

Description of Antibiotic Use in the Length of Hospitalization of Typhoid Patients at Ibnu Sina Hospital Makassar

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ABSTRACT

Typhoid fever remains a major global health problem, with approximately 21 million cases and 128,000–161,000 deaths annually. Appropriate antibiotic therapy is essential; however, irrational antibiotic use can reduce sensitivity and complicate treatment outcomes. This study aimed to describe antibiotic use and its relationship with the length of hospitalization among typhoid fever patients at Ibnu Sina Hospital, Makassar. A descriptive cross-sectional design was employed. Most patients were male (54.21%) and aged 17–25 years (41.12%). Ceftriaxone was the most frequently prescribed antibiotic (72.09%), with cephalosporins being the dominant antibiotic class (85.27%). Intravenous administration was more common (75.19%) than oral therapy. The most frequent length of hospital stay was five days (30.84%). Overall, typhoid fever patients were predominantly young adults treated with intravenous cephalosporins, particularly ceftriaxone, with an average hospitalization duration of five days.

INTRODUCTION

Antibiotics are antimicrobial drugs used to treat bacterial infections. They are natural compounds produced by fungi or other microorganisms that can kill bacteria causing diseases in humans or animals. Some antibiotics are synthetic compounds (not produced by microorganisms) that can also kill or inhibit the growth of bacteria.

Nearly everyone will consume antibiotics at least once in their lifetime. From sore throats caused by throat infections, fever with signs of infection in blood tests, to severe illnesses, all require antibiotics for treatment. Although antibiotics have many benefits, their use has contributed to the occurrence of resistance.

The rapid increase in bacterial resistance to antibiotics has become a global health issue. Bacterial resistance to antibiotics poses a threat to hospitals and public health as it can lead to treatment failure, healthcare-associated infections (HAIs), and increased morbidity and mortality due to multidrug-resistant bacterial infections. Bacterial resistance also results in high healthcare costs and financial burdens for patients, insurance, and governments. Due to resistance to first-line antibiotics, more potent and expensive antibiotics with longer durations need to be chosen.

Bacterial resistance to antibiotics in hospitals, especially in Intensive Care Units (ICUs), can increase the length of hospital stay and mortality rates, both related to healthcare-associated infections (HAIs) and non-HAIs. Patients in the ICU are typically administered selective antibiotics in the first four days of ICU treatment as prophylactic antibiotics to prevent and eradicate pathogenic bacteria. The use of these antibiotics is a risk factor for the development of resistance.

Typhoid fever is a gastrointestinal infection caused by the bacterium *Salmonella typhi*. The global number of typhoid fever cases is estimated at 21 million, with 128,000 to 161,000 deaths annually, with the highest number of cases in South and Southeast Asia. The spread of this disease can occur through contaminated food and beverages containing *Salmonella* bacteria transmitted from patients or carriers.

Management of typhoid fever includes rest, dietary care, supportive therapy and administration of antibiotics. The use of antibiotics is very important to be considered and maintained rationality. Inappropriate use of antibiotics can have various negative impacts, including the development of more severe infections, the occurrence of complications, longer hospital stays and an increased risk of death. Inappropriate prescribing may contribute to the incidence of antibiotic resistance.

As antibiotic development and usage progress, new issues arise, notably the emergence of resistance, particularly with the unprocedural and uncontrolled use of antibiotics. It has been widely reported that pathogenic bacteria have become resistant. Antibiotic resistance in typhoid fever is often associated with increased morbidity and mortality.

Along with the progress of the times, several first-generation antibiotics have been found to treat typhoid fever, such as chloramphenicol, co-trimoxazole, and amoxicillin, so that the prevalence of typhoid fever can be reduced.

However, the frequent use of these antibiotics to treat typhoid fever has resulted in the mutation of the bacteria that cause typhoid fever.

Therefore, based on the quality of antibiotic use that occurs in Indonesia, the researchers are interested to find out more about the description of antibiotic use on the length of hospitalization of typhoid fever patients at Ibn Sina Hospital, Makassar.

THEORETICAL REVIEW

Typhoid fever is a systemic infectious disease caused by *Salmonella enterica* serovar *Typhi* and remains a significant public health problem in developing countries, including Indonesia. The primary therapy for typhoid fever is antibiotic treatment aimed at eradicating the causative pathogen, preventing complications, and reducing mortality. The effectiveness of antibiotic therapy is influenced by the type of antibiotic used, dosage, route of administration, and duration of treatment, as well as patient-related factors such as age, nutritional status, and disease severity.

