed drugs in the hospital setting. Inappropriate antibiotic prescribing and

the increasing levels of resistance are now issues of global concern (Charani et al., 2010). According to Davy et al., (2005), a considerable proportion of antibiotic prescriptions within hospitals have been described as inappropriate. Up to 50% of antibiotic use is inappropriate (Ashiru-Oredope et al., 2012).

Information about antimicrobial prescribing patterns is necessary for a constructive approach to challenges that arise from the multiple antibiotics that are available (Srishyla, et al., 1994). Excessive and inappropriate use of antibiotics in hospitals, health care facilities and the community contribute to the development of bacterial resistance (Shankar et al., 2003).

Irrationally prescribing habits for antibiotics lead to ineffective and unsafe treatment of medical conditions. Moreover, irrational prescribing may worsen or prolong the illness, thereby leading to distress and harm to the patient. As Sharma and Kapoor (2003) argued, not only does irrational prescribing led to exorbitant costs of medicines, but its occurrence is also common in clinical practice.

The decision model of prescribing antibiotics is complex and multiple factors other than clinical considerations can influence the decision to prescribe. These factors include patient characteristics, physician characteristics, and medical environments such as competition for clients. Patient characteristics such as age, lower socio-economic status, and higher comorbidity have significant effects on the antibiotic prescription rate.
Physician characteristics, including gender, age, time since graduation, and volume of practice, also significantly influence antibiotic prescription (Choi et al., 2008).
They also pointed out that an urban location of a medical practice and patient income level also influence antibiotic prescription rates. Other significant predictors are the physician expertise (that is specialist or generalist). Choi et al., (2008) further argued that medical environment variables such as the number of primary care clinics and number of hospital beds affect the rate of antibiotic prescription.

Sharma and Kapoor, (2003) attributed irrational prescribing to lack of knowledge about drugs, unethical drug promotions, high patient load, ineffective laboratory facilities, availability of drugs, and ineffective law enforcement by governments with subsequent failure to ensure compliance to guidelines. The irrational prescribing of antibiotics (particularly broad-spectrum antibiotics), in primary care is a major contributing factor to reduced drug efficacy, increased prevalence of resistant pathogens in the community, and the appearance of new co-infections (Sharma and Kapoor, 2003).

Antimicrobial resistance is currently the greatest challenge to the effective treatment of infections globally. Resistance adversely affects both financial and therapeutic outcomes with effects ranging from the failure of an individual patient to respond to therapy and the need for expensive or toxic alternative drugs to the social costs of higher morbidity and mortality rates, required or longer durations of hospitalization, increased health care costs and the need for changes in empirical therapy (Essick, 2006).

Previous studies on prescribing patterns have looked at the evaluation of rational therapy, the appropriateness of prescribing antibiotics and antibiotic use, resistance development and environmental factors. These factors addressed the characteristics of individual patients and doctors, related to prescription episodes. Most studies have shown that there is inappropriate prescribing. The use of antibiotics and a large number of prescriptions did not conform to the ideal pattern (Baktygul et al., 2011).

Medicines consume a massive portion of the total health care budget. Equitable access to affordable medicines remains a challenge. The Standard Treatment Guidelines and Essential Medical List ensure the cost-effective treatment options are available to citizens of the country and seek to build capacity in health care workers at the Primary Health Care level.

Antibiotics are among the most frequently used drugs worldwide. They are particularly utilized in developing countries, where an average of 35% of the total health budget is spent on antibiotics (Isturiz & Carbon., 2000, cited in Makhado, 2009). In Zambia for instance, the University Teaching Hospital alone spends well over 15.28 % of its medicines budget on antibiotics per quarter of the budget year (UTH Pharmacy records, 2013- unpublished data).

Monitoring prescriptions and drug utilization studies can identify the problems and provide feedback to prescribers and other stakeholders to create awareness about irrational use of antibiotics. This study was undertaken to

investigate the prescribing and profile of antibiotics use at the health center of delta state University, Abarca. This study aimed at describing the patterns of antibiotic prescribing and to suggest modifications in practitioners prescribing habits to make medical care rational and cost effective.

