Full Length Research Paper

Point prevalence study of antibiotic use in hospitals in Butembo

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Inappropriate use of antibiotics is known as an important risk factor in the development of antibiotic resistance which increases the morbidity and mortality. We aimed to determine the prevalence and characteristics of antibiotic use in hospitals. A prevalence survey was conducted in 11 hospitals from 1st to 31th October 2014. In this study, from 700 patients investigated in this study, 476 received at least one antibiotic for their treatment; the prevalence of the antibiotic use was 68%. Most of patients were female (59.1%) and aged between 16 and 30 years. The most attended service was internal medicine (34%). 19 diseases were identified, malaria exhibited the highest prevalence (21.6%) followed by surgical site infections (10.7%), urogenital infections (8.6%), and infectious symptoms (8.4%) and bronchitis (8%). The 476 treated patients received a total of 667 antibiotic drugs (1.4 antibiotics per patient). The most prescribed antibiotic was ampicillin (35%) followed by gentamicin (13.6%), amoxicillin (13.5%), ceftriaxone (11%) and metronidazole (10.3%). The prevalence of combined therapy was 34.9% among patients who received more than one antibiotic. The most common route of administration was the intravenous (68.2%) and the most pharmaceutical form used was the powder for injection (51.1%). The prevalence of antibiotic use in Butembo hospital environment was very high which could be a risk factor for the development of resistance in case of inappropriate use of antibiotics.

Key words: Survey, prevalence, antibiotics, hospitals, Butembo, Democratic Republic of Congo.

INTRODUCTION

Antibiotics are molecules that were since discovered and applied for therapy, have changed completely the evolution of infectious diseases. They have brought considerable benefits for the treatment of infectious diseases. The disappearance of certain forms of serious bacterial diseases, the decrease of common infectious disease complications, the treatment of infectious diseases are largely attributed to antibiotic although the

improvement of socio-economic and hygienic conditions also contributed to the reduction of morbidity and mortality from infectious diseases in industrialized countries (Agence du Médicament, 1999). In modern medicine, antibiotics dominate in drug prescriptions. Many prescribers use antibiotics to treat or to prevent microbial infections. Many people who have taken these drugs also engage in self-medication.

Unfortunately, the hope provided by this therapeutic class was very short and the appearance of antibiotic-resistant bacteria reduces the efforts made by the pharmaceutical industry that provided newer and powerful antibiotics (Kiouba, 2002). Excessive and/or inappropriate use of antibiotics brought the development and expansion of bacterial resistance to these products (Fishman, 2006; World health Organization (WHO), 2011). The link between antibiotic use and bacterial resistance is well established (Austin et al., 1999). Antibiotic resistance reduces the effectiveness and treatment options and increases the morbidity and mortality risks.

In developed countries, monitoring systems for the appearance of bacterial resistance to antibiotics are available and monitoring surveys are conducted in order to provide updated data. Thus, in the United States of America, a survey of hospitalized patients gave a prevalence of 75% (Magill et al., 2014; Hecker et al., 2003); and, in Europe, Eurosurveillance regularly publishes antibiotic use surveys (Ansari et al., 2009; Zarb et al., 2011; Ciofi et al., 2008). In addition to a high prevalence, these studies also highlight the inappropriate use of antibiotics for therapy.

In developing countries such as the Democratic Republic of Congo with poor socio-economic conditions and insufficient sanitation, the antibiotic use patterns in health facilities are the subject of much criticism because in most cases it is made probabilistically. In hospitals, resistant bacteria spread easily and are largely responsible for nosocomial infections. Aiming the patients' well-being, physicians often prescribe empiric therapy through very broad-spectrum antibiotics, which are recent and expensive. This strong selection pressure accelerates the acquisition of resistance factors (Alfandari et al., 1997).

Although epidemiological studies on the prevalence of certain diseases have been conducted, the literature showed few gaps on the antibiotic use literature studies in health facilities are not explored enough in the Democratic Republic of the Congo and the information available from hospital and community is little. Thus, the objectives of this study were to describe the prevalence and characteristics of the use of antibiotics in hospitals of the Butembo city, Democratic Republic of Congo. This study helps to know the most prescribe antibiotics and exposed to possible resistance, but also to consolidate the collection of antibiotic consumption. Also, our findings may support the development of strategies to promote the rational use of antibiotics.

