**Original Research Article**

**Descriptive study of antibiotic prescribing among patients hospitalized in the** **Department of Medicine and Medical Specialties at the Centre Hospitalier Universitaire Yalgado Ouédraogo, Ouagadougou, Burkina Faso**

**ABSTRACT**

**Introduction**: Inappropriate antibiotic prescribing contributes to antibiotic resistance, a major public health issue, particularly in countries with limited resources. The aim of this study was to analyze the practice of antibiotherapy in the various department of medicine and medical specialties at the University Hospital Center Yalgado Ouedraogo (CHU-YO).

**Methods**: This was a descriptive cross-sectional study with retrospective data collection. It took place from January 1 to March 31, 2021 in the Department of Medicine and Medical Specialties of the CHU-YO.

**Results**: A total of five hundred and six patients were included. The prevalence of antibiotic prescription was 48.2%. Among patients taking antibiotics, 61.1% had received monotherapy. The most commonly prescribed antibiotics were beta-lactams (70.1%), particularly Amoxicillin + Clavulanic Acid (39.1%). The intravenous route was the most commonly used (79.6%). The average duration of administration was 5 days. Lower respiratory infections were the main indications for prescribing antibiotics. Antibiotic therapy was probabilistic in 96% of cases.

**Conclusion**: The drafting of therapeutic protocols and antibiotic decision trees could help improve the appropriateness of antibiotic use at CHU-YO.

**Key words**: Compliance - antibiotherapy - medicine – resistance

**INTRODUCTION**

Antibiotic resistance (AMR) has become a real public health problem. The World Health Organization (WHO) has declared it to be one of the top ten global public health threats facing mankind [1]. The causes of the emergence and spread of bacterial resistance are manifold; however, excessive or inappropriate use of antibiotics is the key determinant [2].

In developing countries, antibiotics are often dispensed without prescription, and there is a lack of standardized treatment guidelines [3]. Like other developing countries, Burkina Faso has a high incidence of inappropriate antibiotic prescribing [4]. Ouédraogo A. at CHU- Souro SANOU (Bobo Dioulasso) found 53.7% of prescriptions to be inappropriate [5]. A study carried out at the Centre Hospitalier Universitaire Yalgado Ouédraogo (CHU-YO) in four wards in 2017 reported an average rate of inappropriate antibiotic prescribing in 29.5% [6]. In only 15.3% of cases was a bacteriological examination requested before antibiotherapy was instituted [6]. Rationalizing antibiotic prescribing is therefore a necessity in our healthcare centers.

In our country, efforts have been made with the availability of a guide to good antibiotic prescribing and training courses in antibiotics and antibiotherapy [7]. However, evaluations of ~~medical practices~~ antibiotics prescribing practices are rarely carried out in healthcare ~~establishments~~ settings in developing countries. This study aimed to evaluate the antibiotics prescribing practices in the various department of medicine and medical specialties at the CHU-YO. It would ultimately contribute to the outcome of the management of bacterial infections and combat antibiotic resistance in Burkina Faso.

**METHODOLOGY**

The study took place in the Department of Medicine and Medical Specialities at the CHU-YO. It is one of the reference centers for adult medical pathologies in the city of Ouagadougou and the surrounding localities and regions. The department includes a number of services: medical emergencies, pneumo-phthisiology, hepato-gastro-enterology, nephrology and haemodialysis, cardiology, internal medicine, infectious diseases, neurology, psychiatry, dermatology and venereology, and clinical haematology.

This was a cross-sectional study from retrospective data collection that ran from January 1 to March 31, 2021. This study involved all inpatients hospitalised in the various wards of the stated departments.. Thus, our sampling was comprehensive, taking into account the following inclusion criteria: patients hospitalised during the study period who had received oral or parenteral antibiotic therapy from the medical record. Antibiotic use was assessed according to: the guide to good antibiotic prescribing in Burkina Faso [7] and the recommendations of the French-language infectious pathology society (SPILF) [8]. It was justified if the prescription was based on the antibiotics guideline: the administration of an antibiotic, and theappropriateness for the indication if the antibiotic prescribed was on the list of antibiotics recommended for that infection. It was considered compliant if the dosage, route of administration and duration of treatment complied with the recommendations.

Data were collected through a literature review of patient records and hospitalisation registers, entered into the koboCollect software and analysed using EPI info software version 7.2.4.0.

The anonymity and confidentiality of personal data were preserved during data collection. Authorisation for data collection was obtained from the management of the CHU-YO, and we obtained the agreement of the various heads of the department concerned.