Rational prescribing and appropriate drug use are the keys to achieving optimum therapeutic goal. This is because inappropriate prescribing can lead to therapeutic failure, toxicity, drug interactions and even death of the patient (for which the physician and the dispensing pharmacist can be held responsible for professional misconduct), which then provides basis for a claim for compensation (Brahams, 1989). Poly-pharmacy is a recipe for adverse drug interactions (Irshad et al, 2005); increase risk of bacterial resistance (Yousif et al., 2006; WHO, 2000); non-compliance (Pearson,1982) and increased burden/ cost to both patient and the health care delivery system (George-Kutty et al., 2002).

Inappropriate prescribing is known all over the world to be a major problem with health care delivery; and tactless prescribing is widespread (Rashid et al., 1986). It is a feature in health care settings in developing countries and is characterized by polypharmacy, excessive use of antibiotics, and injections (Laing, 1990; Isah et al., 2001, Ohaju-Obodo et al., 1998; Akande and Ologe, 2007).

Inappropriate prescribing will have an important economic and medical impact on health care as it makes treatment of patients more costly, more risky and less rewarding.
Increased generic prescribing would rationalize drug use and reduce cost of treatment to the patient and lessen the burden on the health care delivery system (Quick et al., 2002; Hogerzveil, 1995).

ational drug prescribing has remained a global concern such that countries have established health regulations to guard against irrational, inappropriate or negligent prescribing, which is regardless of the considerable improvements that has been made in the availability and control of drugs in hospitals over time (Laing, 1990; Overveil, 1995).

Outpatient clinics deliver therapeutic services to a large segment of patients. General Outpatients Departments (in the Teaching and General hospitals), and the outpatient clinics in the private health institutions are the ones that see and treat the patients first. It is only cases that require further medical evaluation that are referred to the specialists.

Private health institutions have substantial clientele who patronize them for various reasons; some of which include absence of long queues, convenience of opening/ consulting hours, better attitude of staff, greater confidence in a particular doctor, and increase in likelihood of privacy (Foster, 1995). Consequently, massive quantities of drugs are prescribed during the clinic encounters. Assessment of prescribing patterns in these important medical facilities is of great relevance to identifying problems regarding rational drug use, so as to propose interventional measures in cases of significant irrational prescribing.

Appropriate drug utilization studies are important tools used to evaluate whether drugs are properly utilized in terms of efficacy, safety, convenience, and economic aspects at all levels in the chain of drug use (Dukes, 1993). The importance of rational drug use in clinical practice is underscored by the introduction in 1975 by World Health Organization (WHO, 1977, 1991) of the “Essential Drugs List (EDL) Concept”, which was followed up with the drawing up of an EDL in 1977 and setting up of implementation program in 1981(WHO, 1987). These initial critical steps have resulted in the improved supply of essential drugs to health care facilities in developing countries (Hogervzeil et al., 1993; WHO/DAP/ INRUD/ 93.1, 1993). With these programs in place, the need to improve rational use of the drugs became imperative and this was highlighted at the WHO sponsored multidisciplinary meeting of experts held in Nairobi in 1985 (WHO, 1987). To this end, a set of objective measures for the evaluation of prescribing practices (Drug Use Indicators: Prescribing Indicators, Patient Care Indicators, and Facility Indicators) were introduced through collaborative work of the Drug Action Program of the World Health Organization (DAP-WHO) and the International Network on the Rational Use of Drugs
{(INRUD)(WHO, 1991; 1993) Isah et al.,/ICIUM, 1997).

Federal Ministry of Health (FMOH), Nigeria in collaboration with WHO, launched the maiden edition of National Drug Policy (NDP) in 1990 and published the revised edition in 2005; with the goals of making available at all times to the Nigerian populace adequate supplies of drugs that are effective, affordable, safe, and of good quality; to ensure the rational use of such drugs and to stimulate increase local production of essential drugs at all levels on the

basis of health needs (NDP, 2005). WHO Drug Use Indicators are standard measures that have been assessed in many settings and found useful in controlling inappropriate prescribing (Hogervzeil et al., 1993). They have to a reasonable extent unified and clarified the concept of rational drug use which had until then appeared abstract, making previous research works on rational drug prescribing to be restricted to using methods, expressions and variables that were peculiar to their settings and that did not allow for direct comparison with other settings (Oviawe et al., 1989).

