CAUSES OF SEPSIS AND USING EMPIRIC ANTIBIOTICS IN PATIENTS WITH SEPSIS AT THAI NGUYEN NATIONAL HOSPITAL

Quynh Nga Luong Thi[1], Thanh Duong Van[1], Tuyet Nguyen Thi[1], Luu Le Thi[1]

Objectives: Describe the causes of sepsis and antibiotic resistance of isolated bacteria in patients with sepsis treated at the Department of Tropical Diseases - Thai Nguyen National Hospital (2020 - 2023).

Subjects and method: Study on 114 patients diagnosed with sepsis treated at the Department of Tropical Diseases at Thai Nguyen National Hospital in Viet Nam from January 1, 2020 to August 16, 2023. Descriptive, retrospective study.

Results and conclusions: A our specific study conducted 114 patients with sepsis at Thai Nguyen National Hospital in Vietnam. Here's a summary of the key points: Gram-negative bacteria, especially *Escherichia coli* and *Klebsiella pneumoniae*, were found to be the most common causative agents of sepsis in our study. Staphylococcus aureus was the most common Gram-positive bacterium. Empiric antibiotic treatment often involves combinations of antibiotics to cover a broad range of potential pathogens. Cephalosporins and penicillins were commonly prescribed, with carbapenems also used. The data on the duration of antibiotic treatment indicates that a significant percentage of patients received antibiotics for 10 - 15 days, and some were on antibiotics for over 15 days. The duration of antibiotic treatment should be individualized, considering various factors like the patient's condition, type of infection, and diagnostic tools available. Reducing the duration of antibiotic treatment is suggested as an effective strategy to combat antibiotic resistance. These information are valuable for improving sepsis management and antibiotic prescribing practices in our hospital.

Keywords: Sepsis, empiric antibiotics, resistance.

INTRODUCTION

Sepsis is life-threatening organ dysfunction caused by a dysregulated host response to infection. Early identification and appropriate management in the initial hours after the development of sepsis improve outcomes[1,2,4]. The estimated worldwide incidence of sepsis admissions is 31.5 million cases per year leading to 5.3 million deaths. The World Health Organization (WHO) has declared antimicrobial resistance to be one of the top 10 global public health threats. Misuse and overuse of antimicrobials are the main factors permitting the emergence of drug-resistant pathogens. In 2019, WHO identified 32 antibiotics under clinical development that address the WHO list of priority pathogens; of these, only six were classified as innovative. A lack of access to quality antimicrobials also remains a major issue. Antibiotic shortages are affecting countries in all regions[5]. WHO has urged low and middle-income countries (LMICs) to establish sepsis prevalence and outcomes. Most authors and societies involved in creating sepsis and septic shock definitions have been from high-income countries (HICs). Applicability of sepsis definitions in LMICs is uncertain. The key tenets of management of sepsis and septic shock in LMICs include early fluid resuscitation and antibiotic therapy coupled with source control when there is a surgical process[6]. The prescription of an empiric antibiotic treatment targeting the most probable pathogens involved is an essential step to improve patient outcomes. There is a broad literature

[1] Thai Nguyen University of Medicine and Pharmacy

Date of submission: *August 20, 2024*

Date of reviewed completion: *September 16, 2024*

Accepted date for publication: *November 25, 2024*

Responsibility for the scientific content: *Quynh Nga Luong Thi, Thai Nguyen University of Medicine and Pharmacy*

