



A Cross-Sectional Study of Cephalosporin Prescriptions for the Treatment of Respiratory and Urinary Tract Infections in Two Sudanese Hospitals



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Abstract

Cephalosporins representing a wide variety of β -lactam antibiotics. Cephalosporins have some desirable features, including a convenience of administration, a reasonably broad spectrum of efficacy and a low incidence of toxicity. A descriptive cross-sectional study on the usage of cephalosporin for the treatment of respiratory tract infections (RTI) and urinary tract infections (UTI) was conducted at Ibsinaa and Alshaab Hospitals in Khartoum state. The data were acquired via questionnaires sent to doctors and community pharmacists, as well as 48 patient files with UTI and RTI diagnoses. SPSS was used to examine the data. The study's findings indicated that 90% of physicians and pharmacists do not follow cephalosporin prescription and dispensing recommendations. 73% of cephalosporins (3rd generation) are used to treat UTI, whereas 54% of cephalosporins (2nd generation) are used to treat RTI. At conclusion, the findings of this research reveal that the use of cephalosporin in these hospitals is often inconsistent with accepted therapeutic principles. To prevent the emergence of cephalosporin-resistant pathogens, healthcare providers should be cautious when prescribing antibiotics and remain current on recommended antibiotic practices and dosages.

Keywords: Antibiotics; Cephalosporin; UTI; RTI; Infections; Sudan

Introduction

Infectious diseases were a major cause of morbidity and death before to the turn of the twentieth century. Even in the industrialized world, the average life expectancy at birth for men and women was 46 and 48 years, respectively. Plaque, diphtheria, smallpox, pneumonia, cholera, typhoid fever, syphilis, tuberculosis, typhus, and other contagious illnesses were common [1]. Alexander Flemming's discovery of the first antibiotic (penicillin) in 1928 revolutionized medicine and saved millions of lives [2]. Following the end of Second World War, the golden era of antibiotic discovery began. From the 1950s until the 1970s, dozens new antibiotics were discovered each year, and they revolutionized medicine. Without antibiotics, routine treatments

such as open-heart surgery, chemotherapy for cancer patients with compromised immune systems, and organ transplantation would be impossible [3-5]. However, bacteria quickly evolved resistance to antibiotics, and the frequency of infections caused by multidrug-resistant bacteria is growing globally. Since the turn of the twenty-first century, the threat of untreatable diseases has loomed [6,7].

Cephalosporins were not discovered by chance. World War II needs pushed the quest for antibiotics generated by microorganisms [8]. Cephalosporins are antibiotics with a beta-lactam ring that are derived from the Acremonium fungus, commonly known as cephalosporium, this important antibiotic

is widely used against bacteria in a variety of serious diseases, including respiratory tract infection (RTI), skin infection, and urinary tract infection (UTI) [9]. Cephalosporins currently come in five generations. With the development of fifth generation cephalosporins, infection management has become even more difficult. However, their use must be strictly limited because if bacteria develop resistance to the fifth generation cephalosporins, infection management will become very difficult [10]. Over the last few decades, the rise and spread of beta-lactam resistance in nosocomial Enterobacteriaceae, *Acinetobacter baumannii*, and *Pseudomonas aeruginosa*, has become a major global concern. Particularly concerning is the rising resistance to third- and fourth generation cephalosporins [11].

Antibiotics are widely utilized in Sudan, and the majority of hospitals in the country rely heavily on cephalosporin antibiotics, especially in surgical departments, as the preferred option for prophylaxis [12]. Accordingly, the current study aimed to evaluate use of cephalosporin in the treatment of respiratory and urinary tract infections in two Sudanese hospitals (Ibnsinaa and Alshaab Hospitals).

Methodology

Study design

This study used a descriptive cross-sectional survey to confirm and/or refute assumptions about the attitudes of health professionals in two hospitals in Khartoum that treat patients with UTI and RTI with cephalosporins, as well as to evaluate the results in order to comprehend and resolve the study's issue.

