

Probabilistic Antibiotic Therapy in the Infectious Diseases Department of the Yalgado Ouédraogo University Hospital (CHU-YO) in Ouagadougou, Burkina Faso

Savadogo Mamoudou*, Bonané Faïz

Department of Infectious Diseases, CHU Yalgado Ouédraogo, Ouagadougou, Burkina Faso

Email: *savadoma@gmail.com

How to cite this paper: Mamoudou, S. and Faïz, B. (2022) Probabilistic Antibiotic Therapy in the Infectious Diseases Department of the Yalgado Ouédraogo University Hospital (CHU-YO) in Ouagadougou, Burkina Faso. *Advances in Infectious Diseases*, 12, 639-645.

<https://doi.org/10.4236/aid.2022.124044>

Received: September 8, 2022

Accepted: October 22, 2022

Published: October 25, 2022

Copyright © 2022 by author(s) and Scientific Research Publishing Inc.

This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Introduction: In Burkina Faso, as in most developing countries, limited access to biological tests forces practitioners to resort very often to probabilistic antibiotic therapy. The objective of this study is to determine the extent of this prescription. **Patients and Methods:** This was a cross-sectional study with retrospective data collection of patients hospitalized in the infectious diseases department in the period from January 1, 2005 to December 31, 2020. The records of patients who received probabilistic antibiotic therapy were included. **Results:** During the study period, 330 patients had received probabilistic antibiotic therapy. The majority of patients were male (53%), with a sex ratio of 1.12. The mean age of the patients was 33 years \pm 14. The age range of 20 to 40 years was the most represented (42%). Fifteen percent (15%) of patients were living with HIV. The majority of patients were from urban areas (56.4%). Forty-nine percent (49%) of the patients worked in the informal sector. Clinically, the reasons for consultation were dominated by fever, alteration of general condition, neurological disorders, digestive disorders, respiratory signs, urinary signs and diffuse pain. The physical examination showed that 48.1% of the patients had meningeal irritation syndrome, 10% had convulsions and 10% had focal signs, trismus was present in 4% of the patients and facial paralysis in 3%. In the digestive system, hepatomegaly was present in 29% of patients and digestive candidiasis in 31%. Respiratory examination showed crepitus and fluid effusion syndrome in 26.83% and 20.62% of patients respectively. The presumptive diagnosis was dominated by bacterial meningitis, salmonellosis and bronchopneumonia with banal germs. In terms of treatment, the beta-lactam family of drugs was the most prescribed. They were followed by aminoglycosides and fluoroquinolones. The evolution was marked by the death of 50 patients (15%). **Conclusion:** The

most prescribed molecules belong to the family of Beta-lactam. And this prescription improved the outcome of patients. Bacterial susceptibility studies will allow better orientation of probabilistic antibiotic therapy in order to limit the emergence of multi-resistant bacteria.

Keywords

Probabilistic Antibiotic Therapy, Beta-lactam, Infectious Diseases
Department of the Yalgado Ouédraogo University Hospital

1. Introduction

Antibiotic resistance remains a major public health problem, particularly in developing countries such as Burkina Faso, where hygiene conditions are still precarious and where the use of antibiotics is often abused and poorly controlled [1]. Rational use of antibiotics is a crucial parameter of quality of care. However, in Burkina Faso, as in most resource-limited countries, limited access to confirmatory diagnostic tests forces practitioners to resort frequently to probabilistic antibiotic therapy. This prescription is based on clinical examination and knowledge of the bacterial ecology of the health facility in question. It does not take into account either the etiological diagnosis or the sensitivity of the bacteria responsible for the infection. Although this practice has demonstrated its impact on improving the vital prognosis of patients, it exposes them to selection pressure for resistant bacteria [2] [3] [4] [5]. Studies conducted in Burkina Faso have shown high rates of probabilistic antibiotic prescription. Youl *et al.* had already observed that ceftriaxone was prescribed probabilistically in almost all patients (98.2%), and that this prescription was inappropriate in 29.5% of cases [6]. The aim of our study, which takes place some ten years later, is to determine the extent of probabilistic antibiotic therapy.