Tel: 0987244931. Email: luongngagangthep@gmail.com

on the detrimental impact and adverse outcomes of inappropriate empiric therapy in sepsis. Therefore, the 2021 Surviving Sepsis Campaign (SSC) guidelines recommend that the initial treatment should include a broad-spectrum antibiotic (alone or in combination) that has activity against all likely pathogens. Of note, the prescription of an inadequate empiric therapy is prevailing, and occurs in 10% to 40% of cases. Recommended empirical regimens of antibiotics should be developed and continuously updated as part of local protocols in every health care institution, in order to facilitate empiric antimicrobial prescription practices, based on current practice guidelines and incorporating local and national ecology/resistance patterns[7]. Viet Nam is one of the developing country in the world. Thai Nguyen National Hospital is a Grade I General Hospital, directly under the Ministry of Health of Viet Nam. The hospital's mission is medical examination and treatment for patients in provinces and cities in the Northeast mountainous region at the highest level. In recent years, blood culture has been one of the clinical tests that has been focused on development, creating favorable conditions for the diagnosis and treatment of sepsis in the hospital. However, the early ordering of blood cultures in clinical specialties is still limited, making the diagnosis of sepsis and the choice of initial antibiotic treatment not really effective. So that, we conducted this study to identify common pathogens causing sepsis, reassess the effectiveness of initial antibiotic selection and treatment, and help improve the quality of diagnosis and treatment of sepsis at the hospital.

Objectives: Describe the causes of sepsis and antibiotic resistance of isolated bacteria in patients with sepsis treated at the Department of Tropical Diseases - Thai Nguyen National Hospital (2020 - 2023)..

MATERIAL AND METHOD

Research subjects: Retrospective study on 114 patients diagnosed with sepsis has a positive blood culture result. treated at the Department of Tropical Diseases at Thai Nguyen National Hospital in Viet Nam from January 1, 2020 to August 16, 2023. Blood cultures for finding bacteria were performed using the automated BACT/ALERT 3D system, and antibiotic susceptibility testing of pathogenic bacteria was conducted automatically on the Vitek system.

Research design: Descriptive, retrospective study.

Data processing: After collected data will be entered and analyzed through SPSS Statistic 20 software and processed according to routine medical statistics methods.

RESULTS AND DISCUSSIONS

In our study, we collected the causative agents (bacteria) responsible for sepsis in 114 patients, along with the number of patients and the percentage of cases attributed to each bacterium Here is a summary of the causes of sepsis in these patients:

Gram-negative bacteria (78.1% of cases), included: *Escherichia coli* (43%), *Klebsiella pneumonia* (16.7%), *Proteus mirabilis* (3.6%), *Salmonella* (1.8%), *Burkholderia cepacia, B. gladioli, B. pseudomallei* (5.3%), *Citrobacter freundii* (0.9%), *Pseudomonas aeruginosa* (3.5%), *Pantoea* spp (0.9%), *Aeromonas hydrophila* (0.9%), *Acinetobacter iwoffi, A. baumannii* (1.8%).

Gram-positive bacteria (21.9% of cases), included: *Staphylococcus aureus* (16.7%); *Streptococcus suis* (1.8%); *Enterococcus faecalis* (1.8%); *S. pyogenes* (0.9%); *S. pneumonia* (0.9%) (Table 1).

Table 1. Distribution of patients according to causes of sepsis

Causes of sepsis	Number of patients	Ratio %
Gram-negative:	89	78.1
Escheriachia coli	49	43
Klebsiella pneumoniae	19	16.7

Causes of sepsis	Number of patients	Ratio %
Proteus mirabilis	4	3.6
Salmonella	2	1.8
Bukhoderia cepacia, B. gladioli, B. pseudomalei	6	5.3
Citrobacter freundi	1	0.9
Pseudomonas aeruginosa	4	3.5
Pantoea spp	1	0.9
Aeromonas hydrophila	1	0.9
Acinobacter iwoffi, baummanii	2	1.8
Gram-positive	25	21.9
Streptococcus pyogenes	1	0.9
Streptococcus pneumoniae	1	0.9
Streptococcus suis	2	1.8
Enterococcus feacalis	2	1.8
Staphylococcus aureus	19	16.7
Total	114	100