Availability of EDL at the health care facilities (HFs) and the WHO drug prescribing indices have therefore unified and made more practicable the concept of rational drug use, and enabled comparisons of drug use practices within and between health facilities, regions and countries. They provide useful tools for supervision and monitoring of drug use practices as well as allowing for evaluations of the impacts or changes that interventional efforts might have made over time (Isa et al., 2001).

2. LITERATURE REVIEW

Several studies emphasize the crucial role of antibiotics in reducing infection-related mortality. Research indicates that inappropriate prescribing practices contribute significantly to antimicrobial resistance. According to global health studies, resistant pathogens such as *Staphylococcus aureus*, *Escherichia coli*, and *Mycobacterium tuberculosis* have emerged due to misuse of antibiotics. Literature also highlights the importance of antibiotic stewardship programs in healthcare centers to ensure rational drug use and improve patient outcomes.

The indiscriminate use of antibiotics has led to the antimicrobial resistance problem (World Health Organization, 2009). According to Lukwesa, (2012- unpublished data), selected data showed that the percentage of resistance for organisms isolated from blood specimens where n=2175, ampicillin was 97.1% resistant, co-trimoxazole (86.2%), penicillin G (83.6%,) erythromycin (53.5%), chloramphenicol (43.5%), gentamycin (40.5%), ciprofloxacin (38%), tetracycline (35.5%) and cefotaxime (31.5%).

According to WHO, (2009) inappropriate antibiotic prescribing was as high as 67.6%. High patient load, prior prescription by unqualified prescribers, high prices of antibiotics, misdiagnosis, availability of antibiotics, ineffective law enforcement to ensure treatment guidelines are followed and prescribers being influenced by a particular company to prescribe its medical products are some of the major reasons for inappropriate prescribing of antibiotics. Lack of systems, structures and processes or antibiotic control measures such as Antibiotic

Policy Committee or their ineffectiveness could contribute to inappropriate prescribing.

3. IGNIFICANCE OF ANTIBIOTICS USED IN HEALTHCARE CENTERS

Antibiotics are indispensable in healthcare for the following reasons:

- Treatment of acute and chronic bacterial infections
- Prevention of postoperative infections (surgical prophylaxis)
- Management of hospital-acquired infections
- Protection of immunocompromised patients
- Reduction of disease transmission
- Support in advanced medical procedures such as organ transplantation and chemotherapy

Antibiotics are chemical substances that inhibit the growth of or destroy pathogenic microorganisms, particularly bacteria. Their significance in health-care centres is outlined below:

a) Treatment of Bacterial Infections

Antibiotics are essential for treating infections such as pneumonia, tuberculosis, urinary tract infections, septicemia, wound infections, and postoperative infections.

b) Prevention of Complications

Early and appropriate antibiotic therapy prevents the spread of infection, reduces morbidity, and lowers mortality rates, especially in immunocompromised patients.

c) Surgical Prophylaxis

Antibiotics are used before, during, or after surgery to prevent surgical site infections.

d) Control of Hospital-Acquired Infections (HAIs)

Health-care centres rely on antibiotics to manage nosocomial infections caused by organisms like Staphylococcus aureus and Pseudomonas aeruginosa.

e) Supportive Role in Advanced Therapies

Antibiotics enable safe implementation of chemotherapy, organ transplantation, dialysis, and intensive care by preventing opportunistic infections.

f) Public Health Impact

Proper antibiotic use helps reduce disease transmission and improves overall community health outcomes.
Proper antibiotic use improves recovery rates, shortens hospital stays, and reduces healthcare costs.