2. Patients & Methods

The study took place in the infectious diseases department of the CHU Yalgado Ouédraogo. This department is specialized in the management of infectious diseases with or without epidemic potential. This was a cross-sectional study with retrospective data collection of patients hospitalized in the infectious diseases department during the period from January 1, 2005 to December 31, 2020. Our study included patients who were hospitalized in the infectious diseases department of the YO University Hospital for a bacterial infectious disease and who had received a probabilistic anti-antibiotic treatment. Patients whose records were not usable were excluded from our study.

Data were collected using a collection form; sociodemographic, clinical, therapeutic, and evolutionary variables were collected from hospitalization records.

The sampling was exhaustive and the variables sought were sociodemographic data (age, sex, residence, profession), clinical data (functional signs, general

signs, physical signs), the presumptive diagnosis that led to probabilistic antibiotic therapy, the antibiotics used, the duration of hospitalization, and the evolution under probabilistic treatment.

The data collected were entered, processed and analyzed on a microcomputer using SPSS, Word and Excel software version 2016.

Ethically, the confidentiality and anonymity of the patients were respected in the processing and analysis of the data. We obtained authorization for data collection from the Director General of the CHU-YO.

Operational definitions:

- Fairly good general condition: patient with a general condition stage I or stage II according to the WHO classification.
- Poor general condition: patient with a general condition stage III or stage IV according to the WHO classification.
- Presumptive diagnosis: diagnosis suspected on the basis of clinical examination
- Probabilistic antibiotic therapy: any antibiotic therapy administered before confirmation of the diagnosis.
- Duration of treatment: the number of days between the beginning and the end of the probabilistic treatment administered.

3. Results

3.1. Sociodemographic Aspects of the Patients

A total of 330 patients had received probabilistic antibiotic therapy. The male sex was the most represented with 53% or a sex ratio of 1.12. The following **Table 1** shows the distribution of patients in our study according to age groups.

Table 1. Distribution of patients by age group.

Age range	Staff	Percentage
<20	123	37.3%
[20 - 40]	138	42%
[40 - 60]	55	16.7%
>60	14	4%
Total	330	100%

The age range of 20 to 40 years was the most represented (42%). The average age of the patients was 33 ± 14 years. The majority of patients worked in the informal sector (49%). More than half of the patients lived in urban areas (56.36%).

3.2. Clinical Aspects

The history of our patients is presented by HIV infection found in 15% of patients, hypertension in 5%, sickle cell disease in 2%, diabetes (1%) and hepatitis B (1%). Clinically, the majority of patients (57%) had a poor general condition on admission to the infectious diseases department. The reasons for consultation

were dominated by fever, alteration of general condition, neurological disorders (headache, consciousness disorders, convulsions), digestive disorders (vomiting, diarrhea, abdominal pain), respiratory signs (dyspnea, chest pain, cough), urinary signs (dysuria, pollakiuria and micturitional burning) and diffuse pain. The physical examination showed that 48.1% of the patients had meningeal irritation syndrome, 10% had convulsions and 10% had focal signs, trismus was present in 4% of the patients and facial paralysis in 3%. In the digestive system, hepatomegaly was present in 29% of patients and digestive candidiasis in 31%. Respiratory examination showed crepitus and fluid effusion syndrome in 26.83% and 20.62% of patients respectively.

3.3. Presumptive Diagnosis

The presumptive diagnosis was dominated by meningitis, salmonellosis, and pneumonia as illustrated in **Table 2**.

Table 2. Distribution of patients by presumptive diagnosis.

Presumptive diagnosis	Staff	Percentage
Meningitis	159	48.1
Salmonellosis	47	14.2
bronchopneumonia with banal germs	44	13.3
Pulmonary tuberculosis	43	13
Urinary tract infections	19	6
Cerebral toxoplasmosis	7	2.1
Pneumocystis	6	1.8
Intestinal amoebiasis	5	1.5
Total	330	100

3.4. Therapeutic Aspects

In our study, 67% of patients had received probabilistic antibiotic therapy. Beta-lactam was the most used antibiotic family (51.28%) in probabilistic antibiotic therapy. The most prescribed molecule was ceftriaxone (38.61%). Aminositides were the second most prescribed antibiotic family (14.05%) with gentamicin being the most prescribed (13.26%). Quinolones were the 3rd most prescribed (11.48%) with mainly ciprofloxacin being prescribed. **Table 3** shows the distribution of antibiotics used by class.

Table 3. Frequency of prescription of molecules by antibiotic family in probabilistic treatment.