This data suggests that Gram-negative bacteria, particularly *E. coli* (43%), are the most common causative agents of patients with sepsis in our study, accounting for a significant portion of the cases. *K. pneumonia* is the second most common agent after *E. coli. S. aureus* (16.7%) is the most common Gram-positive bacterium associated with sepsis in this dataset. Our research results are also similar a retrospective study in 414 patients with positive blooding cultures at a referral oncology hospital from 2015 - 2019, Ali Amanati also show the results: Gram-negative bacteria were mo to re detected (63.3%, 262) than gram-positive bacteria (36.7%, 152). *E. coli* was the most common gram-negative organism (123/262, 47%), followed by *Pseudomonas* spp. (82/262, 31%) and *Klebsiella pneumoniae* (38/262, 14.5%). Coagulase-negative staphylococci was the most frequently isolated pathogen among gram-positive bacteria (83/152, 54.6%)[8]. The top 10 most frequently isolated strains in the China Antimicrobial Surveillance Network (CHINET) in 2017 were *E. coli* (19.3%), *Klebsiella species* (14.7%), *Acinetobacter species* (10.1%), *S. aureus* (9.0%), *P. aeruginosa* (8.7%), *Enterococcus species* (8.4%), coagulase-negative staphylococci (4.4%); *Enterococcus species* (3.9%), β-hemolytic streptococci (3.6%), and *Stenotrophomonas maltophilia* (2.9%). The top 10 most common isolates in the China Antimicrobial Resistance Surveillance System (CARSS) in 2016 were similar to those in CHINET, with only slightly changes in the order: *S. pneumoniae* was listed as the ninth most common isolate in CARSS instead of β-hemolytic streptococci as in CHINET. Among gram-negative bacilli, the top 4 most frequent isolates were *E. coli, Klebsiella pneumoniae, Acinetobacter baumannii,* and *P. aeruginosa* in CHINET. *E. coli* was always listed as the first most common isolate from 2005 to 2017, representing 26% - 29% of all gram-negative bacteria[9]. A study is to investigate the antimicrobial susceptibility of strains isolated from the major hospitals in China of Fupin Hu with totally 244,843 strains were isolated in 2018. Of which gram-negative bacilli and gram-positive cocci were accounting for 71.8% and 28.2%, respectively. 39.7% of isolates were cultured from lower respiratory tract, 18.8% from urine, 14.8% from blood, 1.3% from cerebrospinal fluid, respectively[10]. It's important to note that the treatment and management of sepsis depend on identifying the causative pathogen and its susceptibility to antibiotics, so this information is valuable for healthcare providers to make informed treatment decisions.

Table 2. Distribution of patients according to emperic antibiotics treatment

Emperic antibiotics	Number of patients	Ratio %
Penicillins	25	21.9
Penicillin	1 (4%)	0.9
Penicillin + fluoroquinollon	18 (72%)	15.8
Penicillin + aminoglycosid	4 (16%)	3.5
Penicillin + metronidazol	1 (4%)	0.9
Penicillin + cyclin	1 (4%)	0.9
Cephalosporins	71	62.3
Cephalosporins	9 (12.7%)	7.9
Cephalosporins + fluoroquinollon	37 (52,1%)	33.3
Cephalosporins + aminoglycosid	14 (19.7%)	12.3
Cephalosporins + metronidazol	4 (5.6%)	3.5
Cephalosporins + vancomycin	5 (7%)	4.4
Cephalosporins + linezolid	1 (1.4%)	0.9
Cephalosporins + fluoroquinollon + metronidazol	1 (1.4)	0.9
Carbapenems	10	8.8
Carbapenem	2 (20%)	1,8
Carbapenem + fluoroquinollon	5 (50%)	4.4
Carbapenem + metronidazol	1 (10%)	0.9
Carbapenem + vancomycin	1 (10%)	0.9
Carbapenem + linezolid	1 (10%)	0.9
Fluoroquinolon	1	0.9
Vancomycin	7	6.1
Vancomycin	3 (42.9%)	2.6
Vancomycin + fluoroquinollon	4 (57.1%)	3.5
Monotherapy antibiotics	16	14
Combination of 2 antibiotics	97	85.1
Combination of 3 antibiotics	1	0.9
Total	114	100