Study area

The study took place in two hospitals in Khartoum, Sudan's capital: Ibnsinaa and Alshaab Hospitals in the state of Khartoum.

Study duration

Two months, between May and July 2018, the surveys were performed utilizing a questionnaire to gather data.

Data collection

The sample size was chosen to be 96 prior to completing the survey. The questionnaire was anonymous. It elicited data on cephalosporins administered for UTI and RTI under treatment recommendations, the Protocol for Dispensing Cephalosporin, the Mode of Prescription, the Common Cephalosporin Used to Manage UTI and RTI, and Counseling Patients About Drugs.

Ethical approval statement

The research used a cross-sectional design. The study protocol was authorized by the ethical committee at Alneelain University's Faculty of Pharmacy in Khartoum, Sudan, in accordance with the Helsinki Declaration for the conduct of human experimentation. Each participant completed an informed permission form after receiving a thorough verbal summary of the process.

Statistical analysis

The statistical analyses were performed, classified, and analyzed using SPSS. The descriptive data and results were presented using tables and figures. To compare and correlate variables, the chi-square test was utilized.

Results and Discussion

Cross-sectional studies often enable researchers to gather a large amount of data fast. Self-report questionnaires are often used to acquire data affordably. However, causal correlations might be difficult to deduce from cross-sectional data [13].

According to our current study, numerous significant facts were discovered throughout the present cross-sectional investigation. As seen in (Table 1), the protocol for treating RTI and UTI infections at the respective institutions which should be followed by healthcare providers. Clinical guidelines are gaining popularity as a tool for clinicians to use to influence their practice. No guideline, however, can be sufficiently detailed to apply to all clinical circumstances [14].

Table 1: RTI and UTI treatment protocols.

RTI	Treatment	UTI	Treatment
Pneumonia	Ceftriaxone and cefuroxime	TURP	Ceftazidime
Asthma	Ceftriaxone	Right upper ureter stones	Ceftazidime Ceftriaxone
Lung abscess	Cefuroxime	Left nonfunctioning kidney stone	Ceftazidime
COPD	Cefuroxime	Ureter stricture (VIU)	Cefpodoxime-proxitel
TB	Cefuroxime	Obstructive urepathy (pelvic mass)	Ceftriaxone

Additionally, 90 % of healthcare personnel (physicians and pharmacists) at these two hospitals do not adhere to cephalosporin prescription and dispensing guidelines (Table 2). These intriguing results highlight a global concern, especially in developing countries where antibiotic stewardship is poor. Regrettably, the irrational use of antibiotics in Sudan is well-documented [15,16]. According to previously published data, even developing countries with a better health situation than Sudan, a significant

amount of antibiotics is provided without a prescription, and a large percentage of antibiotics supplied are unsuitable for the illnesses being treated [17]. The WHO acknowledged irrational antibiotic usage as a significant role in the development of antimicrobial resistance in its two publications, 'Global Strategy for Antimicrobial Resistance Containment' and 'The Pursuit of Responsible Medicines' and therefore, health authorities in developing countries should tackle this concern [18].

Table 2: Protocol for Dispensing Cephalosporin.

Question	Answer	Frequency	Percent
Do you adhere to the certified Cephalosporin Dispensing Protocol?	Yes	5	10%
	No	43	90%
Total		48	100%

In our study, as shown in (Figure 1-3), 90 % of healthcare providers at these hospitals did not follow specific manner in prescription of cephalosporins for UTI and RTI patients. 4% of participants prescribed first generation cephalosporins, 17% prescribed second generation, 73% prescribed third generation, and 6% prescribed other antibiotics, as shown in Figure 2 & 3. As a result, the third-generation cephalosporin is the most often used

antibiotic to treat urinary tract infections. Additionally, our survey found that 6% of respondents prescribed the first generation of cephalosporins to control RTI infections, 54% used the second generation, 31% used the third generation, and 8% used others, as shown in Figure 2 & 3. As a result, we discovered that second generation cephalosporins are effective in treating RTI infections in our investigation.

