

Original article

Spot analysis of antimicrobial prescribing at the Regional Hospital Center of Saint-Louis: results of two surveys with the Global PPS tool

Analyse ponctuelle de la prescription des antimicrobiens au Centre Hospitalier National de Saint-Louis : résultats de deux enquêtes avec l'outil Global PPS

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Abstract

Introduction: Antimicrobials are used to treat infectious diseases. Microbes have developed mechanisms of antimicrobials resistance (AMR). To combat AMR, it is imperative to have data. We used the Global-Point Prevalence Surveillance to measure and monitor antimicrobial prescribing and resistance. **Methodology:** We conducted a descriptive, cross-sectional, one-time study at the Regional Hospital Center of Saint-Louis over two periods: first from April 2 to 25, 2018 and second from October 5 to 6, 2021.

The Global PPS inclusion criteria were used according to the guideline. Data collected on the survey forms were entered into Excel and analyzed by Epi Info version 7.

Results: The survey involved respectively 84 et 85 inpatients in 2018 and 2021. Patients under antimicrobial was 58% in 2018 and 55% in 2021. Mean age was 43.3 years in 2018 and in 2021, age ranges between 0-15 years were majoritary (n=28).

For the first investigation, 25.5% of patients had samples for bacteriological examination. Five bacterial strains were isolated with ESBL-secreting *Escherichia coli* (n=1). Unlike the second study in

2021, four patients had bacteriological sampling, one of which was positive for methicillin-resistant *Staphylococcus aureus*. Antimicrobials prescribed (n=76) in 2018 were mostly antibiotics (92.68%). In addition, four antifungals and 2 antiparasitics were prescribed. In 2021, amoxicillin and ceftriaxone were predominant with a prevalence of 31% each. Patients on antimicrobial therapy in 2018 were predominantly from general surgery with 26.5%, followed by infectious diseases with 16.3%. While in 2021, except maternity, at least 50% of patients were under antimicrobial for all services.

Conclusion: Results show an increasing use of antimicrobials with a rate exceeding 50% compared to developing countries. This situation, associated with a lack of prescriptions conformity, proves urgency of limiting use of antibiotics which are more concerned and the recourse to antibiotic therapy recommendations.

Keywords : Antimicrobial, Prescription, Resistance, Saint-Louis, Senegal.

Résumé

Introduction : Les antimicrobiens sont utilisés pour traiter les maladies infectieuses. Les microbes

ont développé des mécanismes de résistance aux antimicrobiens (AMR). Pour combattre la RAM, il est impératif de disposer de données. Nous avons utilisé le Global-Point Prevalence Surveillance pour mesurer et surveiller la prescription et la résistance aux antimicrobiens.

Méthodologie : Nous avons réalisé une étude descriptive, transversale et ponctuelle au Centre Hospitalier Régional de Saint-Louis sur deux périodes : du 2 au 25 avril 2018 et du 5 au 6 octobre 2021.

Les critères d'inclusion du PPS global ont été utilisés conformément à la ligne directrice. Les données recueillies sur les formulaires d'enquête ont été saisies dans Excel et analysées par Epi Info version 7. **Résultats :** L'enquête a concerné respectivement 84 et 85 patients hospitalisés en 2018 et 2021. Les patients sous antimicrobiens étaient 58% en 2018 et 55% en 2021. L'âge moyen était de 43,3 ans en 2018 et en 2021, les tranches d'âge entre 0 et 15 ans étaient majoritaires (n=28).

Pour la première investigation, 25,5% des patients avaient des échantillons pour un examen bactériologique. Cinq souches bactériennes ont été isolées, dont *Escherichia coli* sécrétant des BLSE (n=1). Contrairement à la deuxième étude de 2021, quatre patients ont eu des prélèvements bactériologiques, dont un était positif pour le *Staphylococcus aureus* résistant à la méthicilline. Les antimicrobiens prescrits (n=76) en 2018 étaient principalement des antibiotiques (92,68%). En outre, quatre antifongiques et deux antiparasitaires ont été prescrits. En 2021, l'amoxicilline et la ceftriaxone étaient prédominantes avec une prévalence de 31% chacune. Les patients sous traitement antimicrobien en 2018 étaient majoritairement issus de la chirurgie générale avec 26,5%, suivie des maladies infectieuses avec 16,3%. Alors qu'en 2021, à l'exception de la maternité, au moins 50% des patients étaient sous antimicrobien pour tous les services.