**RESULTS**

**Frequency of antibiotic prescriptions**

A total of 1049 patients were hospitalised in the Department of Medicine and Medical Specialties during the study period. Of these, 506 received at least one antibiotic prescription, giving an overall prevalence rate of 48.2%. The emergency medicine, pneumology and dermatology departments had 85%, 77.2% and 60% antibiotic prevalence rate respectively. Table I shows the frequency of prescriptions by department.

**Sociodemographic characteristics**

The mean age of the patients was 51 ± 19.76 years, with extremes of 15 and 90 years. The sex ratio was 1.5 in favour of males (59.9%). Patients living in Ouagadougou and outside Ouagadougou accounted for 63% and 37% respectively. Of the patients receiving antibiotics, 172 (33.2%) were housewives, 155 (30.6%) farmers and 71 (14%) shopkeepers.

**Antibiotic prescription**

Of the 506 patients receiving antibiotics, 61.1%, 31.2% and 7.7% were on monotherapy, dual therapy and triple therapy respectively. Antibiotics were administered intravenously in 79.6% of cases and orally in 20.4%. The average duration of antibiotic administration was 3 ± 1 days, with a minimum of 1 day and a maximum of 180 days. A total of 797 prescriptions were made, with the beta-lactam, imidazole and macrolide families accounting for 70.1%, 11.5% and 5.8% respectively of the antibiotics prescribed. Amoxicillin + clavulanic acid, ceftriaxone and metronidazole accounted for 39.1%, 29% and 12% of antibiotics prescribed respectively. Table II gives the breakdown according to the antibiotics received.

**Indications**

Antibiotherapy was probabilistic in 96% (n=486) of patients. Lower respiratory infections were the main indications for antibiotic prescription (50.8%) (table III). No indication was found in 21.8% of cases. Bacteriological samples were taken in 33 patients (6.5%). Of these patients, 11 (33.3%) had a positive culture. *Mycobacterium tuberculosis, Escherichia coli* and *Staphylococcus aureus* were isolated in 36.36%, 18.2% and 18.2% of cases respectively (table IV).

**Compliance**

Ninety-three percent (93%) of patients receiving antibiotics received antibiotic therapy without the advice of a specialist on antibiotic therapy. In our study, 158 patients (31.2%) received antibiotic therapy in compliance with recommendations. Antibiotic therapy was justified in 395 (78.1%) patients. The duration and route of administration were incorrect in 68.8% and 46.3% of patients respectively. Antibiotic dosage was incorrect in 3.4% of cases (table V).

**DISCUSSION**

This study evaluated the use of antibiotics in the Department of Medicine and Medical Subspecialties at the CHU-YO. However, its cross-sectional nature limits the conclusions on patient outcomes according to the antibiotic regimens used.

**Frequency of antibiotic prescriptions**

The overall prevalence of antibiotic prescribing was 48.2% in our study. In 2010, Ouédraogo reported an average antibiotic prescribing rate of 75.27% in a study conducted in four wards at the CHU-YO [9]. Patry et al [10] in France and Diallo et al [11] in Senegal found rates of 29.1% and 12.5% respectively. This high prevalence of antibiotic prescribing could be explained, on the one hand, by the high prevalence of infectious diseases in our context and, on the other hand, by misuse and/or overuse in certain departments. An analysis of ceftriaxone prescriptions at the CHU-YO found that 29.5% of prescriptions were inappropriate [12]. The medical emergency department alone accounted for 70.8% of patients treated with antibiotics. As the gateway to specialised services, this department records a high level of use of these treatments. These results suggest either a high prevalence of bacterial infections among those admitted, or inappropriate prescription of antibiotics for non-bacterial infections. Hence the importance of having certain rapid diagnostic tests for bacterial infections, certain referral tests such as procalcitonin, and a full-time laboratory for the aetiological diagnosis of bacterial infections.

**Antibiotic prescriptions**

In our study, probabilistic antibiotherapy accounted for 96% of prescriptions. Our results are similar to those of Diallo et al [11] in 2012 in Senegal, who found 98.6% of probabilistic treatment. This high antibiotic prescription rate can be explained by the status of the university hospital as a last-resort facility where patients often arrive in a critical condition. This necessitates rapid antibiotic treatment when indicated, ideally after sampling. In addition, the lack of access to certain aetiological tests within the optimum timeframe, and the financial constraints of some patients, mean that frequent recourse is made to probabilistic treatments. However, healthcare workers should take care to respect the rules and principles of good practice in probabilistic antibiotherapy, and always take bacteriological samples where necessary and possible.

