

Investigating the pattern of antibiotic prescription in the emergency department of Baqiyatallah hospital

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Abstract

Introduction: Antibiotics are among the most commonly prescribed drugs today. Today, there are more than 100 different antibiotics, but they can be very dangerous if taken inappropriately. Improper use of antibiotics can lead to drug side effects, resistant microorganisms, and exorbitant economic costs. In order to achieve a reasonable dose of the drug used, it is necessary to use drugs with appropriate efficacy, while paying attention to the dose and duration of the drug. Currently, microbial resistance is a global problem, causing multidrug-resistant bacterial infections as well as the spread of resistant microorganisms. Given the importance of prescribing appropriate antibiotics and the importance of antibiotic testing in prescriptions by physicians, in this study we sought to determine the pattern of antibiotic use over a six-month period. The emergency physicians' use of the results of the antibiogram test was also evaluated, and the possible association of underlying diseases with their antibiotic use was assessed.

Methods: After preparing the proposal and the relevant questionnaires and after obtaining the necessary permits, the project was implemented in the emergency department of Baqiyatallah Hospital. Participants in the study were all patients receiving antibiotics who were admitted to the emergency department for at least 48 hours. The data and their information were completed in the questionnaire and after the end of the 6-month period, the data were statistically analyzed.

Results: The results of the study showed that the rate of E coli infection was the highest among the study participants. The results of the antibiogram test showed that the majority of people were sensitive to Nitrofurantoin, Levofloxacin and Metronidazole, while most people resisted Trimoxazole. The most commonly prescribed antibiotic in the emergency room was Ceftriaxone, followed by a combination of Vancomycin and Meropenem. There was no significant statistical relationship between antibiotic use and final diagnosis, and there was a statistically significant association between antibiotic use and underlying renal disease. In a higher percentage of cases (36.6%), the results of antibiogram testing in Baqiyatallah emergency room were not used during this 6-month period.

Conclusion: In general, the most antibiotics prescribed in the emergency room of Baqiyatallah Hospital during the 6-month study period were ceftriaxone. The types of antibiotics used in the emergency room included Meropenem, amikacin, ciprofloxacin, azithromycin, metronidazole, ceftriaxone, vancomycin, clindamycin, and levofloxacin. In a high percentage of cases, 36.6% of cases, antibiotics that prescribed were incorrect.

Keywords: Antibiotic, Prescription pattern, Emergency department, Baqiyatallah hospital

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Introduction

Paying attention to therapeutic drugs as one of the traditional methods in the treatment of patients is considered as one of the influential factors in ensuring the health of the society. Providing scientific and standard models for the prescription and rational use of drugs is the

responsibility of policy makers and health care providers¹. The role of the patient, doctor and pharmacist as the main elements influencing the prescription and consumption of medicine can be delayed². The mutual relationship between the doctor, the pharmacist and the patient

through the correct diagnosis of the disease and the selection and rational prescription and delivery of the correct medicine and its correct consumption due to the acquisition of knowledge about the correct prescription of the drug and also the social, economic and cultural background of the environment and the region. The number of factors They are influential in this field ³. The contents of the book are a document of the relationship between the doctor and the patient, which can show the state of correct and incorrect prescription and rational use of medicine in a society and country. According to the available statistics, the per capita consumption of drugs in our country is at a high level due to the prevailing culture and relative cheapness of drugs and is four times the world average ⁴. Antibiotic is a type of antimicrobial substance that is active against bacteria, the most important type of antibacterial substance to fight bacterial infections, and antibiotic drugs are widely used in the treatment and prevention of such infections ⁵. They may inhibit the growth of bacteria or kill bacteria. A limited number of antibiotics also have anti-protozoal activity ⁶. Antibiotics are not effective against viruses such as the common cold or flu. Sometimes, the term antibiotic - literally "against life", from the Greek roots "anti", "against" and βίος bios, "life" - is used broadly to refer to any substance that acts against microbes. But in common medical use, antibiotics (such as penicillin) are those that are naturally produced (produced by one microorganism fighting against another), while non-antibiotic antibacterial (such as sulfonamides and antiseptics) are completely synthetic ⁷. However, both classes have a similar purpose in killing or inhibiting the growth of microorganisms. "Antibacterial" include disinfectants, antibacterial soaps, and chemical disinfectants, while antibiotics are an important class of antibacterial used specifically in medicine and sometimes in food ⁸. Antibiotics have been used since ancient times. Antibiotics revolutionized medicine in the 20th century. Alexander Fleming discovered modern penicillin in 1928, which was widely used during wartime. However, the effectiveness and easy access to antibiotics have also led to their overuse and some bacteria have become resistant to them ⁹. The World Health Organization calls antimicrobial resistance a "serious threat" that is no longer a predictor of the future but is now occurring in all regions of the world and has the potential to affect anyone, of any age, in any country. Antibiotics are the most prescribed drugs among today's drugs. Antibiotics fight pathogens by killing microbes or stopping their reproduction ¹⁰. Penicillin was the first antibiotic that was

