



A Study of Antimicrobial Prescribing at a Secondary Health Facility in a Semi-urban Community in Bayelsa State, South-South Nigeria

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A – research concept and design; B – collection and/or assembly of data; C – data analysis and interpretation; D – writing the article; E – critical revision of the article; F – final approval of article.

Abstract

Background: Monitoring antimicrobial prescribing helps generate data to inform local policies on antimicrobial use and guides estimations for their stocking.

Objectives: To assess utilization of antimicrobial agents, diagnosis and management of infections as well as associated drug therapy problems (DTPs) at a secondary health facility in Bayelsa State.

Materials and Methods: In a retrospective study, case notes belonging to 1,278 patients who attended clinics at the study center from January 1st to December 31st, 2016 and who were prescribed at least an antimicrobial agent each for the treatment of infection were evaluated. Of these, 320 were retained for study having met completeness of prescription items. Data obtained were expressed in simple percentages while average values were presented in mean \pm standard deviation (SD).

Results: Two hundred and ninety-seven (92.8%) of the retained case notes were actually diagnosed with infections. In all, 24.8% of the 467 cases of infections treated were confirmed with requisite laboratory tests with 43.5, 19.9, and 13.1% of all being malaria, typhoid fever, and respiratory tract infections, respectively amongst others. Antibacterial (46.6%), antimalarial (35.5%), and anthelmintic (9.6%) agents were the most prescribed antimicrobial drugs. Respective average numbers of infections treated and antimicrobials prescribed per encounter were 1.47 ± 0.71 and 2.19 ± 0.97 , and each prescription contained an average of 0.89 ± 0.86 DTP.

Conclusion: Most of the antimicrobial prescribing were done without requisite diagnostic tests and each of the prescriptions contained at least a DTP necessitating a need for the education of the prescribers on rational use of antimicrobials.

Keywords: Antimicrobial agents, communicable diseases, Niger Delta Area

INTRODUCTION

Antimicrobials comprise agents with activity against all forms of microorganisms such as bacteria, fungi, viruses, and protozoa. They are very essential in the treatment of a variety of infections in humans as their mode of action involve either killing or inhibiting the growth of microorganisms with minimal effect on the host cells. They are also increasingly being used in animal and livestock production (Michigan State University, 2011). The antimicrobials are among the

most widely prescribed drugs especially in developing countries where burden of infections is very high (Morgan *et al.*, 2011) and they are either used for prophylaxis, as empirical treatments or definitive therapy. Meanwhile, when antimicrobial agents are required for definitive treatment of infections, it is important that the exact causative organism(s) be identified in order to aid appropriate medication selection (Leekha *et al.*, 2011).

Earlier studies have shown that among the antimicrobial agents, the antibacterials are the most

frequently used (Molstad *et al.*, 1994), of which penicillins and cephalosporins were reported as the most prescribed across different healthcare settings in Nigeria and elsewhere (Pathak *et al.*, 2011; Anyanwu and Arigbe-Osula, 2012; Abdu-Aguye *et al.*, 2016; Nsofor *et al.*, 2016). Importantly, respiratory tract infections, gastro-intestinal diseases, urinary tract infections, and malaria are the commonest of all indications for which antimicrobial agents are prescribed in clinical settings in Nigeria (Kehinde and Ogunnowo, 2013; Israel *et al.*, 2014; Nsofor *et al.*, 2016).

Irrational use of antimicrobials has been demonstrated in many studies conducted in Nigeria (Anyanwu and Arigbe-Osula, 2012; Kehinde and Ogunnowo, 2013; Abdu-Aguye *et al.*, 2016; Nsofor *et al.*, 2016). Patterns of irrational use of antimicrobials in hospitals include wrong drug therapy, inappropriate combinations and high rates of empirical prescribing due to poor use of

laboratory investigations (Israel *et al.*, 2014). However, this widespread and inappropriate use of antimicrobials had led to the emergence of antimicrobial resistance (AMR), (Bronzwaer *et al.*, 2002). Antimicrobial resistance is now a major public health concern globally as the rate at which new resistant bacterial strains emerge is now faster than the rate at which new requisite antimicrobial agents are being developed. This poses a major threat to antimicrobial therapy and has been shown to significantly impact patients' treatment outcomes. There is therefore the need for rational use of these antimicrobial agents in the management of infectious diseases (Leekha *et al.*, 2011).