METHODS

This study was conducted at hospitals in Butembo City, Democratic Republic of Congo. These hospitals were grouped into two health zones of Butembo. The University Clinics of Graben, the Hospital of Baptist Community in Central Africa, the Light Clinic, the General Hospital of Kitatumba and the Makasi health Center are in Butembo health zone while the hospital Matanda, the General Hospital of Katwa, the Hospital Kivika, the Wanamahika Hospital, the Ngothe Hospital and the Medical Center HOLY FAMILY are in Katwa health area.

For each selected hospital, a staff officer, who could be a nurse or a doctor, was identified to help in data collection. One day was set in advance with the staff of each hospital for the investigation. The selected patients were those hospitalized for at least 24 h and who were present at 8:00 am in one of the hospital's services on the day the survey was programmed. Our investigation was conducted in a period from 1 to 31 October 2014.

Our sample excludes patients hospitalized for less than 24 h or before the day of our investigation.

Two different groups were set up, one for all patients who were receiving at least one antibiotic on the day of the investigation and another for patients who did not receive any antibiotic for their treatment.

The data were collected from patients' cards with the following variables: The age, the gender, the date of hospitalization, and the prescribed drugs (antibiotics and others drugs), and the number of hospitalized patients who received at least one antibiotic, antibiotic used (identity, number, routes of administration, dose), therapeutic indications. The patient charts were a valuable tool to gather this information. The Excel was used for the prevalence calculation. The prevalence was calculated as a ration between the number of the patients receiving at least on antibiotic for their treatment and the number of all hospitalized patients.

RESULTS

A total of 700 patients were hospitalized in hospitals that participated in the study and among them 476 patients were eligible for the following steps of this investigation because their treatment had one or more antibiotics. The prevalence of the antibiotic use in hospitals was 68% (Table 1). This prevalence is slightly higher in the Katwa health zone, in female subjects, among children and young people. The distribution of patients treated with antibiotics is summarized in Table 2.

Although, the highest frequencies of antibiotic use occur from 16 to 30 years old, the age group of 31 to 45 years exhibited the highest prevalence.

The population of patients who was treated with antibiotics was unevenly distributed in the hospital units (Table 2). Katwa health zone comprised more patients than Butembo health zone. The highest admission frequency was observed in Ngothe Hospital (13%) followed by the Wanamahika Hospital (11.6%) and Matanda Hospital (10.7%). The minimum was observed in Makasi Health Center (4.8%). The majority of patients was hospitalized in internal medicine (34%), followed by

Table 1. Prevalence of antibiotic use in hospitals in the city of Butembo.

Patients characteristics		Number of patients	Number of patients treated with antibiotics	Prevalence (%)
Health Zone	Butembo	265	179(37.6%)	67.54
	Katwa	435	297(62.4)	68.27
		700	**476(100%)**	**68**
Gender	Male	288	195(40, 9%)	67.8
	Female	412	281(59, 1%)	68.2
		700	**476(100%)**	**68**
Age (years)	0-15	180	116(24, 3%)	64.44
	16-30	319	220(46.2%)	68.96
	31- 45	125	88(18.5%)	70.4
	46-100	76	52(11%)	68.42
		700	**476(100%)**	**68**

Table 2. Distribution of patients under antibiotic treatment by hospital.

Hospital	Number of patients	Percentage
NGOTHE Hospital	62	13
WANAMAHIKA Hospital	55	11.6
MATANDA Hospital	51	10.7
General Hospital of Kitatumba	47	9.9
Medical Center Holy Family	45	9.5
Hospital of Baptist Community in Central Africa	42	8.8
General Hospital of Katwa	42	8.8
Hospital Kivika	42	8.8
University Clinics of Graben	38	8
Light Clinic	29	6.1
MAKASI Health Center	23	4.8
Total	476	100

Table 3. Distribution of patients under antibiotic treatment by service.