Conclusion : Les résultats montrent une utilisation croissante des antimicrobiens avec un taux supérieur à 50% par rapport aux pays en développement. Cette situation, associée à un manque de conformité des

prescriptions, prouve l'urgence de limiter l'utilisation des antibiotiques qui sont les plus concernés et le recours aux recommandations d'antibiothérapie.

Mots-clés : Antimicrobien, Prescription, Résistance, Saint-Louis, Sénégal.

Introduction

Antimicrobials constitute a very broad class of molecules in the therapeutic arsenal used against infectious pathologies of bacterial, parasitic, viral or fungal origin. For decades, microbes, and in particular bacteria, have become increasingly resistant to the various antimicrobials used to combat them (WHO 2020) [1].

The Global Action Plan to Combat Antimicrobial Resistance (AMR) (Resolution WHA 2015), [2], endorsed by the World Health Assembly, and the General Assembly Political Declaration on AMR (WHO 2016), both recognize that AMR is a global threat to public health [3]. These policy initiatives blame the overuse and misuse of antimicrobials as the main culprits in the development of resistance and work to optimize them. This requires a situational analysis of antimicrobial prescribing and use practices. The information derived from these analyses is crucial to antimicrobial stewardship programs, an effective tool for minimizing antimicrobial resistance. Unfortunately, they are lacking in most developing countries, including Senegal. In Europe, a standardized method for monitoring antimicrobial use in hospitals to assess antimicrobial prescribing practices was initiated in 2014-2015. This is the Global-Point Prevalence Surveillance (G-PPS) which is a simple, freely available online tool to measure and monitor antimicrobial prescribing and resistance in hospitals worldwide (www.global-pps.com). The Global-PPS provides quantifiable measures to assess and compare the quantity and quality of antimicrobial prescribing and antimicrobial resistance in hospitalized adults, children, and neonates worldwide (Global-PPS 2020) [4].

As part of the activities of the healthcare-associated infection control committee at the Regional Hospital Center of Saint-Louis, we used this tool to conduct a point-in-time analysis of prescribing and to optimize prescribing. The specific objectives were to determine the indications and prevalence of antimicrobial prescribing, to identify the main antimicrobials prescribed, and to assess compliance with dosages and duration of treatment.

Methodology

The study was conducted at the Regional Hospital Center (RHC) of Saint-Louis. This health facility, built in 1822, is a UNESCO World Heritage Site. Its theoretical capacity is 300 beds. In the health pyramid, it is a level 3 public health establishment with several specialties. The study was a descriptive, cross-sectional, one-time study conducted over two periods: the first from April 2 to 25, 2018 and the second from October 5 to 6, 2021.

The Global PPS inclusion criteria were used: [5].

- All patients present in a department (excluding one-day admissions in endoscopy or renal units) at 8:00 am of the survey day;

- All patients «on antimicrobial therapy» admitted at 8:00 a.m. of the survey day should be included.

Patients not included in the study were those admitted to day hospital and those in ambulatory care.

For each patient the following data were collected: department, age, sex, weight, diagnosis, antimicrobial treatment and duration of treatment. The data collected on the survey forms were entered into Excel and analyzed by Epi Info version 7. The analysis of the appropriateness of the prescription was done by the prescribing committee, taking into account local recommendations on antibiotic therapy.

Results

The survey had involved 9 services with 84 inpatients for 216 beds in 2018. While for 2021, 10 services were concerned with 85 hospitalized patients for 179

beds.

The number of patients under antimicrobial treatment in our study was 49 (58%) in 2018 compared to 71 (55%) in 2021. The information concerning the services surveyed, the theoretical number of beds, the number of patients hospitalized and those undergoing antimicrobial treatment are summarized in Table I and II.

With the pandemic Covid-19 and the erection of the Epidemic Treatment Center (ETC), a reorganization was carried out and the Internal Medicine, Infectious Diseases, and Pulmonology services were merged in 2021 (mixed services).