This study was aimed at assessing the utilization of antimicrobial agents at a secondary healthcare facility which is located in Amassoma, a semi-urban community in Bayelsa State in the Niger Delta Area, South-South of Nigeria.

METHODOLOGY

Setting

The study was conducted at Amassoma General Hospital which is located on Wilberforce Island in Southern Ijaw Local Government Area of Bayelsa State, South-South of Nigeria. The hospital provides secondary health care services to the indigenes and residents of the Amassoma town and its environs. Amassoma is a semi-urban community with estimated population of 6,970 indigenous people and they are mostly farmers (TipTopGlobe, 2018).

Study Design

Following ethical approval, case notes belonging to 1,278 patients were reviewed retrospectively. They were those who were prescribed at least an antimicrobial agent each for the treatment of infections out of a total of 1,710 patients who attended outpatient clinics at the General Hospital from January 1st to December 31st, 2016. Patients' clinic attendance register was used as a guide for the selection of requisite case notes while considering the last clinic attendance for those patients who attended clinic more than once within the review period.

Three hundred and twenty of the case notes that were initially assessed were retained for further study having met completeness of prescription. For this study, a case note with prescription containing selected items regarding – prescriber's details such as name and designation, the patient's pertinent information particularly their socio-demographics, height, and weight. Also considered were inclusion of

names, dosages, and duration of drugs prescribed as well as the legibility of the prescriber's writing.

Data Collection

A structured data collection form was used in collecting patients' pertinent information, conditions treated while noting the diagnostic procedures and details of medication prescribed.

Main outcomes measures were pattern of antimicrobial utilization in relation to infections encountered including consideration of diagnostic tests conducted. Also determined were the DTPs associated with the prescribing practice and they were classified as earlier reported by Strand and colleagues (1990).

Statistical Analysis

Data obtained were analyzed using Statistical Package for Social Sciences (SPSS) version 20.0 (International Business Machines (IBM) Corp.) and GraphPad InStat 3.10 for Windows (GraphPad Software, San Diego California USA). They were expressed in simple percentages while average values were presented in mean \pm standard deviation (SD).

RESULTS AND DISCUSSION

Results

Of the 320 patients that were assessed, 186 (58.1%) were females while children (50.0%) below the age of 18 years old were the most encountered. Average age of all patients was 18.6 ± 17.74 and majority (70.3%) were dependents (Table 1).

Two hundred and ninety-seven (92.8%) of the cohort studied were actually documented to have presented with infections. In all, 467 infectious diseases were diagnosed, of which just 116 (24.8%) were actually confirmed with requisite diagnostic tests. Most (49.8%) of the patients presented with one infection followed by those who presented with two (43.1%),

while those who presented with three (7.1%) were in the minority. Malaria (43.5%) and typhoid fever (19.9%) were the most treated infections followed by respiratory tract infections (13.1%), infectious diarrhoea (6.6%) and urinary tract/genital infections (5.6%) amongst others. Average number of infections treated per encounter was 1.47 ± 0.71 (Table 2).

Table 1: Patients' Socio-demographics

Characteristics (n = 320)	N (%)
Gender	
Male	134 (41.9)
Female	186 (58.1)
Age (years)	
Children (< 18)	160 (50.0)
Adult (18 – 49)	139 (43.4)
Elderly (≥ 50)	21 (6.6)
Occupation	
Civil servants	36 (11.2)
Traders	46 (14.4)
Unemployed	12 (3.8)
Retired	1 (0.3)
Dependents (students and under-school age)	225 (70.3)

Average patient's age (Mean \pm SD), 18.6 ± 17.74 ; N, number of observations; n, sample size; SD, standard deviation