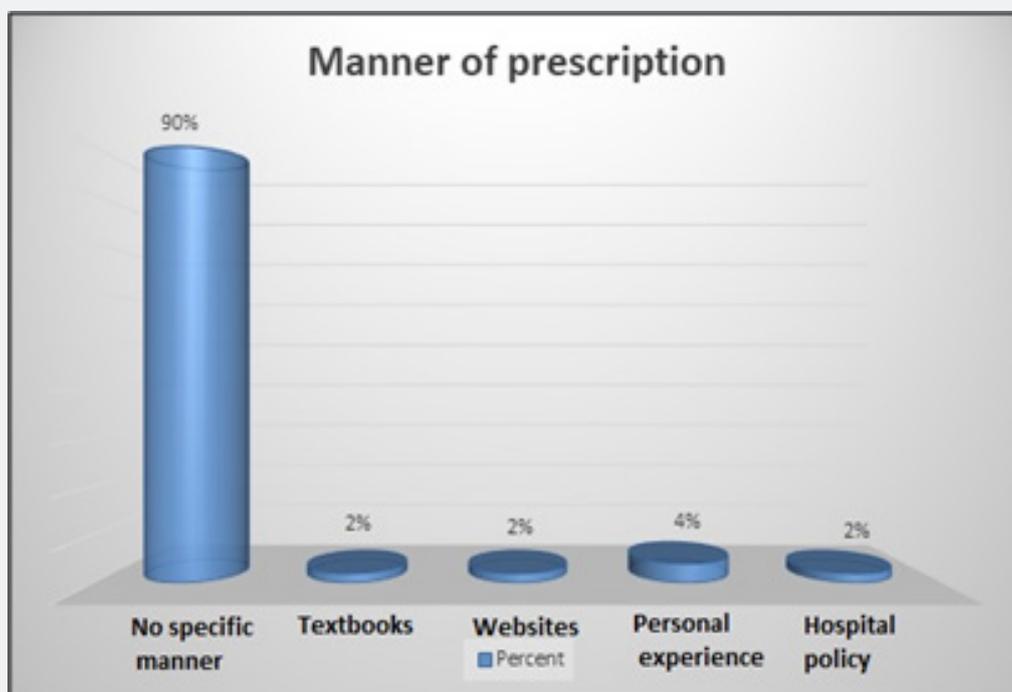


Figure 1: Manner of cephalosporins prescriptions.

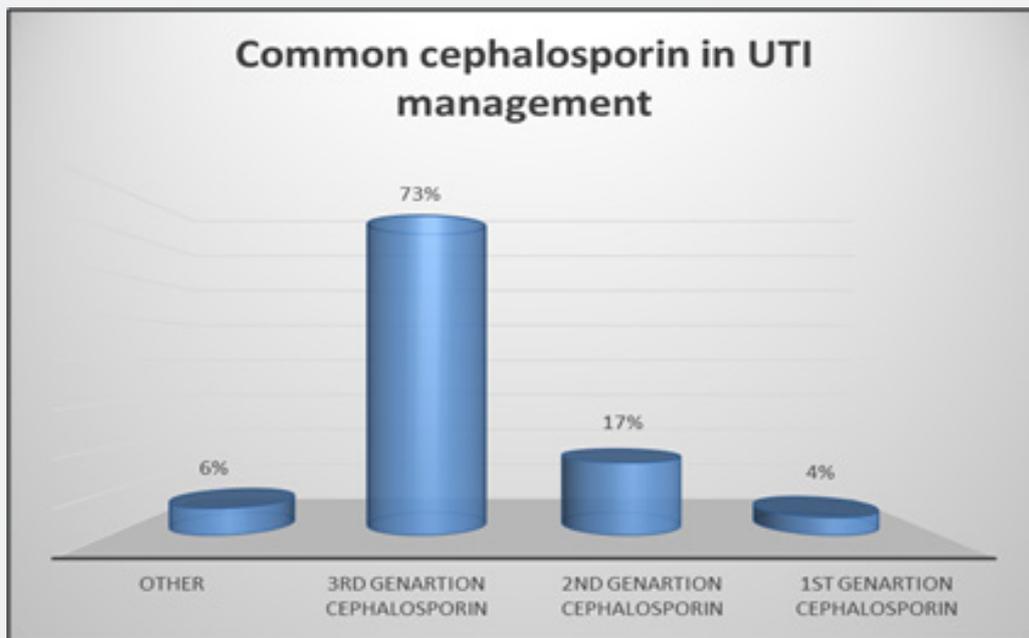


Figure 2: Common cephalosporin in UTI management.