accidentally discovered from mold culture. Today, there are more than 100 different antibiotics that doctors use to treat minor ailments to life-threatening infections, but they can be very dangerous if used inappropriately. By knowing the importance of the right and wrong use of antibiotics, you can help your health and that of your family ¹¹. Although some antibiotics are effective against a wide variety of infections, it is important to know that not every antibiotic can cure all infections, and they are only used against infections caused by pathogenic bacteria, fungi, and parasites. Viral diseases such as colds and flu have no effect ¹². Antibiotics have revolutionized medical science, leading to the treatment of infections that were once quite fatal and protective processes that once seemed far-fetched. Their availability has created an assurance of health that was unknown to previous generations. This certainty, now confirmed, will be lost if resistance develops as antibiotics continue to grow, as they have in the past decade ¹³. Currently, microbial resistance is a global problem and causes multi-drug resistant bacterial infections and the spread of resistant microorganisms. The World Health Organization announced in 2007 that antibiotic resistance is one of the most important health threats in the current century. The irrational use of antibiotics has caused antibiotic resistance to become a health problem all over the world ¹⁴. Various measures have been taken to solve this problem. In 2011, the theme of the World Health Day: "Resistance to antimicrobial drugs was named a global threat" and on this occasion, the World Health Organization introduced a 6-part policy package to combat the spread of antimicrobial resistance ¹⁵. This shows the importance of the problem and the need to take serious measures in all population groups. Indiscriminate and incorrect use of antibiotics is the main reason for creating antibiotic resistance and reducing their effectiveness. After 70 years of producing antibiotic drugs, the society has been exposed to this problem ¹⁶. Unfortunately, antibiotics are one of the most common drugs used inappropriately, which, in addition to creating microbial resistance at the community level, causes heavy and unnecessary costs to be imposed on the patient and the countries' drug and treatment systems ¹⁷. The process of prescription and indiscriminate use of antibiotics is considered one of the most important problems of the medical society of the present era, and in addition to the direct impact on the health of the society, it is also worth considering from the economic point of view. The World Health Organization has named drug resistance against antibiotics as a major global threat ¹⁸. Antibiotic