In 2018, the mean age of patients on antimicrobial therapy was 43.3 years [± 21.7 years] with a median of 45 years and extremes ranging from 03 to 84 years. Subjects aged 16 to 45 years accounted for nearly 43% of the study population (n=21) (Figure 1).

While in 2021, the extreme ages ranged from 1 day to 90 years, the age ranges between 0-15 years were in the majority (n=28) followed by 16-45 years (25) (Figure 1).

Patients on antimicrobial therapy in the 2018 PCG were predominantly from general surgery with 13 cases (26.5%), followed by Medicine 4 or infectious diseases with 8 cases (16.3%) for the first period. While in 2021, except for maternity, at least 50% of patients were under antimicrobial treatment for all services.

According to the diagnoses selected in 2018, diabetes with its complications and bacterial pneumonitis were the most frequent indications with 7 (12.3%) and 4 cases (8.2%), respectively. Next came sepsis, pleurisy and diabetic ketoacidosis with 3 cases each (6.1%). The other indications were present twice (abscess, bacterial encephalitis, acute angiocholitis, urinary tract infection, extrapulmonary tuberculosis, genital ulcerations) or only once with, among others, urinary bilharzia, bronchitis, pancreatic cancer, erysipelas, peritonitis, phlegmon.

In 2021, the diagnosis was specified for 61 patients (86%) with infections in the majority of cases (neonatal n=8; pneumonia n= 7; gynecological n= 7;

urinary tract n=4; meningitis n=3; other infections n=13), followed by fractures (n=9) and other indications (n=10).

For the first investigation, twelve patients (25.5%) had samples taken for bacteriological examination. The samples were mainly: urine (n=4), pleural fluids (n=4), pus (n=2), sputum (n=1) and a gastric tube (n=1). Five bacterial strains were isolated: ESBL-secreting *Escherichia coli* (n=1), *Klebsiella pneumoniae* (n=1), *Pseudomonas aeruginosa* (n=1), non-groupable *Streptococcus* (n=1) and methicillin-susceptible *Staphylococcus aureus* (n=1).

Unlike the second study in 2021 where only four patients had bacteriological sampling, one of which came back positive for methicillin-resistant *Staphylococcus aureus* (Meti-R).

Antimicrobials prescribed (n=76) in 2018 were mostly antibiotics (92.68%). Amoxicillin-clavulanic acid combination was the leading one (30/76), followed by metronidazole (15/76), ceftriaxone (9/76) and ciprofloxacin (4/76). Other antibiotics were prescribed twice (Amoxicillin, Ampicillin, Cefixime, Spiramycin, Rifampicin-Isoniazid-Pyrazinamide-Ethambutol) or only once (Azithromycin, Erythromycin, Doxycycline, Sulfadoxine-pyrimethamine) (Table III).

Some molecules were used in combination. Dual therapy was used in 25 patients (49%), followed by monotherapy in 18 (35.3%) and triple therapy in 6 cases (11.8%). Two patients were treated with four antimicrobial molecules. In surgery, the majority of hospitalized patients were treated with amoxicillin-clavulanic acid combination (87.5%) and flagyl (75%). In addition, four antifungals (ciclopiroxolamine n=2; myconazole n=1; fluconazole n=1) and 2 antiparasitics (albendazole and praziquantel) were prescribed. The majority of antimicrobial prescriptions were empirical due to the unavailability of bacteriological results.

In 2021, amoxicillin and ceftriaxone were predominant with a prevalence of 31% (n=22) each. The majority of patients (n=38; 53%) were on a combination of antibiotics with thirty-three (87%) taking at least two molecules (Table IV).

Amoxicillin and Amikacin were used in combination for 8 cases each, as well as 3rd generation Cephalosporins and Metronidazole with 4 cases respectively. The other antibiotics are represented by the following molecules: Cefixime, Vancomycin, Erythromycin, Gentamycin, Cotrimoxazole, Imipenem.