Service	Number of patients	Percentage
Internal Medicine	162	34
Pediatrics	106	22.3
Maternity	120	25.2
Surgery	88	18.5
Total	476	100

maternity (25.2%), pediatrics (22.3%) and surgery (18.5%) (Table 3).

Among patients receiving antibiotics, the most encountered indications observed (21.6%) was malaria. Other indications were surgical site infections (10.7%), urogenital infections (8.6%), infectious syndrome (8.4%) and bronchitis (8%) (Table 4). A variety of active molecules were represented in this antibiotic therapy, including beta-lactams, aminoglycosides, macrolides, quinolones with the predominance of beta-lactam molecules (penicillins and cephalosporins). The most commonly prescribed antibiotic was ampicillin (35%) followed by gentamicin (13.5%), ceftriaxone (11%) and metronidazole (10.3%) (Table 5).A total of 667 molecules of antibiotics were administered in 476 patients;1.4 antibiotic molecules per patient. Antibiotics are prescribed either alone or in combination. It was found that the antibiotics were prescribed alone for 65.1% and in combination of two antibiotics for 30.3%. Associations of more than three antibiotics are almost non-existent

Table 4. Distribution of patients under antibiotic treatment by diagnosis.

Diagnosis	Number of patients	Percentage
Malaria	103	21.6
Surgical site infections	51	10.7
Urogenital infections	41	8.6
Infectious syndrome	40	8.4
Bronchitis	38	8
Typhoid fever	34	7
Gastroenteritis	30	6.3
Gastritis	24	5
Amoebiasis	21	4.4
Antibiotic prophylaxis	18	4
UTI	18	4
Threatening infection abortion	12	2.5
Pneumonia	12	2.5
Edematous syndrome	10	2
Endocarditis	9	1.9
Meningitis	6	1.3
Secondary infection to diabetes	4	0,8
Tuberculosis	3	0,6
Neonatal Infection	2	0,4
Total	476	100

Table 5. Distribution of antibiotics used.

Antibiotic name	Number	Percentage
Ampicillin	223	35
Gentamicin	91	13.6
Amoxicillin	91	13.6
Ceftriaxone	73	11
Metronidazole	69	10.3
Ciprofloxacin	35	5.2
Erythromycin	21	3.1
Penicillin	13	2
Augmentin	9	1.35
Cefotaxine	9	1.35
Doxycilline	8	1.2
Azytromycine	6	1
Pentazocine	3	0.4
Cloxacyline	2	0.3
Others (Azitromycine, kanamycin, extencilline and cefixine)	5	0.7
Total	667	100

(Table 6). Antibiotics prescribed in hospitals in the city of Butembo were mostly the powder for injection (51.1%). Other dosage forms used are the tablet (20%) and the solution for injection (17%). The most common route of administration was intravenous (68.2%) followed by oral route (31.3%). In most cases, antibiotics are prescribedfor a period of 1 to 7 days (93.4%) (Table 7).

DISCUSSION

The survey on the prevalence of antibiotic use in hospitals in the city of Butembo revealed some important information. It was used to assess which antibiotics are currently used in hospitals; it also provide knowledge about the most represented antibiotics and the related

Table 6. Distribution of patients according to the number of prescribed antibiotics.

Number of prescribed antibiotics	Number	Percentage
1	310	65.1
2	144	30.3
3	19	4
4	3	0.6
Total	476	100

Table 7. Distribution of antibiotics according to the dosage form, the route of administration and the duration of use.

Variable	Parameters	Number of patients	Percentage
Dosage form	Powder for injection	343	51.1
	Tablet	132	20
	Solution for injection	113	17
	Capsule	66	10
	Syrup	11	1.6
	Eye drops	2	0.3
	Total	667	100
Duration of use (days)	1-7	623	93.4
	8-10	39	5.85
	11-15	5	0.75
	Total	667	100
Route of administration	I.V	455	68.2
	Oral	209	31.3
	Ocular	2	0.3
	I.M	1	0.2
	Total	667	100

diseases, the age and the gender of patients; the dosage forms and the most common routes of administration. Shows a high use of antibiotics after emergence of proven or assumed bacterial infections. These results confirmed the conclusion of previous studies (Vlahović-Palcevski et al., 2007; N'diaye, 2003), but they are higher compared to the results obtained by other studies (Zarb et al., 2011; Robert et al., 2012; Toure et al., 1997). The high use of antibiotics might increase the risk of bacterial resistance to some antibiotics; however, it is important to note that the difference between the prevalence found in this study and in previous studies does not necessarily indicate that there is inappropriate use of antibiotics where prevalence is high. These differences might be due to the difference in populations of patients (number, profile) or the prevalence of infectious diseases in the hospitalized population.