Among the classes of antibiotics prescribed, beta-lactam antibiotics predominated (70.1%). Our results are similar to those of Koanda S., who found 71% [13]. The broad spectrum of betalactam antibiotics may explain the preference for their prescription. Amoxicillin + clavulanic acid (39.1%) and ceftriaxone (29%) were the most commonly prescribed antibiotics. Anass Elbouti et al. found that 31.4% of prescriptions were for amoxicillin/clavulanic acid and 8.6% for ceftriaxone [14]. Ouédraogo et al. in 2010 in Burkina Faso found that 48.32% of patients prescribed ceftriaxone [5]. The use of ceftriaxone in our patients could be explained by its broader antibacterial spectrum, its wide distribution and its very low cost compared with other antibiotics, making it more accessible to all social classes. The non-existence or inadequacy of health insurance and mutual insurance means that the cost of treatment is paid directly by patients themselves. The unfavourable socio-economic context demands efficiency in the prescription of antibiotics. The use of these antibiotics in our health center must be properly supervised to avoid the emergence of resistant strains of bacteria.

**Indication**

Lower respiratory infections, in particular acute community-acquired pneumonia, were the main indications for antibiotic prescription (50.8%). Results similar to ours were found by Diallo M et al (60.7%) and de Porgo S et al (78.4%) [11,15]. On the other hand, Gault et al [16] in France and Dia N et al [17] in Senegal reported a rate of 10.5% and 28.3% of respiratory infections respectively. Our results may reflect a high frequency of respiratory infections in hospitals, possibly due to environmental factors (exposure to air pollution) or to a loss of immunity in patients of advanced age. Advanced age is one of the factors increasing the risk of occurrence and/or severity of pneumopathy. Respiratory infections are the primary site of community-acquired bacterial infection, and their treatment is well codified [16]. Given their importance in our hospitals, healthcare workers must be familiar with their medical management. To this end, protocols for their management must be made available in health centres; this could contribute to the proper use of antibiotics and the fight against antimicrobial resistance in our country.

In our study, only 6.5% of patients had bacteriological samples taken during their hospital stay. Youl et al. found that 15.3% of patients had bacteriological samples taken [12]. This low percentage in our study could be explained, on the one hand, by the effective use of empiric antibiotic therapy in the majority of patients, and on the other hand, by the fact that during data collection, in most of the files the indications for bacteriological sampling were not mentioned and the paraclinical data were not included.

**Duration of administration**

The average duration of administration was 3 days, with extremes of 1 and 180 days. Youl et al. found an average duration of 6.5 days, with extremes of 1 and 32 days [12]. The extremes of 180 days found in our study could be explained by the fact that the management of certain respiratory and cardiac pathologies requires a long duration of treatment, in particular tuberculosis and infective endocarditis. Failure to comply with treatment times could have a considerable economic impact, but could also contribute to the selection of resistant strains of bacteria. Healthcare workers need to be familiar with and master the treatment protocol for different diseases. The use of treatment guidelines and therapeutic protocols, and the contribution of therapeutic committees, could help to improve the proper use of antibiotics and combat antimicrobial resistance.

**Compliance**

In the course of our study, 348 patients received antibiotic therapy that did not comply with the recommendations, i.e. 68.7% non-compliance rate. Koné D in Mali found that 68.3% of antibiotic treatments did not comply with national and/or international recommendations [18]. On the other hand, in Congo, Senga P et al. found that 18.2% of antibiotic therapy was abusive [19]. Non-compliance was linked to antibiotic prescriptions for non-infectious conditions (21.9%). Some patients whose diagnosis and/or clinico-biological presentation did not point to an infectious pathology or bacterial aetiology were systematically given antibiotics in addition to their aetiological or specific treatment. Reasoning or gymnastics in antibiotherapy forms the basis of probabilistic antibiotic therapy. Non-compliance related to dosage (3.4%) consisted essentially of insufficient or high doses of antibiotics that did not correspond to the dosage for treatment of the pathologies indicated.

Non-compliance with the route of administration (46.3%) and the duration of treatment (68.7%) accounted for 46.3% and 68.7% respectively. The causes of non-compliance with ATB prescriptions were dominated by inappropriate duration of administration. Some antibiotics, such as amoxicillin/clavulanic acid, were administered for very short periods, while others, such as metronidazole and gentamicin, were administered for too long. Our results are similar to those of Talaam et al. who reported 45.9% of inappropriate duration [20]. Referring physicians or biologists in antibiotherapy should be consulted if possible for antibiotic prescriptions in our university hospitals, a structure where hospitalised patients have already received unsuccessful treatments in peripheral health centers. In addition, the establishment or effective operation of therapeutic committees and interdisciplinary collaboration will help to improve the rational and efficient use of antibiotics in order to contribute to the fight against antimicrobial resistance.