Table I: Distribution of patients by service in 2018

Services	Number of beds N (%)	Inpatients N (%)	Patients on antimicrobial therapy N (%)
Surgey	42 (19)	17 (20)	13 (27)
Maternity	29 (13,5)	7 (8)	6 (12,5)
Pediatric	29 (13,5)	8 (10)	4 (8)
Orthopedic	24 (11)	7 (8)	3 (6)
Infectious diseases	22 (10)	20 (24)	7 (14,5)
Internal medicine	21 (10)	13 (15,5)	8 (16)
Emergency	19 (9)	5 (6)	2 (4)
Cardiology	18 (8)	5 (6)	5 (10)
Urology	12 (6)	2 (2,5)	1 (2)
Total	216 (100)	84 (100)	49 (100)

Table II: Distribution of patients by service in 2021

Services	Number of beds N (%)	Inpatients N (%)	Patients on antimicrobial therapy N (%)
Maternity	47 (26)	51 (40)	14 (19,7)
Urology	12 (7)	8 (6)	4 (5,6)
Intensive care unit	17 (9,5)	8 (6)	5 (7)
Orthopedic	8 (4)	8 (6)	8 (11,2)
Pediatric	23 (13)	23 (18)	16 (22,5)
Neonatology	19 (11)	11 (9)	7 (9,8)
Cardiology	16 (9)	3 (2)	3 (4,2)
Mixed services	22 (12)	12 (9)	9 (13)
Surgey	15 (8,5)	5 (4)	5 (7)
Total	179 (100)	129 (100)	71 (100)

Table III: Antibiotics prescribed en 2018

Antibiotiques	Nombre de prescriptions (%)
Amoxicilline-acide clavulanique	30 (39,5)
Métronidazole	15 (19,7)
Cephalosporin third génération	9 (11,8)
Ciprofloxacine	4 (5,3)
Others antibiotics	18 (23,7)
Total	76 (100)

Table IV: Antibiotics prescribed in 2021

Antibiotics	Number of prescriptions (%)
Amoxicilline	36 (34)
Cephalosporine third generation	34 (32)
Metronidazole	8 (7,5)
Amikacin	8 (7,5)
Others Antibiotics	19 (19)
Total	105

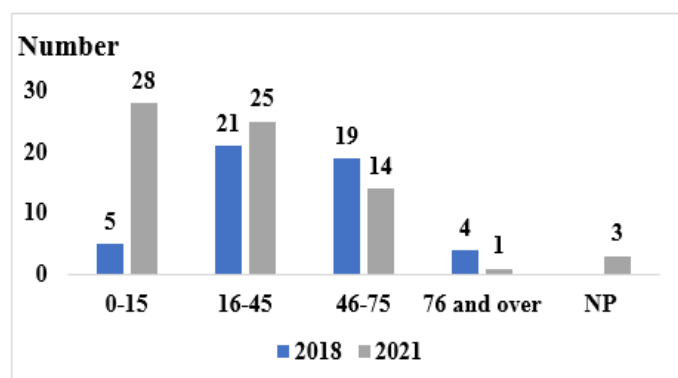


Figure 1: Distribution of patients on antimicrobial therapy by age group

NP: Not specified

The number of female patients was 25 (51%) compared to 24 male patients, for a sex ratio of 0.96 (Figure 2).