Early use of appropriate antibiotics has been shown to be one of the most important factors in improving the outcome of these patients. The results in table 2 provides information about the using emperic antibiotics in the treatment of sepsis in a group of patients, along with the number of patients and the percentage of cases for each antibiotic regimen. Penicillins (21.9% of cases): monotherapy with penicillin (4%); penicillin + fluoroquinolone (72%); penicillin + aminoglycoside (16%); penicillin + metronidazole (4%); penicillin + cyclin: (4%). Cephalosporins (62.3% of cases): Monotherapy with cephalosporins (12.7%); cephalosporins + fluoroquinolone (52.1%); cephalosporins + aminoglycoside (19.7%); cephalosporins + metronidazole (5.6%); cephalosporins + vancomycin (7%); cephalosporins + linezolid (1.4%); cephalosporins + fluoroquinolone + metronidazole (1.4%). Carbapenems (8.8% of cases): monotherapy with carbapenem (20%); carbapenem + fluoroquinolone (50%); carbapenem + metronidazole (10%); carbapenem + vancomycin (10%); carbapenem + linezolid (10%). Other antibiotics: Monotherapy with fluoroquinolone (0.9%); vancomycin: (6.1%); vancomycin + fluoroquinolone (3.5%).

Treatment regimen: Monotherapy antibiotics (14% of cases); combination of 2 antibiotics (85.1% of cases); combination of 3 antibiotics (0.9% of cases). It appears that the majority of patients received combination therapy with two antibiotics, with cephalosporins and penicillin based regimens being the most commonly used antibiotics. Carbapenems were also used in a significant percentage of cases. Additionally, vancomycin and fluoroquinolone based treatments were utilized, although to a lesser extent. The data provided here offers insight into the antibiotic treatment strategies used for sepsis in this patient group. Vu Quoc Dat et al observed a high frequency use and a substantial variation in patterns of empirical antibiotic use in the critical care units (CCUs) in primary and secondary hospitals in Vietnam. It highlights the importance of continuous monitoring antibiotic consumption in CCUs. It looks like you've provided some data that appears to be related to antibiotic therapy choices in a specific context. The numbers in parentheses appear to represent percentages of cases or patients receiving different types of antibiotic therapy. Here's a breakdown of the data: No antibiotic therapy (36.3%, 32.3%, 41.5% in three different groups - all patients; CCUs in primary hospitals and CCUs in secondary hospitals); single antibiotic therapy (37.0%, 47.4%, 23.7% in three different groups); dual antibiotic therapy (25.4%, 19.9%, 32.5% in three different groups); triple antibiotic therapy (1.2%, 0.3%, 2.3% in three different groups). It appears that you've provided data related to the usage of different classes of antibiotics or antimicrobial agents, along with the percentages of their usage in different groups or populations. Here's an interpretation of the data: Third Generation Cephalosporins: percentage usage (60.3%, 64.0%, 55.0% in three different groups); fluoroquinolones percentage usage (31.5%, 21.9%, 45.7% in three different groups); combinations of penicillins percentage usage: (14.8%, 13.6%, 16.7% in three different groups); Second Generation Cephalosporins percentage usage (10.8%, 15.2%, 4.2% in three different groups); carbapenems (6.0%, 0.2%, 14.7% in three different groups). All the p-value are less than 0.003; 0,001, signifying a highly significant difference in the usage of antibiotics among three groups. The most frequently prescribed antibiotics were cefotaxime (22.3%), levofloxacin (19%) and ceftazidime (10.8%). Antibiotics were given in 31.5% of patients without diagnosis of infection. This type of data analysis can be valuable in understanding patterns of antibiotic use and potentially guiding antimicrobial stewardship efforts to promote rational antibiotic prescribing[11]. A randomized trial of a short course of aminoglycoside added to β-lactam antibiotics for empirical treatment in critically ill patients with sepsis justified, D.S.Y. Ong prove aminoglycosides are among the most widely used antibiotics in intensive care units (ICU), despite demonstrated absence of survival benefits when added to β-lactam therapy and higher rates of adverse effects, such as nephrotoxicity, in patients with sepsis. Yet most studies evaluated prolonged courses of aminoglycosides, used multiple daily dosing schedules or compared broad spectrum betalactam monotherapy to a combination of an aminoglycoside with a less broad spectrum betalactam. As short courses (< 3 days) of once daily dosing of aminoglycosides yield less nephrotoxicity, it has been suggested that such combination therapy might be beneficial in severely ill patients, such as those admitted to ICU with sepsis or septic shock. Addition of an aminoglycoside broadens the antibacterial spectrum and thus reduces the risk of inadequate empirical treatment, and it may enhance bacterial killing in the bloodstream. Short-term adjunctive treatment with aminoglycosides for the empirical treatment of sepsis in critically ill patients is recommended in some, but not all national guidelines[12]. As recommended by SSC 2021, for adults with sepsis or septic shock and high risk for multidrug resistant (MDR) organisms, using two antimicrobials with gram-negative coverage for empiric treatment over one gram-negative agent. For adults with sepsis or septic shock and low risk for MDR organisms, using two gram-negative agents for empiric treatment, compared with one gram-negative agent. For adults with sepsis or septic shock, using double gram-negative coverage once the causative pathogen and the susceptibilities are known[1].