- Antibiotic: A group of drugs used to treat infections caused by bacteria and to prevent bacterial infection in cases of immune system impairment (Medical Dictionary, 2008).
- Prescription: This is an instruction written by a medical practitioner that authorizes a patient to be issued with a medicine or treatment.
- Pattern: A combination of qualities, acts, tendencies etc. forming a consistent or characteristic arrangement.
- Polypharmacy: This is the use of three or more medications by a patient, generally adults.
- Antibacterial drugs: A group of drugs used to treat infections caused by bacteria.
- Antimicrobial: A drug used to treat a microbial infection. "Antimicrobial" is a general term that refers to a group of drugs that includes antibiotics, antifungals, anti-protozoals, and antivirals (Medical Dictionary, 2008).
- Antibiotic resistance: The ability of bacteria and other microorganisms to withstand an antibiotic to which they were once sensitive (and were once stalled or killed outright). Also called drug resistance (Medical Dictionary, 2008).
- Irrational use of medicines: This is a major problem worldwide. It is estimated that half of all medicines are inappropriately prescribed, dispensed or sold and that half of all patients fail to take their medicine properly. The overuse, under use or misuse of medicines results in wastage of scarce resources and widespread health hazards (WHO, 2004).
- Rational drug therapy: The use of the least number of drugs to obtain the best possible effect in the shortest period and at a reasonable cost (Gross, 1981)

4. ANTIBACTERIAL PROFILE

4.1 Definition

The antibacterial profile describes the spectrum of activity of an antibiotic against specific bacteria.

4.2 Classification Based on Spectrum

Narrow-spectrum antibiotics:** Effective against specific bacteria (e.g., Penicillin G)

Broad-spectrum antibiotics:** Effective against a wide range of bacteria (e.g., Tetracyclines)

4.3 Mechanism of Action

Antibacterial agents act by:

- Inhibiting cell wall synthesis
- Disrupting cell membrane function
- Inhibiting protein synthesis
- Inhibiting nucleic acid synthesis

- Blocking metabolic pathways

4.4 Common Target Bacteria

- Gram-positive bacteria
- Gram-negative bacteria
- Aerobic and anaerobic bacteria

5. ANTIMICROBIAL AGENTS

5.1 Definition

Antimicrobial agents are substances that kill or inhibit the growth of microorganisms, including bacteria, viruses, fungi, and parasites.

5.2 Classification

- Antibiotics: Against bacteria
- Antifungals: Against fungi
- Antivirals: Against viruses
- Antiparasitic agents:Against protozoa and helminths

5.3 ommon Classes of Antibiotics

- Beta-lactams
- Aminoglycosides
- Macrolides
- Tetracyclines
- Fluoroquinolones
- Sulfonamides

5.4 Importance of Rational Use

- Prevents antimicrobial resistance
- Ensures patient safety
- Maintains effectiveness of existing drugs

6. THEORETICAL KNOWLEDGE AND CLINICAL APPLICATION

In healthcare centers, antibiotics are selected based on:

- Type of infection
- Causative organism
- Patient's age and condition
- Drug sensitivity tests
- Side effects and drug interactions

Antibiotic stewardship programs guide clinicians to choose the right drug, dose, and duration.

7. ONCLUSION: PROFILE OF ANTIBIOTIC USE IN A HEALTH-CARE CENTRE

Antibiotics are one of the most significant discoveries in medical science and remain essential in healthcare centers. Their antibacterial profile and classification as antimicrobial agents help clinicians in effective infection control. However, irrational use leads to resistance, making infections difficult to treat. Therefore, responsible prescribing, patient education, and strict adherence to antimicrobial stewardship programs are necessary to preserve the

effectiveness of antibiotics for future generations.

Antibiotics and other anti-microbial agents are indispensable in modern health-care centers. Rational use based on anti-bacterial profiling is essential to prevent antibiotic resistance and ensure effective patient management.

Antibiotics play a vital role in the effective functioning of health-care centres by enabling the prevention, control, and treatment of bacterial infections. A well-defined antibiotic profile ensures the selection of appropriate drugs based on the type of infection, causative organism, and patient condition. Proper use of antibiotics helps reduce morbidity, mortality, and the spread of infectious diseases, while also supporting advanced medical procedures such as surgeries, intensive care, and immunosuppressive therapies.

Rational and judicious use of antibiotics, guided by anti-bacterial profiling and sensitivity testing, is essential to minimize adverse effects and combat the growing problem of antimicrobial resistance. Therefore, maintaining an updated antibiotic profile and adhering to standard treatment guidelines are crucial for improving patient outcomes, ensuring patient safety, and sustaining the effectiveness of antibiotics in health-care centres.

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