Table 2: Infections treated in patients

Characteristics of infections treated	N (%)
Number of infections treated per encounter (n = 297)	
One	148 (49.8)
Two	128 (43.1)
Three	21 (7.1)
Cases of infections treated (n = 467)	
Malaria	203 (43.5)
Typhoid fever	93 (19.9)
Respiratory tract infection	61 (13.1)
Infectious diarrhoea	31 (6.6)
Urinary tract/genital infection	26 (5.6)
Pelvic inflammatory disease	17 (3.6)
Skin infection	16 (3.4)
Sepsis	5 (1.1)
Sexually transmitted infection	4 (0.9)
Hepatitis	4 (0.9)
Helminthiasis	4 (0.9)
Measles	2 (0.4)
Ear infection	1 (0.2)
Appropriate diagnostic (laboratory) test conducted (n = 467)	
Yes	116 (24.8%)
No	351 (75.2%)

Average number of infections treated per encounter (Mean ± SD), 1.47 ± 0.71

A total of 698 antimicrobial agents were prescribed for the treatment of the infections encountered. Of these, antibacterials (46.6%) were the most prescribed followed by antimalarials (35.5%) and the anthelmintics (9.6%). In the specific subgroup of the antimicrobial agents, for antibacterials, penicillins (43.4%), cephalosporins (28.3%) and fluoroquinolones (12.9%) were the most prescribed. For the anti-malarials, artemisinin derivatives as monotherapy were the most prescribed while the

albendazole (100.0%) was the only prescribed anthelmintic. Others were as presented below (Table 3).

A total of 280 DTPs were observed in the medication therapies prescribed for the patients studied at average of 0.89 ± 0.86 DTPs per encounter. Of these, need for additional drug therapy (58.6%), unnecessary drug therapy (29.3%), and dosage too low (6.4%) were the most encountered (Table 4)

Table 3: Antimicrobial agents prescribed

Characteristics of antimicrobial agents	N (%)
Class of agents (n = 698)	
Antibacterial	325 (46.6)
Antimalarial	227 (32.5)
Anthelmintic	67 (9.6)
Amoebicides	52 (7.4)
Antifungals	26 (3.7)
Antiviral agent	1 (0.1)
Specific subgroup/individual antimicrobial agents prescribed	
Antibacterial (n = 325)	
Penicillins	141 (43.4)
Cephalosporins	92 (28.3)
Fluoro-quinolones	42 (12.9)
Aminoglycosides	9 (2.8)
Sulfonamides	14 (4.3)
Tetracyclines	10 (3.1)
Macrolides	6 (1.8)
Chloramphenicol	3 (0.9)
Nitrofurantoin	3 (0.9)
Others	5 (1.5)
Antimalarial (n = 227)	
ACT	67 (29.5)
Artemisinin derivative monotherapy	158 (69.6)
Quinine	2 (0.9)
Anthelmintics (n = 67)	
Albendazole	67 (100.0)
Amoebicides (n = 52)	
Metronidazole	52 (100.0)
Antifungals (n = 26)	
Ketoconazole	8 (30.8)
Fluconazole	3 (11.5)
Clotrimazole	4 (15.4)

Miconazole	4 (15.4)
Nystatin	4 (15.4)
Others	3 (11.5)
Antiviral agent (n = 1)	
Acyclovir	1 (100.0)

Average number of antimicrobials prescribed per encounter (Mean \pm SD), 2.19 \pm 0.97

Table 4: Drug therapy problems (DTPs)

Class of DTPs (n = 280)	N (%)
Unnecessary drug therapy	82 (29.3)
Wrong drug therapy	2 (0.7)
Dosage too low	18 (6.4)
Dosage too high	6 (2.1)
Drug interaction	8 (2.9)
Additional drug therapy needed	164 (58.6)

Average number of DTPs observed per encounter (Mean \pm SD), 0.89 \pm 0.86

DISCUSSION

Out of the 467 cases of infections treated within the study period, 24.8% were actually confirmed with requisite diagnostic tests. Most of the patients were treated for cases of malaria. Typhoid fever, respiratory tract infections (RTIs), and infectious diarrhoea amongst other infections were also treated abundantly among the patients seen. Antibacterial, antimalarial, and anthelmintic agents were the most prescribed medications. On the average, numbers of infections treated and antimicrobials prescribed per encounter were 1.47 \pm 0.71 and 2.19 \pm 0.97, respectively. Each of the prescription vetted was fraught with at least a drug therapy problem (DTP) of which need for additional drug therapy, unnecessary drug therapy, and dosage too low were the most encountered.