resistance is increasing all over the world and has made the medical community face a problem. One of the important causes of the occurrence of antibiotic-resistant bacteria is the use of antibiotics, especially the inappropriate prescription of antibiotics has a significant contribution to the amount of inappropriate antibiotic prescription in this field ¹⁹. The rate of inappropriate antibiotic prescription has been reported from 40 to 91% in different studies. In the occurrence of antibiotic resistance, in addition to the unnecessary and abundant prescription of antibiotics in cases where there is no need to prescribe antibiotics, inappropriate selection of the type of antibiotic and also the inappropriate dose of antibiotics is also effective ²⁰. In previous studies, it has been reported that at least one out of every three hospitalized patients is treated with antibiotics, and at least half of the cases are unnecessary. In recent decades, the spread of resistant strains of staph aureus, pneumococci, enterococci, and Gram-negative rivers has been caused by the inappropriate use of antibiotics ²¹. Considering the importance of prescribing appropriate antibiotic drugs and the important place of antibiogram test in the prescription performed by treating doctors, we sought in this study to determine the pattern of antibiotic use in the emergency department of Baqiyatallah. In this way, to determine what kind of antibiotics and with what frequency were prescribed in the emergency room of Baqiyatallah. We also decided to evaluate the use of antibiogram test results by emergency physicians. Considering the fact that the patients under investigation who referred to the emergency room of Baqiyatallah were suffering from underlying diseases and also referred to the emergency room for other reasons, as well as the possible relationship between these diseases and the antibiotics they consumed.

Materials and Methods

The current study was prospective-cross-sectional. The statistical population included patients who were admitted to the emergency department for 48 hours and received antibiotics. After preparing the proposal and related questionnaires and after obtaining the approvals of the council and ethics committee, it was implemented in the emergency department of Baqiyatallah Hospital. 100 participants were included in the study, and informed consent was obtained from all of them. The data and their information were completed in the questionnaire and after completion (after 6 months) the data was analyzed in SPSS environment based on the variables by the Chi-square test.

Results

The average age of the study participants was 68.86 ± 14.66 , which ranged from the lowest age of 16 years to the highest age of 97 years. The average age of women was 70.81 ± 12.42 and the average age of men was 66.75 ± 16.63 years. According to the results presented in [table 1](#), the highest rate of bacterial infection among the study participants was E coli with 15%. Out of 100 study participants, 41 people had microbial infection, of which 30 cases were gram negative.

Table 1. Frequency distribution of microbial infection.

| Bacteria | Positive | Negative |
|----------------------|----------|----------|
| E coli | 15 (15%) | 85 (85%) |
| Enterococci | 10 (10%) | 90 (90%) |
| StaphylococcusAureus | 4 (4%) | 96 (96%) |
| Pseudomonas | 3 (3%) | 97 (97%) |
| Streptococci type B | 3 (3%) | 97 (97%) |
| Streptococci | 2 (2%) | 98 (98%) |
| Klebsiella | 2 (2%) | 98 (98%) |
| Acinetobacter | 1 (1%) | 99 (99%) |
| Micrococci | 1 (1%) | 99 (99%) |

Among the 100 participants in the study, the antibiogram test was performed for 41 patients, of which 34 had positive urine cultures and 6 had positive blood cultures. Among the antibiotics tested, the highest percentage of antibiotic resistance observed was related to Co resistance-Trimaxazole was in 68.3% of patients. The highest antibiotic sensitivity is also compared to Nitrofurantoin, Levofloxacin and Metronidazole for the same percentage of 75.6% of patients. The results are given in [table 2](#). Among the antibiotics used, only azithromycin is administered orally. As can be seen from [table 3](#), the most underlying disease observed among the study participants is diabetes with 42%. The results of the frequency distribution of received drugs can be seen in [table 4](#).

Table 2. Antibigram test results.