Appropriate and rational use of antibiotics is theoretically associated with faster clinical recovery, earlier resolution of fever, and reduced bacterial load, which in turn can shorten the length of hospitalization. Conversely, inappropriate antibiotic selection, delayed initiation of therapy, or the presence of antimicrobial resistance may lead to prolonged fever clearance time, treatment failure, and longer hospital stays. Prolonged hospitalization not only increases healthcare costs but also elevates the risk of hospital-acquired infections and antibiotic misuse.

The length of hospital stay is commonly used as an indicator of treatment effectiveness and healthcare efficiency. In the context of typhoid fever, it reflects the patient's clinical response to antibiotic therapy and the adequacy of case management. Therefore, understanding patterns of antibiotic use and their association with hospitalization duration provides an important theoretical basis for evaluating the quality of typhoid fever management and for optimizing antibiotic stewardship in hospital settings, such as Ibnu Sina Hospital Makassar.

METHODOLOGY

This type of research is descriptive research with a cross sectional approach. Descriptive design is used in this study because in its implementation includes data collection, analysis and data obtained. In addition, the cross-sectional design was chosen in this study because the data collection or retrieval process was carried out using pre-existing ones. The data used is secondary data, where secondary data is data in the form of antibiotic medical records used in typhoid fever inpatients at Ibnu Sina Hospital Makassar.

Data obtained from medical records will be entered into the computer by researchers. Analysis of the data obtained was carried out analytically using the SPSS (Statistical Program for Social Science) program.

RESEARCH RESULTS

Gender

Table 1. Characteristics of Typhoid Fever Patients Based on Gender

Gender	Frequency (n)	Percentage (%)
Male	58	54,21
Female	49	45,79
Total	107	100

In this study, it was found that the number of male patients was more than female patients where there were 58 male patients (54.21%) and 49 female patients (45.79%).

Age

Table 2. Characteristics of Typhoid Fever Patients Based on Age

Age	Frequency (n)	Percentage (%)
1-5	11	10,30
6-12	8	7,47
12-16	14	13,08
17-25	44	41,12
26-35	11	10,30
36-45	7	6,54
46-55	8	7,47
56-65	3	2,80
>65	1	0,93
Total	107	100

In this study, the highest number of patients aged 17-25 years were 44 patients (41.12%), aged 12-16 years were 14 patients (13.08%), aged 1-5 years and 26-35 years were 11 patients (10.30%), aged 6-12 years and 46-55 years were 8 patients (7.47%), aged 36-45 years were 7 patients (6.54%), aged 56-65 years were 3 patients (2.80%) and aged >65 years were 1 patient (0.93%).

Antibiotic Types

Table 3. Characteristics of Typhoid Fever Patients Based on Antibiotic Type

Antibiotic Types	Frequency (n)	Percentage (%)
Ceftriaxone	93	72,09
Cefixime	16	12,40
Levofloxacin	11	8,53
Ciprofloxacin	4	3,10
Cotrimoxacol	2	1,55
Chloramphenicol	1	0,78
Azitromisin	1	0,78
Cefotaxime	1	0,78
Total	107	100

In this study, it was found that the number of patients with the highest use of antibiotics with ceftriaxone was 93 patients (72.09%), the use of cefixime was 16 patients (12.40%), the use of levofloxacin was 11 patients (8.53%), the use of ciprofloxacin was 4 patients (3.10%), the use of cotrimoxacol was 2 patients (1.55%), and the use of chloramphenicol, azithromycin, cefotaxime was 1 patient (0.78%) each.

Length of Hospital Stay

Table 4. Characteristics of Typhoid Fever Patients Based on Length of Hospital Stay

Length of Hospital Stay (Day)	Frequency (n)	Percentage (%)
1	1	0,93
3	8	7,48
4	28	26,17
5	33	30,84
6	14	13,08
7	11	10,28
8	5	4,67
9	3	2,80
10	2	1,87
11	1	0,93
14	1	0,93
Total	107	100

In this study, the length of hospital stay for typhoid fever patients was as follows: 33 patients (30.84%) stayed for 5 days, 28 patients (26.17%) for 4 days, 14 patients (13.08%) for 6 days, 11 patients (10.28%) for 7 days, 8 patients (7.48%) for 3 days, 5 patients (4.67%) for 8 days, 3 patients (2.80%) for 9 days, 2 patients (1.87%) for 10 days, and 1 patient each (0.93%) stayed for 1, 11, and 14 days, respectively.