In this study, 75.2% of the cases of infections treated were not confirmed with the requisite laboratory tests. This is in contrast to the need for appropriate diagnostic procedures to aid holistic management of diseases as posited in several quarters. In the treatment of an infection, it is important that the exact causative organism(s) are identified in order to guide the prescriber in making informed decision as to the selection of suitable evidence-based treatment modalities (Leekha *et al.*, 2011). In the absence of the foregoing, irrational prescribing, wastage of resources, increase in length of hospital stay and unnecessary

exposure of patients to side effects of drugs have been noted to impact patients' safety and quality of life negatively. However, some guidelines allow for initiation of medication therapy empirically for certain infections using clinical judgments (Leekha *et al.*, 2011; Federal Ministries of Agriculture, Environment and Health of Nigeria, 2017).

Malaria and typhoid fever remained the most encountered infections at the study center in consistence with a previous study at the same center, and a number of factors have been advanced for the findings. They include certain unfavourable environmental factors all of which have been noted to collectively support the proliferation of organisms responsible for malarial and typhoid fever infections (Ganiyu *et al.*, 2014). Also, appreciable proportions of patients assessed in this study presented with respiratory tract infections and infectious diarrhoea amongst other diseases. Meanwhile, it is important to note that malaria, typhoid fever, certain RTIs, and diarrhoea have been categorized as diseases of poverty (Stevens, 2004). Thus, poor living conditions, poor drainage system, environmental pollution, lack of pipe-borne water and improper waste disposal which are commonplace in the community hosting the study center (Ganiyu *et al.* 2014; Ganiyu *et al.*, 2016) may be implicated as major contributing factors to the prevalence of the identified diseases. Hence, the arm of government administering this locality needs to be

alive to its responsibilities in making life bearable in the community. In addition, the locals also have to play their roles in order to complement the efforts of the government accordingly.

Virtually all of the infections treated required the prescribing of antibacterial medications notably the penicillins, cephalosporins, and fluoroquinolones asides cases of malaria which required requisite formulations containing artemisinin derivatives with antiplasmodial activities. This is a testament to the trend in disease presentations noted above and it is somewhat similar to the observation made in a study conducted at the present study center some years back (Ganiyu *et al.*, 2014). Meanwhile, the anthelmintic - albendazole was also prescribed for a lot of patients without recourse to laboratory confirmation of whether the causative organisms are present or not. This is probably in keeping with the effectiveness of deworming exercise especially in children in order to improve their nutritional status (Sungkar *et al.*, 2017). The prescription for antimicrobial agents written for each of the patients seen in this study contained at least a DTP and most required additional drug therapy in relation to the treatment of the conditions presented with. This observation connotes lack of completeness in the treatment of majority of conditions encountered. This is evident in the prescribing of Artemisinin derivative monotherapies for the treatment of most of the cases of malaria diagnosed. Moreover, unnecessary drug therapy and dosage too low amongst others were other DTPs that were abundantly reported. Corroborating the forgoing, Federal Ministries of Agriculture, Environment and Health of Nigeria in a

recent report related that unnecessary prescription, under-prescribing, and incessant prescribing of suboptimal doses of antimicrobials were among the most reported irrational use of antimicrobial agents in the country (Federal Ministries of Agriculture, Environment and Health of Nigeria, 2017).

The findings from this study may not be extrapolated for what obtains in the treatment of infections at other health centers in the same community in which the study center is located and Bayelsa State at large given that just one health facility was used for the study. Meanwhile, monitoring antimicrobial utilization patterns will provide guidance on treatment of infections. It will also help generate data to inform local policies on appropriate antimicrobial use and guide estimations for drug procurement and stocking (Duguid *et al.*, 2008).

CONCLUSION

Most of the infections treated in this study were not confirmed with requisite laboratory tests. Malaria, typhoid fever, and RTIs were the most treated of all the infections diagnosed, while antibacterials, antimalarials, and anthelmintics were the most prescribed antimicrobial drugs. Each of the prescription issued by the prescribers contained an average of one DTP. There is therefore the dire need for prescribers in this facility to be further trained on the rational use of antimicrobial agents in order to forestall the adverse consequences of their irrational use.

ETHICAL APPROVAL

The ethical approval for this work was given by the management of the General Hospital, Amassoma, Bayelsa State.

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