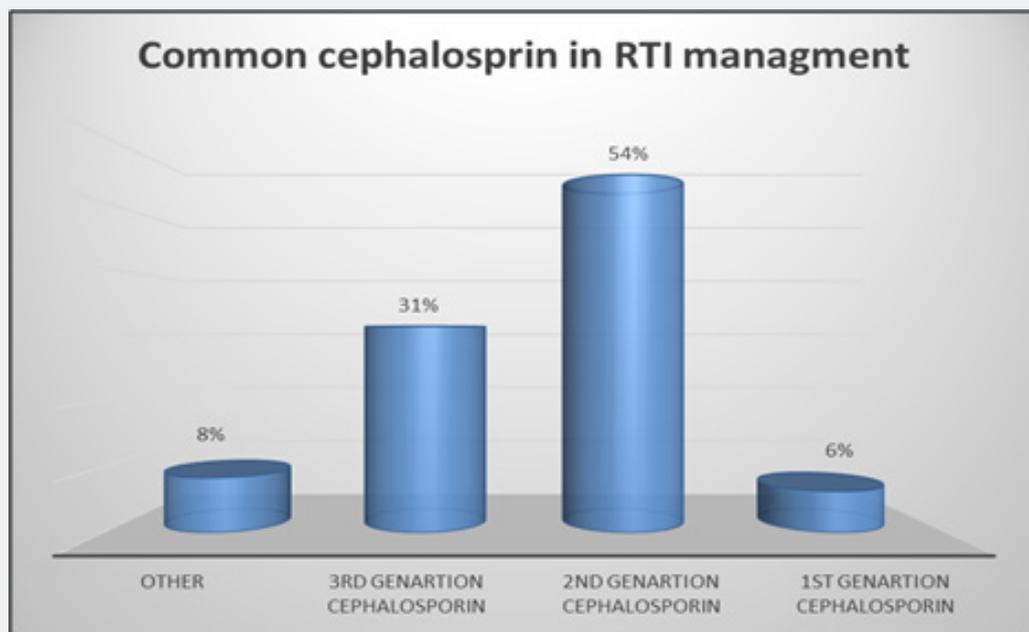


Figure 3: Common cephalosporin in RTI management.

Numerous clinics worldwide give cephalosporins to patients in excess of what is necessary and with an excess of extravagance that borders on abuse, necessitating medical monitoring and control to prevent the establishment of anti-cephalosporin infections [19,20]. Fortunately, several institutions have recognized the negative repercussions and created control procedures aimed at possibly limiting antibiotic usage and abuse [21]. These control

strategies must be implemented as soon as possible in developing countries such as Sudan, since some countries have reported infections and the rise of cephalosporin-resistant pathogens. For instance, *Acinetobacter baumannii* strains was detected highly resistant to cephalosporins and β -lactamases in Syria [22], In the United Kingdom, *Enterobacter cloacae* reported resistant to third generation cephalosporins [23], and *Klebsiella* infection

which was found resistant to late-generation cephalosporins in a nosocomial outbreak in the United States [24]. Finally, Effective antibiotic resistance prevention strategies are available and should be adopted aggressively in critical care units. These strategies fall into three categories: nonpharmacologic infection control, antibiotic management and increasing existing efforts to avoid antibacterial resistance, particularly given the expected future scarcity of novel antibacterial medication classes [25].

Limitation

We did not undertake a cohort study or follow-up since our sample size was modest and some Healthcare professionals were unwilling to cooperate.

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