| Antibiogram Antibiotic | Sensitivity | Median | Resistant |
|---------------------------|-------------|----------|------------|
| Co-Trimaxazole | 13 (31.7%) | - | 28 (68.3%) |
| Tetracyclin | 14 (34.1%) | - | 27 (65.9%) |
| Ofloxacin | 14 (34.1%) | - | 27 (65.9%) |
| Gentamycin | 15 (36.6%) | - | 26 (63.4%) |
| Clindamycin | 16 (39%) | - | 25 (61%) |
| Piperacillin | 16 (39%) | - | 25 (61%) |
| Ciprofloxacin | 16 (39%) | - | 25 (61%) |
| Cefepime | 16 (39%) | - | 25 (61%) |
| Cefexime | 16 (39%) | - | 25 (61%) |
| Cefazolin | 17 (41.5%) | - | 41 (58.5%) |
| Oxacillin | 17 (41.5%) | - | 24 (58.5%) |
| Penicillin | 17 (41.5%) | - | 24 (58.5%) |
| Rifampin | 17 (41.5%) | - | 24 (58.5%) |
| Meropenem | 18 (43.9%) | - | 23 (56.1%) |
| Ampicillin | 18 (43.9%) | - | 23 (56.1%) |
| Cefotaxim | 18 (43.9%) | - | 23 (56.1%) |
| Ceftriaxone | 15 (36.6%) | 3 (7.3%) | 23 (56.1%) |
| Ceftazimibe | 17 (41.5%) | 2 (4.9%) | 22 (53.7%) |
| Vancomycin | 20 (48.8%) | - | 21 (51.2%) |
| Amikacin | 26 (36.4%) | 1 (2.4%) | 14 (34.1%) |
| Azithromycin | 27 (65.9%) | - | 14 (34.1%) |
| Imipenem | 29 (70.7%) | - | 12 (29.3%) |
| Levofloxacin | 31 (75.6%) | - | 10 (24.4%) |
| Metronidazol | 31 (75.6%) | - | 10 (24.4%) |
| Nitrofurantoin | 31 (75.6%) | 1 (2.4%) | 9 (22%) |

Table 3. Frequency distribution of underlying diseases.

| Underlying disease | Positive | Negative |
|------------------------|----------|----------|
| Diabetes | 42 (42%) | 58 (58%) |
| Blood pressure | 25 (25%) | 75 (75%) |
| Ischemic heart disease | 25 (25%) | 75 (75%) |
| Chronic kidney disease | 7 (7%) | 93 (93%) |
| ESRD | 6 (6%) | 94 (94%) |
| Cirrhosis | 3 (3%) | 97 (97%) |

Table 4. Frequency distribution of antibiotics received.

| Drug | Frequency |
|---------------------------------------|-----------|
| Ceftriaxon | 25 (25%) |
| Vancomycine/Meropenem | 14 (14%) |
| Azithromycin/Meropenem | 13 (13%) |
| Ceftriaxon/Azithromycin | 9 (9%) |
| Metronidazol/Ceftriaxone | 7 (7%) |
| Meropenem/Vancomycine/Ciproflouxacin | 6 (6%) |
| Clindamycin/Ceftriaxone | 5 (5%) |
| Meropenem/Ciproflouxacin | 4 (4%) |
| Meropenem/Clindamycin | 4 (4%) |
| Meropenem/Levofiuuxacin | 4 (4%) |
| Ciproflouxacin/Azithromycine/Amikacin | 3 (3%) |
| Meropenem/Amikacin | 2 (2%) |
| Amikacin/Ciproflouxacin | 2 (2%) |
| Amikacin/Metronidazol | 1 (1%) |
| Ceftriaxone/Ciproflouxacin | 1 (1%) |

Among the 100 study participants, the survival rate was 88%, which means that 88 of the study participants were alive after receiving the treatment and only 12 of them (12%) died. According to the statistical analysis conducted by the Chi-square test, it was found that the antibiotic used in the emergency room had no statistically significant relationship with the final diagnosed disease for the study participants (P-value=0.981). According to the statistical analysis conducted by the Chi-square test, it was found that the antibiotic used in the emergency room has a statistically significant relationship with the underlying disease of chronic kidney disease (CKD) (P-value=0.048). Antibiotic consumption did not show a statistically significant relationship with other underlying

diseases. According to the evaluation of the results, it was found that in 36.6% of cases, the results of the antibiogram test were not used in prescribing the drug, and in 34.1% of the cases, the test results were used. In 29.3% of cases, out of several prescribed antibiotics, some were prescribed according to the results of the antibiogram test and some were prescribed against the results of the antibiogram test. According to the analysis, none of the patients showed any side effects after receiving the prescribed antibiotics.