Classes of antibiotics	Molecules and % compared to other antibiotics	Dosage/24 H	Way	Staff	% compared to other antibiotic classes
BÊTA-LACTAMINES	Ceftriaxone (38.61%)	50 - 150 mg/kg.	IV	195	51.28%
	Ampicilline (5.94%)	50 - 300 mg/kg.	IV/IM	30	
	Amoxicillin clavulanic acid (5.14%)	2 g - 3 g.	IV/PO	26	

Continued

	Imipenem (1.58%)	3 g	IV	8	
AMINOSIDES	Gentamicine (13.26%)	3 - 5 mg/Kg	IV	67	14.1%
	Amikacin (0.79%)	15 - 30 mg/Kg	IV	4	
QUINOLONE	Ciprofloxacin (11.48%)		IV/PO	58	11.48%
IMIDAZOLE	Metronidazole (10.29%)	20 - 40 mg/kg.	IV/PO	52	10.29%
ANTI-TUBERCULOSIS DRUGS	Rifampicins	Associated in 1 Cp.			
	Isoniazid	Single dose 2 to 5	PO	36	7.12%
	Pyrazinamide	Cp/day			
	Ethambutol (7.12%)				
SULFAMIDE	Cotrimoxazole (3.16%)	960 mg * 3;	PO	16	3.16%
GLYCOPEPTIDE	Vancomycine (2.57%)	60 mg/kg	IV	13	2.57%

Monotherapy was prescribed in 59% of patients. Dual therapy was prescribed in 23% of patients; the combination of ceftriaxone + gentamycin was the most commonly used (41%) for dual antibiotic therapy; triple therapy was prescribed in 10% of patients and the combination of ceftriaxone + metronidazole + gentamicine was the most commonly prescribed; quadruple therapy (Isoniazid, Ethambutol, Rifampicin, and Pyrazinamide) was prescribed in 8% of patients with tuberculosis.

The injectable route was mostly used for probabilistic antibiotic therapy (86% versus 15% for the oral route). The duration of probabilistic antibiotic therapy varied from 5 days to 30 days. The evolution under treatment was marked by the death of 50 patients, *i.e.* a lethality of 15% and 1.6% of patients were discharged against medical advice.

4. Discussion

Our study had limitations and constraints. Indeed, the sample of our study was not representative enough. Some files were not complete and other files were missing. Despite these limitations, our results give rise to some comments and discussions.

Infectious diseases are a frequent reason for hospitalization in the infectious diseases department of the Yalgado Ouédraogo University Hospital. They lead to probabilistic and sometimes inappropriate antibiotic prescriptions [6] [7] [8] with a high risk of emergence of resistant bacteria. In our study, 67% of prescriptions were probabilistic. This rate is comparable to those found by Kouanda and Fongang in Burkina and Mali respectively [6] [9] [10]. However, in the multicenter study by Michard *et al.*, lower rates of probabilistic antibiotic therapy were observed in Mauritania, Niger and Senegal [11]. In European series, this rate varied from 43% to 70% depending on the study [12] [13] [14]. The results of the studies mentioned above confirm, to varying degrees, the frequency of antibiotic prescription for treatment in hospitals [11] [15]. In our series, beta-lactams were the most prescribed. This can be explained by the high number

of cases of meningitis diagnosed during the epidemic periods that Burkina Faso has experienced. Indeed, during meningitis epidemics, the Burkina Faso government provided ceftriaxone free of charge for the management of cases. This justifies, among other things, the important use of this molecule. Other reasons for the frequent use of this molecule are its relatively affordable cost and accessibility [6]. Dual antibiotic therapy was the dominant prescription in our series as in the series of Fongang *et al.* [7]. The combination of ceftriaxone + gentamycin was the most prescribed combination in our series as in most African series [6] [7] [8]. However, in the study by Youl *et al.* ceftriaxone was frequently combined with metronidazole [4].