**CONCLUSION**

In order to improve compliance in the use of antibiotics at the Yalgado Ouédraogo University Hospital, more sustained action, such as serial assessment of the need for antibiotics, and the development of local antibiotic guidelines, could contribute to the rational use of antibiotics as a means of combating antimicrobial resistance.

**CONSENT AND ETHICAL APPROVAL**

The anonymity and confidentiality of personal data were preserved during data collection. Authorisation for data collection was obtained from the management of the CHU-YO, and we obtained the agreement of the various heads of the department concerned.

**COMPETING INTERESTS DISCLAIMER:**

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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Table 1: Antibiotic prescription frequency by department

|  |  |  |  |
| --- | --- | --- | --- |
| **Departments** | **Inpatients** | **Patients on antibiotics** | **Prevalence (%)** |
| Medical emergencies | 421 | 358 | 85.0 |
| Pneumology | 79 | 61 | 77.2 |
| Dermatology | 15 | 9 | 60.0 |
| Infectious diseases | 21 | 12 | 57.1 |
| Hepato-gastroenterology | 53 | 23 | 43.4 |
| Cardiology | 163 | 19 | 11.6 |
| Nephrology | 177 | 9 | 5.1 |
| Internal medicine | 37 | 8 | 21.6 |
| Neurology | 83 | 7 | 8.43 |
| **Total** | **1049** | **506** | **48.2** |

Table 2: Distribution of patients according to antibiotics

|  |  |  |
| --- | --- | --- |
| **Antibiotics** | **Effective** | **Percentage (%)** |
| Amoxicillin + Clavulanic Acid | 312 | 39.1 |
| Ceftriaxone | 230 | 29.0 |
| Metronidazole | 94 | 12.0 |
| Azithromycin | 44 | 5.6 |
| Gentamicin | 30 | 3.7 |
| Ciprofloxacin | 22 | 3.0 |
| RHZE\* | 18 | 2.3 |
| Cefixime | 14 | 1.8 |
| Cotrimoxazole | 12 | 1.5 |
| Norfloxacin | 11 | 1.3 |
| Rifamycin | 4 | 0.5 |
| Piperacillin+Tazobactam | 2 | 0.2 |
| Clarithromycin | 2 | 0.2 |
| Levofloxacin | 2 | 0.2 |

\* Rifampicin, Isoniazid, Pirazinamide, Ethambutol

Table 3: Distribution of patients treated with antibiotics by indication.

|  |  |  |
| --- | --- | --- |
| **Indications for antibiotics** | **Effective** | **Percentage (%)** |
| Lower respiratory infections | 257 | 50.8 |
| No indication | 111 | 21.9 |
| Digestive infections | 55 | 10.9 |
| Sepsis | 18 | 3.6 |
| Urinary tract infections | 16 | 3.2 |
| Skin infections | 16 | 3.2 |
| Cerebro-meningeal infections | 11 | 2.2 |
| ENT and upper respiratory infections | 7 | 1.4 |
| Heart infections | 7 | 1.4 |
| Osteo-articular infections | 6 | 1.2 |
| Envenimation | 2 | 0.4 |
| **Total** | **506** | 100 |

Table 4: Distribution according to germs isolated

|  |  |  |
| --- | --- | --- |
| **Isolated bacteria** | **Effective** | **Percentage (%)** |
| *Mycobacterium tuberculosis* | 4 | 36.4 |
| *Escherichia coli* | 2 | 18.2 |
| *Staphylococcus aureus* | 2 | 18.2 |
| *Klebsiella pneumoniae* | 1 | 9.1 |
| *Staphylococcus sp* | 1 | 9.1 |
| *Enterobacter cloacae* | 1 | 9.1 |
| **Total** | 11 | 100 |

Table 5: Distribution according to compliance criteria

|  |  |  |
| --- | --- | --- |
| Compliance criteria | Effective | Percentage (%) |
| Non-infectious diseases | 111 | 21.9 |
| Choice of antibiotic | 102 | 12.8 |
| Dosage compliance | 27 | 3.4 |
| Route of administration | 369 | 46.3 |
| Duration of administration | 548 | 68.8 |