Among the antibiotics, ampicillin, a beta-lactam was the most prescribed antibiotic with 35% of cases, followed by gentamicin (13.5%), ceftriaxone (11%) and metronidazole

Among 700 patients, 476 (68%) were receiving antibiotics at the time the survey was conducted. This (10.3%). The choice of these antibiotics is usually probabilistic because the sensibility tests were not conducted prior the antibiotic prescription and in many hospitals the antibiotic use guidelines were not available. Thus, it is feared that only the experience of practitioners is not sufficient to prevent the emergence of resistance to antibiotics used.

The ways of prescriptions encountered in the two health zones of Butembo city are not identical to those found in hospitals in France (Robert et al., 2012). Indeed, in France, 3rd generation cephalosporins and beta-lactam associated with beta-lactamase inhibitors accounted with 44%, while in the present study is ampicillin, an aminopenicillin is prescribed by 35%. But the results found in Mali by Toure et al. (1997) also present ampicillin (57.54%) followed by gentamicin(23.13%), metronidazole (6.5%), lincomycin (2.6%) as the first choice of prescribers. N'diaye (2003)

revealed the predominance of the penicillin G (39.5%), followed by cotrimoxazole (22%), chloramphenicol (12.24%) and penicillin V (6.39%). Kiouba (2002) identified amoxicillin (19.4%), followed by ciprofloxacin (14.13%), metronidazole (12.8%), amphotericin B (12.8%), cotrimoxazole (10.6%) and gentamicin (7.3%).The difference in the prevalence of a given antibiotic likely depends on infectious pathologies present in the area of study and prescribing habits.

In addition to ampicillin, 17 other molecules of antibiotics are regularly prescribed in Butembo. The 18 molecules were prescribed in 667 lines of prescription with an average of 1.4 antibiotics per prescription. N'Diaye (N'diaye, 2003) got 399 lines of prescriptions for 263 patients (1.5 antibiotics per prescription) and Musey et al. (1990) 920 lines of prescriptions for 720 patients (1.27 antibiotic per prescription). More than half of hospitalized patients were under one antibiotic (65.1%) and 30.3% were treated with two antibiotics. These results are similar to those obtained by Jarno and Piednoir (2010) which shows a frequency of 76% for patients on a single antibiotic therapy and 20.5% for patients on two antibiotic therapies. However, it is also possible to find small values of single antibiotic therapy (Kiouba, 2002).

More than 68.2% of the antibiotics were prescribed by intravenous route, which is in line with the value found by Sissiko (2000) while the results obtained by Jarno and Piednoir (2010) and Ouedrago (1997) show a higher frequency antibiotic prescribed by oral route. The dosage form of antibiotics used is dominated by the powder for injection with 51.1%, followed by the tablet form with 20%.

This study presents the ways that antibiotics are used to solve health problems in the city of Butembo. Provided data will be useful to improve the healthcare system in this city by promoting the rational antibiotic use and the susceptibility test prior prescription of antibiotics. However, some limitations of this study should be noted. Indeed, the data collected in this study are from a non-random sample, but rather from a list of the major hospitals in the city of Butembo. The current data can therefore not be representative the situation in all hospitals of the city of Butembo especially the smallest ones.

Conclusions

The present study determined the prevalence of antibiotic use in hospitals in the city of Butembo in order to contribute to the rational use of antibiotics. This is the first study to characterize practices in the use of antibiotics in hospitals in the city of Butembo. The data collected in this survey will allow a better use of the limited resources of our country in the health field by identifying opportunities to improve the rational use of antibiotics practices which

will reduce health costs and improve the patients 'care.

Conflict of Interests

The authors have not declared any conflict of interests.

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