Antibiotic Administration

Table 5. Characteristics of Typhoid Fever Patients Based on Antibiotic Administration

Antibiotic	Administration	Frequency (n)	Percentage (%)
Ceftriaxone	Oral	5	3,88
Ceftriaxone	IV	88	68,22
Cefixime	Oral	15	11,63
Cefixime	IV	1	0,78
Levofloxacin	Oral	6	4,65
Levofloxacin	IV	5	3,88
Ciprofloxacin	Oral	2	1,55
Ciprofloxacin	IV	2	1,55

Cotrimoxacol	Oral	2	1,55
Chloramphenicol	Oral	1	0,78
Azitromisin	Oral	1	0,78
Cefotaxime	IV	1	0,78
Total		107	100

In this study, the number of patients with antibiotic administration with Intravenous administration methods was 97 patients (75.19%), and 32 patients (24.81%) with per-oral administration methods.

Antibiotic Group

Table 6. Characteristics of Typhoid Fever Patients Based on Antibiotic Group

Antibiotic Group	Frequency (n)	Percentage (%)
Sefalosporin	110	85,27
Kuinolon	15	11,63
Sulfonamida	2	1,55
Chloramphenicol	1	0,78
Macrolides	1	0,78
Total	107	100

In this study, the number of patients based on the administration of antibiotic groups was 110 patients (85.27%) with cephalosporin antibiotics, 15 patients (11.63%) with quinolone antibiotics, 2 patients (1.55%) with sulfanomide antibiotics, 1 patient (0.78%) with chloramphenicol and markolide antibiotics respectively.

DISCUSSION

In this study, the average patient data taken were patients with male gender with a total of 58 patients (54.21%). This research is in line with Rahmad (2021) regarding "Factors Associated with the Incidence of Typhoid Fever in the Work Area of the Jayawijaya Regency Health Office" obtained the characteristics of respondents Gender can be seen that the majority of respondents are male as many as 42 people (56.8%). More men consume fast food or food stalls which usually contain a lot of flavorings and hygiene is not guaranteed, compared to women who prefer to cook their own food so that they pay more attention to food composition and hygiene. This habit makes men more susceptible to food-borne diseases such as typhoid if the food purchased is unhygienic. Based on this discussion, in terms of diet, men are more susceptible to diseases than women.8,9

The characteristics of the sample based on age in this study were the highest sample in the age range 17-25 years, namely 44 patients (41.12%). Research from Ainun (2020) on "Characteristics of Inpatient Typhoid Fever Patients in Pekalongan Regency in 2018" obtained in Indonesia, from studies conducted based on the highest age at the age of 17-25 years with a percentage (23.2%), for 42 patients with a diagnosis of typhoid fever alone as many as 144 patients (77.8%) and typhoid fever with comorbidities as many as 41 patients.

Typhoid is an infectious disease caused by *Salmonella typhi* bacteria, and the tendency to occur in the age group of 17-25 years can be explained by several factors. This age often includes the transition from adolescence to young adulthood, where individuals tend to be more socially active and frequently interact with diverse environments. This may increase the risk of exposure to typhoid bacteria through consumption of contaminated water or food. In addition, lifestyles that may lack discipline, such as eating out or lack of awareness about personal hygiene, may provide opportunities for the spread of the disease. These factors together create an environment that is more susceptible to typhoid infection among individuals aged 17-25 years.

From the results obtained, it shows that the majority of 93 patients (72.09%) used Ceftriaxone type antibiotics. These results are in line with a study conducted by Hudi R (2020) on "Rationality of Antibiotic Use in Typhoid Fever Patients", the most commonly used antibiotics are ceftriaxone, ciprofloxacin, and cefixime with the results of rationality analysis category 0 (55.22%), category IIIA (1.49%), category IIIB (8.96%), category IVA (17.91%) and category IVC (4.48%). Clear rules and instructions are needed in the use of antibiotics on an ongoing basis, as well as a control system to increase the level of rationality of antibiotic use. The rationality of antibiotic use according to Gyssen criteria includes appropriate indications, efficacy, safety, and affordable costs. Rationality in the use of antibiotics can prevent the occurrence of bacterial resistance whose main goal is to reduce morbidity and mortality due to antibiotic use in patients, save medical costs, shorten the period of hospitalization, save hospital operational costs and improve the quality of hospital services.