5. Conclusion

Antibiotic therapy is a common practice in the infectious diseases department of the Yalgado Ouédraogo University Hospital. Even if it improves the outcome of patients, it exposes to the selection of resistant mutants. Monitoring the efficacy of ceftriaxone, gentamicin and ciprofloxacin is essential given the extent of the prescription of these molecules for probabilistic treatment. This follow-up must also concern animals according to the “One Health” approach. To do this, it is important to improve the technical platform of laboratories.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Abdoul-Salam, O. (2016) Prevalence, Circulation and Characterization of Multi-drug-Resistant Bacteria in Burkina Faso. Human Medicine and Pathology. University of Montpellier, Montpellier. (In French)
- [2] McCaig, L.F., Besser, R.E. and Hughes, J.M. (2003) Prescriptions de médicaments antimicrobiens dans les établissements de soins ambulatoires, États-Unis, 1992-2000. *Emerging Infectious Diseases*, **9**, 432-437. <https://doi.org/10.3201/eid0904.020268>
- [3] Lautenbach, E., Larosa, L.A., Kasbekar, N., Peng, H.P., Maniglia, R.J. and Fishman, N.O. (2003) Utilisation des fluoroquinolones dans les services d'urgence des centres médicaux universitaires: Prévalence et facteurs de risque d'une utilisation inappropriée. *Archives of Internal Medicine*, **163**, 601-605. <https://doi.org/10.1001/archinte.163.5.601>
- [4] Fraser, A., Paul, M., Almanasreh, N., Tacconelli, E., Frank, U., Cauda, R., *et al.* (2006) Benefit of Appropriate Empirical Antibiotic Treatment: Thirty-Day Mortality and Duration of Hospital Stay. *The American Journal of Medicine*, **119**, 970-976. <https://doi.org/10.1016/j.amjmed.2006.03.034>
- [5] Montravers, P., Lumbroso, A. and Cargeac, A. (2004) Rational Probabilistic Antibiotic Therapy and Impact on Vital Prognosis. *AFAR*, **23**, 610-614. <https://doi.org/10.1016/j.annfar.2004.05.005>
- [6] Youl, E., Gnoula, C. and Ouédraogo, M. (2014) Antibiotic Therapy at the Yalgado Ouédraogo University Hospital: Analysis of Ceftriaxone Prescription Practices.

Journal of Pharmaceutical and Biological Sciences, **15**, 12-22.

- [7] Badiagaa, S. and Gerbeaux, P. (2006) Antibiotherapy in the Emergency Department. *Réanimation*, **15**, 514-522. <https://doi.org/10.1016/j.reaurg.2006.10.005>
- [8] Sanou, I., Kam, K.L., Bationo, A.O., Traoré, A., Konaté, F., Dao, L., *et al.* (1997) Analysis of the Prescription of Antibiotics in the Pediatric Department of the Yalgado Ouédraogo National Hospital Center in Ouagadougou. Thesis, Faculty of Health Sciences, Ouagadougou.
- [9] Fongang, S. (2019) Probabilistic Antibiotic Therapy in the Department of Infectious Diseases of the CHU of Point "G". Thesis, University of Technical Sciences and Technologies, Bamako.
- [10] Kouanda, S. (1997) Practical Antibiotic Therapy at CHNYO: A Study of the Relationship between Prescribing Suspicion and Bacteriological Tests. <https://hdl.handle.net/20.500.12177/2396>
- [11] Michard, F. (1993) Action Programme on Essential Drugs and Vaccines. Antibiotic Prescriptions in Three West African Countries: Mauritania, Niger and Senegal. World Health Organization, Geneva. <https://apps.who.int/iris/handle/10665/61528>
- [12] Masson, E. (2005) Contribution of a Systematic Infectious Diseases Consultation to the Control of Antibiotic Therapy in the ICU. *EM-Consulte*, **14**, 281-287.
- [13] Veber, B. (2008) Conduct of Probabilistic Antibiotic Therapy. *The Practitioner in Anesthesia Resuscitation*, **12**, 78-84. <https://doi.org/10.1016/j.pratan.2008.03.005>
- [14] Porcheret, H., Barraud, D., Bingen, M., Rabenja, T., Costa, Y., Estève, V., *et al.* (2010) Empirical Anti-Infectives in the First 24-48 Hours of Bacteraemia in Patients Hospitalized in the Hospitals of the Ile-de-France Group of Microbiologists in 2007. *Pathologie Biologie*, **58**, 7-14. <https://doi.org/10.1016/j.patbio.2009.08.001>
- [15] Ammor, A. (2012) Bibliographic Study on the Emergence and Emergence Factors of Infectious Diseases over the Last 20 Years. Thesis, Cheikh Anta Diop University, Dakar.