Discussion

According to the opinion of the World Health Organization, in order to achieve the rational use of drugs, it is necessary to use drugs with appropriate therapeutic effects that can solve the clinical needs of patients in a specific geographical area with the least complications and the least cost²². In addition, it is very important to pay attention to the dose and duration of drug use²³. Despite the fact that the prescription of antibiotics is necessary in most bacterial infections and its non-use threatens the patient's life, but most studies have shown that 30-60% of prescription cases were incorrect and inappropriate, and usually these mistakes are made by doctors, distributors, or self-medication. has taken place²⁴. Therefore, in this study, we sought to determine the pattern of antibiotic consumption in the emergency department of Baqiyatallah during six months. We also sought to achieve these goals by designing this study, determining the frequency of antibiotics used in the emergency room, determining the type of antibiotics used in the emergency room, determining the amount of use of antibiogram results in the emergency room, and determining the relationship between the antibiotic used in the emergency room and Sickness. In the present study, most of the participants were women. The average age of the participants was 68.86 ± 14.66 , and the average age of women was higher than that of men. According to the culture, the results of the investigations showed that the rate of infection with E coli was the highest rate of infection observed among the study participants. And after enterococci, it had the highest rate of infection. These results were calculated from among 41 patients whose culture was positive out of 100 patients studied. The results of the antibiogram test showed that the majority of people were sensitive to Nitrofurantoin, Levofloxacin and Metronidazole, while the majority of people were resistant to Trimoxazole. After that, the highest antibiotic resistance to Ofloxacin and Tetracycline was observed. The underlying diseases among the study participants, in the order of the highest percentage to the lowest, included diabetes, hypertension and IHD, chronic kidney disease, ESRD and finally cirrhosis. Most of the

participants in this study had a final diagnosis of UTI and then the highest percentage of people had Pneumonia. The pattern of emergency antibiotic use in the 6-month period of the present study included the following antibiotics: Meropenem, Amikacin, Ciprofloxacin, Azithromycin, Metronidazole, Ceftriaxone, Vancomycin, Clindamycin, Levofloxacin. The most prescribed antibiotic in the emergency room was Ceftriaxone, followed by the combination of Vancomycin and Meropenem. The results of the investigations showed that there was no statistically significant relationship between the antibiotic used and the final diagnosis of the disease. Data analysis showed that a statistically significant relationship was observed between antibiotic consumption and the underlying disease of chronic kidney disease, while no statistically significant relationship was observed in the case of other underlying diseases. After examining the use of antibiogram test results in the prescription of drugs, it was found that in a higher percentage of cases (36.6%), the antibiogram test results were not used in the emergency room of Baqiyatallah in this period of 6 months, and as a result, Antibiotic prescription was incorrect in 36.6% of cases. According to the obtained results, the main and partial objectives of this study were answered, which include determining the pattern of antibiotic consumption in the emergency room of Baqiyatallah during six months, determining the frequency of antibiotics used in the emergency room, determining the type of antibiotic used in the emergency room, determining the rate of use of antibiogram results in the emergency room, and determining the relationship between the antibiotic used and the disease. UTI and then pneumonia have the highest frequency of the final diagnosis of the emergency patients. Therefore, appropriate antibiotics in the treatment of UTI and then appropriate antibiotics in the treatment of pneumonia should have the highest frequency of antibiotics used. In choosing the type of antibiotic, one should take into account the effectiveness, spectrum of effect, sensitivity and resistance of the microorganism to the antibiotic, price, etc. A study was conducted by the refugee in 2013 with the aim of investigating the rationality of the antibiotic consumption pattern in a children's department. In this study, about 37% of cases of antibiotic use were incorrect, which is very high and significant considering the figure of 20% of incorrect use of antibiotics in industrialized countries. The most common antibiotic used was ceftriaxone. Despite sending different cultures from patients, 99% of antibiotic prescriptions were experimental and it seemed that sending cultures had no effect on choosing the type of antibiotic²⁵. The results of our study also showed that in 36.6% of cases, the prescription of antibiotics was incorrect, which is a very high and significant figure