Furthermore, related to the length of antibiotic administration, it was found from the results of the study that the length of hospitalization in typhoid fever patients was mostly 33 patients (30.84%) for 5 days. Adult patients with typhoid fever should ideally experience clinical changes within 3 to 7 days, but treatment of typhoid fever takes an average of 5 to 14 days depending on the type of antibiotic used. In this study, the duration of antibiotic administration in the treatment of typhoid fever was within 2 to 5 days (59.69%), which was more on day 4 (19.38%). This can be said to be reasonable because the handling of typhoid fever cases is mostly treated within 3 to 7 days, where the duration of appropriate antibiotic treatment can change microbiological data, patient conditions and other clinical outcomes.

The results of the study related to the method of antibiotic administration in typhoid fever patients found that most patients were given antibiotics intravenously, namely the use of IV ceftriaxone as many as 88 patients (68.22%). The main choice of antibiotics depends on the susceptibility pattern of *S.typhi* and *S.paratyphi* germs in a particular area. The original first-line therapy was chloramphenicol, ampicillin, and trimethopimsulfamethoxazole. These antibiotics are effective against sensitive germs, but resistance to these drugs is often found. Fluoroquinolones are the most effective class with 98% cure rate, relapse rate and fecal carrier.

And the results of research related to the class of antibiotics used by typhoid fever patients found that the use of the cephalosporin group was widely

used by patients as many as 110 patients (85.27%) out of 129 total samples. This research is in line with research from Arfani N (2021) on "Sensitivity Test of Salmonella typhi to Third Generation Cephalosporin Antibiotics in Patients with Typhoid Fever", Salmonella typhi has a high sensitivity to third-group cephalosporin antibiotics. In cases of typhoid fever, therapy is usually given in the form of antibiotics. Ideally, antibiotics used as a treatment for typhoid fever should have properties that are tolerated by patients, can reach high levels in the intestine, and have a limited spectrum for several microbes. Extended spectrum cephalosporins are the drugs of choice for the treatment of infections due to fluoroquinolone-resistant Salmonella spp. The emergence of Extended Spectrum Beta Lactamase (ESBL) in Salmonella is a new challenge. ESBL is the most developed antibiotic resistance mechanism among the Enterobacteriaceae family. ESBL has 3 main types namely Sulphydryl (SHV), Temoineira (TEM), and Cefotaxime (CTX-M).

CONCLUSION AND RECOMMENDATION

Most typhoid fever patients were male, aged 17-25 years, ceftriaxone antibiotic type, cephalosporin antibiotic class, length of hospitalization 5 days, and intravenous antibiotic administration method. Based on the study findings, several recommendations can be proposed to improve the management of typhoid fever patients. First, the continued use of ceftriaxone as a first-line antibiotic should be supported, as it is the most commonly used therapy and is consistent with current clinical guidelines for hospitalized typhoid patients. However, regular evaluation of antibiotic effectiveness and local antimicrobial resistance patterns is necessary to ensure its continued efficacy. Second, the predominance of intravenous antibiotic administration suggests the need for clear protocols regarding timely switching from intravenous to oral antibiotics once clinical improvement is observed, in order to reduce hospitalization duration and healthcare costs. Third, given that most patients were young adults and male, targeted health education on hygiene, food safety, and early healthcare-seeking behavior should be strengthened in this demographic group to reduce disease incidence and severity.

FURTHER STUDY

Further research is recommended to explore the relationship between different antibiotic regimens and clinical outcomes, particularly comparing intravenous and oral antibiotic therapies in terms of fever clearance time and length of hospitalization. Future studies should also assess the impact of antimicrobial resistance on treatment effectiveness by incorporating microbiological data such as culture and sensitivity testing. In addition, analytical or longitudinal study designs are suggested to identify causal factors influencing hospitalization duration, including disease severity, comorbidities, and patient adherence to treatment. Expanding the study population and including multiple hospitals would enhance the generalizability of findings and provide a broader understanding of antibiotic use patterns in typhoid fever management.

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