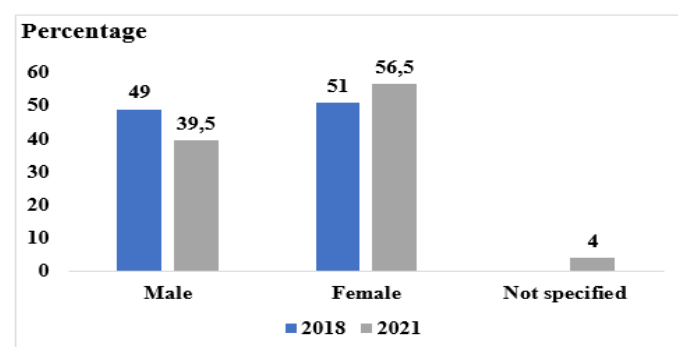


Figure 2: Distribution of patients on antimicrobial therapy by gender

NP: Not specified

Discussion

This survey was conducted at the Saint-Louis Regional Hospital, a referral facility for the fight against healthcare-associated infections. However, certain difficulties were encountered, particularly those related to data management. Indeed, some patient files were incomplete, others were without mention of the prescribed treatment. Access to patient files was difficult, and there was no filing system. In most cases, the start and stop dates of treatment were not mentioned, especially for antimicrobials. In the context of improving the quality of care, the hospital had enrolled in monitoring the prescription and consumption of antimicrobials. This one-time survey per hospitalization service had involved different medical and surgical specialties. In 2018, 49% of patients were under antimicrobial treatment. This prescription frequency is similar to that of African countries but higher compared to data from the global PPS survey conducted between January and September 2015 [6]. Indeed, out of 86776 hospitalized patients enrolled worldwide, 29891 had received at least one antimicrobial, i.e., a prevalence of 34.4%, and Africa, compared with the other areas explored by the study, had the highest prevalence of antimicrobial use (49%) ([7]). In 2011, a study had identified critical points in the prevalence of antibiotic prescribing within regions or countries, with the highest prevalence in Africa (50%; country range 27.8-74.7%) and the lowest in Eastern Europe (27.4%; 23.7-27.8%) ([8]). However, in 2021 antimicrobial prescribing in Saint-Louis reached 55% and was therefore significantly higher than in previous years. This increase in the prevalence of antibiotic consumption is also observed in Nigeria 2017 (59.6%) ([9]). In Asia, the same constraints on high antimicrobial use are also reported. A study conducted in India in 2019, involving 1750 patients from 16 health facilities, had shown an antimicrobial use rate of 57.4% ([10]).

The most frequently reported diagnoses in our two studies were diabetes and its complications in the first study and infections, especially neonatal infections

and pneumonia, in the second. In Belgian hospitals, the most frequently reported indications were pneumonia (23.2%), urinary tract infections (15.2%) and skin and soft tissue infections (11.9%) ([11]. In the multicenter survey in Punjab, Pakistan, the top three indications for antibiotic use were prophylaxis in gynecology and obstetrics, gastrointestinal, and lower respiratory tract infections ([12].

Betalactams, imidazoles, and quinolones were the most prescribed. This is in contrast to the 2015 Global-PPS report where penicillin with β -lactamase inhibitors, 3rd generation cephalosporins, and fluoroquinolones were the three most prescribed antimicrobials worldwide. These findings reveal high rates of broad-spectrum antibiotic prescribing. In addition, according to the same source, carbapenems were most frequently prescribed in Latin America and Central and Western Asia. Antimicrobial prescribing was often prophylactic at 32% and empirical at 59%. Prophylaxis concerned surgery and used narrow-spectrum antibiotics and also the neonatal ward. But the duration of treatment should be 5 to 10 days for clean surgery and sometimes four weeks for septic procedures (diabetic feet). This information about the duration of treatment was not mentioned on the patient records and was partly one of the limitations of the survey. Ann Versporten and al. 2018 had shown that one of the main problems with prolonged antibiotic use was perioperative prophylaxis (in general, the duration of perioperative antibiotic prophylaxis was greater than one day in 80% of surgical patients in low- and middle-income countries (LMIC) [7].

Non-standard probabilistic antibiotic therapy was related to the unavailability of a prescription manual. High use of broad-spectrum antibiotics was noted with consequent susceptibility to resistance occurrence and gene dissemination in hospital and community settings. In the 2015 Global PPS report, most of these antibiotics were prescribed for empirical use, illustrating the lack of diagnostics to document infections [7].

Local antibiotic guidelines were lacking for 7050 (19.2%) antibiotic prescriptions out of 36792 with a

guideline compliance of 77.4%. Surgical specialties were more involved in antimicrobial prescriptions than medical specialties. This predominance of antimicrobial prescriptions in surgery can be explained by post-surgical prophylaxis but also by the fact that the general surgery department received all post-surgical hospitalizations. Mono-antibiotic therapy represented only 18%. Combinations of antibiotics were predominant and 49% of patients were taking at least two antibiotics.

Antifungals are often used for the treatment of pressure sores that occur during hospitalization. Antiparasitics were less prescribed either for systematic deworming or for the treatment of bilharzia. We did not find any patients under antiviral treatment since the management of people living with HIV is done on an outpatient basis.

Conclusion

The results obtained show an increasing use of antimicrobials with a rate exceeding 50% compared to the countries of the North. This situation, associated with a lack of conformity of prescriptions to local and international guidelines, proves the urgency of limiting the use of antibiotics which are more concerned and the recourse to antibiotic therapy recommendations.

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