compared to the figure of 20% of incorrect use of antibiotics in industrialized countries. Ceftriaxone was also the most commonly used antibiotic in this study. In 2009, a study was conducted by Karimi and his colleagues with the aim of determining the pattern of experimental antibiotic prescription in the emergency department of a teaching hospital. Ceftriaxone was the most common antibiotic prescribed with a frequency of 72.1%. 63.7% of the prescribed antibiotics were appropriate and 36.3% were inappropriate. In 15.8% of cases, antibiotic prescription was unnecessary. The drug dose was wrong in 6.8% and the drug administration method was wrong in 1.2% of the cases. In general, taking into account the mistake in the diagnosis of the indication, type of antibiotic, dose and method of drug administration, a total of 77 cases (40.52%) were made in the prescription of antibiotics. The results of this study showed that the inappropriate prescription of antibiotics. The experience in this center was more than expected for an academic hospital. It seems logical to take measures in the field of antibiotic prescription training ²⁶. The results of this study are completely in line with the results of the present study. In 2017, a study was conducted by Barati and his colleagues with the aim of determining the correct amount of antibiotics prescribed by general practitioners in the emergency department of Tawheed Hospital in Sanandaj. According to the results of this study, 11.18% of the patients who were prescribed antibiotics by the general physician did not need antibiotics according to the infectious disease specialist. The agreement and exact pharmaceutical similarity of the antibiotics prescribed (for a specific patient) by the general practitioner with the specialist physician was 7.8%. The average number of drugs prescribed by general practitioners and infectious disease specialist was 2.08 and 2.21, respectively. The most antibiotics prescribed by the infection specialist were spirofloxacin and azithromycin each with 13.3%, and by general practitioners, ciprofloxacin with 21.3% and cefixime with 12% ²⁷. In 2018, a study was conducted by Alavi Moghadam and his colleagues with the aim of investigating the pattern of experimental antibiotic prescription in one of the affiliated hospitals of Shahid Beheshti University. Among the 200 investigated cases in which at least one antibiotic was prescribed for the patient, in 108 patients (54.0%), the prescribed antibiotic did not have an indication, and out of 92 cases where the antibiotic was prescribed, in 55 cases (59.8, % of antibiotics were prescribed correctly (in terms of quantity, type and interval). The results of this study showed that the amount of antibiotics prescribed without indication and inappropriate choice of antibiotics in the emergency room of the study was high. It is necessary to train doctors and monitor the prescription of antibiotics ²⁸.

Conclusion

In general, it can be concluded that ceftriaxone was the most prescribed antibiotic in the emergency department of Baqiyatallah Hospital during the 6-month study period. The type of antibiotics used in the emergency room during this period included Meropenem, amikacin, ciprofloxacin, azithromycin, metronidazole, ceftriaxone, vancomycin, clindamycin, and levofloxacin. The pattern of antibiotic use in the emergency room had no statistically significant relationship with the type of disease diagnosed. Consumption pattern had a statistically significant relationship with chronic kidney disease among underlying diseases. In a high percentage of cases, i.e. 36.6% of cases, antibiotic prescription was done incorrectly, which is a very significant number and more than the figure of 20% which is related to incorrect antibiotic prescription in industrialized countries.

Highlights

What Is Already Known?

Antibiotics are among the most commonly prescribed drugs today, but they can be very dangerous if taken inappropriately. In order to achieve a reasonable dose of the drug used, it is necessary to use drugs with appropriate efficacy, while paying attention to the dose and duration of the drug.

What Does This Study Add?

Ceftriaxone was the most prescribed antibiotic in the emergency department. The pattern of antibiotic use in the emergency room had no statistically significant relationship with the type of disease diagnosed.

Authors' Contributions

All the authors meet the standard authorship criteria according to the recommendations of international committee of medical journal editors.

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Conflicts of Interest Disclosures

The authors declare that they have no Conflict of Interest.

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