The data about the susceptibility of the causative bacteria to different antibiotics show at the table 3.

Table 3. Distribution of patients according to emperic antibiotics susceptivity

	Number of patients	Ratio %
Emperic antibiotics 1		
No data	65	57
Intermediate	3/49 (6.2%)	2.6
Resistance	11/49 (22.4%)	9.6
Susceptibility	35/49 (71.4%)	30.7
Emperic antibiotics 2		
No data	55	48.2
Intermediate	4/59 (6.8%)	3.5
Resistance	15/59 (25.4%)	13.2
Susceptibility	40/59 (67.8%)	35.1
Two emperic antibiotics		
Intermediate	1/23 (4.3%)	0.9
Resistance	2/23 (8.7%)	1.8
Susceptibility	20/23 (87%)	17.5
Total	114	100

It is categorized into three groups: "Emperic antibiotics 1", "Emperic antibiotics 2", and "Two emperic antibiotics." The categories include the number of patients and the ratio of patients falling into different susceptibility categories (No data, Intermediate, Resistance and Susceptibility). The results of emperic antibiotic susceptibility data: Emperic antibiotics 1 (57% of cases): Intermediate (2.6%), resistance (9.6%), susceptibility (30.7%); emperic antibiotics 2 (48,2% of case): Intermediate (3.5%), resistance: (13.2%), susceptibility (35.1%); two emperic antibiotics: Intermediate (0.9 %), resistance (1.8%) and susceptibility (17.5%). In which, the empirical antibiotics 1 are usually betalactam antibiotics: Penicillin, cephalosporin and carbapenem; the empirical antibiotics 2 are usually aminoglycoside, fluoroquinolone, cyclin, metronidazol and vancomycin. In both "emperic antibiotics 1" and "emperic antibiotics 2" groups, the majority of patients had susceptibility data available, and a significant percentage were classified as susceptible to the antibiotics used. Intermediate and resistant cases were also present but to a lesser extent. In the "two Emperic antibiotics" group, almost all patients had susceptibility data available, and the majority were classified as susceptible, with very few cases categorized as intermediate or resistant. However, data on resistance to emperic treatment antibiotics are lower than those not available, limiting our assessment of initial antibiotic choice. The group of patients who were given the least resistant emperic antibiotic were mainly prescribed by tropical disease specialists and the initial antibiotic of choice was from the carbapenem group. Many patients are referred from other specialties and are inappropriately prescribed antibiotics by other specialists without consultation with an infectious disease physician. This led to the initial antibiotic choice being almost ineffective in treatment and the patient had to be transferred to the tropical diseases department. Lack of antibiotics makes our initial antibiotic selection difficult. We have to use drugs for which we cannot do antibiograms, so the initial antibiotic use assessment is more limited. At that time, our *S. aureus* antibiogram failed to test sensitive to vancomycin and linezolid, which limited us in using antibiotics to treat *S. aureus* septicemia. Inappropriate initial antimicrobial therapy (IIAT) refers to the antibiotic regimen prescribed and administered during the first 72 hours after suspecting BSI that was not active against the pathogen identified by culture and in vitro susceptibility testing. IIAT plays an important role in the prognosis of patients with severe infections. Previous studies reported that IIAT increased the hospital mortality rate and length of stay in solid cancer patients and critically ill patients complicated by Gram-negative bacteria bloodstream infections (GN-BSI)13. Among patients with sepsis or septic shock, the mortality rate of those treated with inappropriate initial antibiotics was signifcantly higher than those treated with appropriate antibiotics from the beginning. In order to increase appropriate antibiotic usage and reduce the incidence and mortality of IIAT, guidelines recommend the application of cephalosporins (e.g., cefepime), beta lactamase inhibitors (BLBLI) (e.g., piperacillin and tazobactam), and carbapenems as frst-line empirical drugs or other antibiotics according to the local epidemiological data in HM (hematological malignancies) patients presenting with neutropenic fever. However, in China, as reported by the CHINET monitoring network, the rate of drug resistance to fourth-generation cephalosporins is relatively high at 21.6 - 28.1%, resistance to fourthgeneration cephalosporins was as high as 37.3%. This means that patients with suspected severe infections, cephalosporins are not suitable as initial empirical treatment. On the other hand, with increased use of carbapenems in recent years, resistance to carbapenems has also risen, especially in *K. pneumoniae* (2.9% in 2005 to 24% in 2017)[13]. According Yishu Tanglists the antibiotic susceptibility test results of different pathogens isolated from our sample population. Across all species, resistance to cephalosporins was high, up to 37.3%. Resistance to fuoroquinolones was also high at 45.9%. On the other hand, resistance to carbapenems, BLBLI (piperacillin-tazobactam and cefoperazone-sulbactam) and amikacin was relatively low at around 10%. MDR (MultiDrug Resistance) bacteria accounted for 73.4% of the resistance species. Nearly half (48.7%) of MDR bacteria were resistant to cephalosporins, and the resistance rates to BLBLI, carbapenems, and amikacin were relatively low, at 18.4%, 8.2% and 12.8%, respectively. Our results confrm high proportion of drug-resistant bacteria in HM patients with HM complicated by GN-BSI. The overall resistance rates of GN-bacteria were the lowest to carbapenems and aminoglycosides (such as amikacin), followed by BLBLI. The sensitivity rate to carbapenem and cefoperazone-tazobactam monotherapy was nearly 90.0%. The results also indicated that only adding amikacin signifcantly improved appropriateness to cephalosporins and BLBLI, making antibiotics combinations more than 95% sensitive in vitro, which were significantly higher than those of monotherapies. Thus, carbapenem and cefoperazone-tazobactam monotherapy or combination of antibiotics selected based on antibiogram can reduce IIAT rate to less than 15%[13]. M.L. Martínez recommends selecting an adequate empiric antimicrobial therapy involves covering all likely microorganisms causing the suspected source of infection. Patient-and pathogen-related factors need to be considered when choosing an initial antimicrobial therapy. Patient-related factors should also be considered, such as age, weight, allergies and comorbidities. The presence of chronic organ dysfunction (renal or hepatic dysfunction), immunosuppressive therapy, and recent exposure to antimicrobials due to infection or colonization must be addressed. Also, it is crucial to determine the risk of MDR pathogens: Prior antibiotic exposure, prolonged hospital length of stay, recent hospitalization, presence of invasive devices, local ecology and resistance patterns, and previous colonization by resistant pathogens (surveillance cultures). Different interventions have been proposed to improve empiric antimicrobial therapy in patients with sepsis. Computerized clinical decision support systems (CCDSSs) or automated antibiotic alerts, infectious diseases consultation, and local antibiotic prescription guidelines are some examples. Recommended empirical regimens of antibiotics should be developed and continuously updated as part of local protocols in every health care institution, in order to facilitate empiric antimicrobial prescription practices, based on current practice guidelines and incorporating local and national ecology/resistance patterns[7]. Fupin Hu with Totally 244,843 strains were isolated in 2018, of which gram-negative bacilli and gram-positive cocci were accounting for 71.8% and 28.2%, respectively. 39.7% of isolates were cultured from lower respiratory tract, 18.8% from urine, 14.8% from blood, 1.3% from cerebrospinal fluid, respectively. Of those, the five major species were most often isolated (65.5%, 63%, 52.3%, and 30.3%). The resistance rate of MRSA to most antimicrobial agents was significantly higher than that of MSSA strains, except for to trimethoprim-sulfamethoxazole in urine specimen. *E. coli* was still highly susceptible to carbapenem antibiotics, and the resistance rate was less than 5%. Carbapenem resistance among *K. pneumoniae*, especially cultured from cerebrospinal fluid, increased significance from 18.6 to 64.1%. The resistance rates of *P. aeruginosa* to carbapenems were nearly 30% in the blood, in urine, and in the lower respiratory tract, but about 60% of that in cerebrospinal fluid. About 80% of *A. baumannii* strains was resistant to imipenem and meropenem, respectively. Bacterial resistance of five major clinical isolates from cerebrospinal fluid to common antibiotics (in particular carbapenem-resistant *K. pneumoniae*) currently shows an increasing trend. It is worth to emphasize the importance of serious control of hospital infection and better management of clinical use of antimicrobial agents[10].

Table 4. Distribution of patients according to time for antibiotics

Time for antibiotics (day)	Number of patients	Ratio %
< 10	22	19,3
10 - 15	76	66,7
≥ 15	16	14
Total	114	100

It appears that we have data related to the duration of antibiotic treatment (in days) for a certain group of patients. The data is categorized into three groups: < 10 days, 10 - 15 days, and ≥ 15 days. You also have the number of patients in each category and the ratio as a percentage. Patients who received antibiotics for less than 10 days 2/114 (19.3%); patients who received antibiotics for 10 to 15 days 76/114 (66.7%). Patients who received antibiotics for 15 days or more 16/114 (14%). This data can be useful for analyzing the patterns of antibiotic use in this group of patients or for other relevant medical research purposes. In our study, long duration of antibiotic use is related to ineffective experience antibiotic selection due to failure to predict primary infection, failure to diagnose sepsis early, late blood culture and antibiogram results, and failure to diagnose sepsis early. Lack of antibiotics to treat patients, doctors lack experience. According to M. L. Martínez, reducing the duration of antibiotic treatment is the most effective strategy to reduce antibiotic resistance: By reducing the pressure on the endogenous flora and selection of resistant strains. Nevertheless, in different circumstances, the duration of therapy cannot be well-defined, as adjustments of antimicrobial prescription mainly rely on effective source control. Although initiation of antibiotics may represent a difficult decision, stopping antibiotic therapy often proves to be even more difficult in some particular situations. Effective control of infection cannot be timely achieved in some cases, favoring the emergence of antimicrobial resistance. Decisions on duration of antibiotic therapy need to be individualized, being necessary to consider different patient-related factors (e.g., severity of illness, clinical response), the type of infection (e.g., source control, deep-seated infection, MDR pathogens) and the availability of diagnostic tools (e.g., clinical/laboratory scores, biomarkers)[7].

CONCLUSIONS

Our study providing some information as follow:

Causative agents of sepsis: The common causative agents of sepsis in patiens treated at our hospital, with Gram-negative bacteria, especially Escherichia coli and Klebsiella pneumoniae, being the most frequent pathogens. Staphylococcus aureus was the predominant Gram-positive bacterium associated with sepsis.

Empirical antibiotic selection: The majority of patients received empirical antibiotic therapy, often involving combinations of antibiotics to cover a broad range of potential pathogens. Cephalosporins and penicillins were commonly prescribed, with carbapenems also used.

Antibiotic susceptibility: The data shows that most patients were classified as susceptible to the antibiotics used, with some cases categorized as intermediate or resistant. However, resistance rates varied based on the antibiotics and the causative pathogens.

Duration of antibiotic treatment: A significant percentage of patients received antibiotics for 10-15 days or more, highlighting potential challenges in early diagnosis and management.

Challenges and antibiotic resistance: Our study underscores challenges in antibiotic selection, especially in the context of limited access to quality antimicrobials and potential inappropriate initial antibiotic therapy. Antibiotic resistance patterns also vary, which can impact treatment effectiveness.

Strategies to reduce antibiotic resistance: Reducing the duration of antibiotic treatment is suggested as an effective strategy to combat antibiotic resistance, though it should be individualized based on various factors..

RECOMMENDATION

The study's findings are essential for improving sepsis management and antibiotic prescribing practices in this specific healthcare setting. Our work contributes to the understanding of sepsis epidemiology and antibiotic use in low and middle-income countries and emphasizes the importance of tailored approaches to combat antibiotic resistance.

REFERENCES

1. Laura Evans, Andrew Rhodes,Waleed Alhazzani. Surviving Sepsis Campaign International.21.pdf. Critical Care Medicine. November 2021 Volume 49 Number 11.

2. The Ministry of Health. Guidelines for diagnosis and treatment of some infectious diseases. Issued together with Decision No. 5642/QD-BYT dated December 31, 2015 of the Ministry of Health. 2015:79-86.3. R. P. Dellinger, Andrew Levy Mm Fau - Rhodes, Djillali Rhodes A Fau - Annane, et al. Surviving Sepsis Campaign: international guidelines for management of severe sepsis and septic shock, 2012. (1432-1238 (Electronic).

4. A. Rhodes, L. E. Evans, W. Alhazzani, et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016. (1432-1238 (Electronic).

5. WHO. World Health Statistics 2022 - Monitoring health for the SDGs. 2022:33.

6. A. H. Stephen, R. L. Montoya,A. R. Aluisio. Sepsis and Septic Shock in Low- and Middle-Income Countries. (1557-8674 (Electronic).

7. M. L. Martínez, E. P. Plata-Menchaca, J. C. Ruiz-Rodríguez,R. Ferrer. An approach to antibiotic treatment in patients with sepsis. (2072-1439 (Print).

8. A. Amanati, S. Sajedianfard, S. Khajeh, et al. Bloodstream infections in adult patients with malignancy, epidemiology, microbiology, and risk factors associated with mortality and multi-drug resistance. (1471-2334 (Electronic).

9. Fupin Hu, Demei Zhu, Fu Wang,Minggui Wang. Current Status and Trends of Antibacterial Resistance in China. Clinical Infectious Diseases. 2018; 67(suppl_2):S128-S134.

10. F. Hu, Y. Guo, Y. Yang, et al. Resistance reported from China antimicrobial surveillance network (CHINET) in 2018. (1435-4373 (Electronic).

11. V. Q. Dat, T. T. Dat, V. Q. Hieu, K. B. Giang,S. Otsu. Antibiotic use for empirical therapy in the critical care units in primary and secondary hospitals in Vietnam: a multicenter cross-sectional study. (2666-6065 (Electronic).

12. D. S. Y. Ong, C. H. van Werkhoven, O. L. Cremer, G. E. Thwaites,M. J. M. Bonten. Is a randomized trial of a short course of aminoglycoside added to β-lactam antibiotics for empirical treatment in critically ill patients with sepsis justified? (1469-0691 (Electronic).

13. Y. Tang, X. Wu, Q. Cheng,X. Li. Inappropriate initial antimicrobial therapy for hematological malignancies patients with Gram-negative bloodstream infections. (1439-0973 (Electronic).