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DRUG SENSITIVITY PATTERN IN SPONTANEOUS BACTERIAL PERITONITIS AT CHANDKA TEACHING HOSPITAL LARKANA

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Abstract

Background: *Spontaneous bacterial peritonitis (SBP) is a serious and potentially life-threatening complication commonly associated with liver cirrhosis and ascites. It is a major cause of morbidity and mortality among hospitalized patients. The increasing prevalence of antibiotic-resistant bacterial organisms has made the management of SBP increasingly challenging. Therefore, identifying local bacterial pathogens and their antimicrobial sensitivity patterns is essential for selecting appropriate empirical antibiotic therapy.*

Objective: *To determine the bacterial profile and antimicrobial drug sensitivity patterns among patients diagnosed with spontaneous bacterial peritonitis at Chandka Teaching Hospital, Larkana.*

Methods: *This study was conducted at Chandka Teaching Hospital, Larkana, among patients diagnosed with spontaneous bacterial peritonitis. Relevant clinical information and ascitic fluid samples were collected for microbiological examination. Bacterial culture and antibiotic susceptibility testing were performed to identify the causative organisms and evaluate their sensitivity and resistance to commonly used antibiotics. The findings were analyzed to determine the distribution of bacterial pathogens and their antimicrobial susceptibility patterns.*

Results: *The study focused on identifying the commonly isolated bacterial organisms and evaluating their antibiotic sensitivity and resistance profiles. Particular attention was given to the effectiveness of commonly prescribed antibiotics and the occurrence of antimicrobial resistance to identify suitable treatment options for patients with spontaneous bacterial peritonitis.*

Conclusion: *Determining the local antimicrobial sensitivity pattern is important for improving the management of spontaneous bacterial peritonitis. Regular monitoring of bacterial pathogens and antibiotic resistance at Chandka Teaching Hospital, Larkana, can help guide empirical antibiotic selection, promote rational antibiotic use, and improve patient outcomes.*

INTRODUCTION

Spontaneous bacterial peritonitis (SBP) represents a serious and often fatal infection caused by the presence of bacteria in peritoneal/ascitic fluid and no apparent infection intra-abdominally. Ascitic fluid bacterial infection caused by liver cirrhosis is one of the many complications of liver cirrhosis, particularly those that are complicated by decompensated liver function

and portal hypertension. Of the complications of liver cirrhosis, SBP is one of the most frequently seen. The translocation of bacteria to the mesenteric lymph nodes and to the peritoneal cavity is caused by bacteria in the gut, and is unregulated by the intestinal lining and the immune system. SBP is one of the many causes of the high morbidity and mortality of cirrhosis. Diagnosis and timely antimicrobial therapy are important to SBP and to its many complications (Abu-Freha, 2021). SBP is of major clinical importance due to its many complications and the poor prognosis it carries. SBP is a potential diagnosis in cirrhosis patients with ascites due to the compromised immune system, the leaky gut, and dysbiosis. SBP is defined by a leukocyte count, and more often than not, a leukocyte differential and a culture and susceptibility test of the ascitic fluid. Furthermore, infection-related complications and the prognosis of SBP will depend upon the rapid detection of the pathogen and the appropriate antibiotic (Biggins, 2021). Escherichia coli and Klebsiella pneumoniae are both of the gram-negative bacilli and both of the gut flora and both of which are among the most common pathogens of SBP. However, Streptococcus, Staphylococcus, and Enterococcus species and other Gram-positive bacteria have been increasingly identified and are reported in studies as posing threats to repeatedly antibiotic exposed and hospitalized patients. Bacteria distribution changes based on location, practiced healthcare, antibiotic exposure, and patient-related risk factors (Zhang, 2023). Antibiotics are the main therapy for SBP, but a growing concern for antimicrobial resistance greatly challenges efforts on a global scale. Prophylaxis and empirical use of antibiotics fostered the creation of organisms with multidrug resistance that render antibiotics ineffective. There is a lag in the adaptive response of bacteria to the changes in the patterns of resistance to antibiotics; thus, a local antimicrobial resistance system is crucial to rational empirical use of antibiotics. Since bacterial resistance is specific to the healthcare environment and population, local studies are particularly important (Juncu, 2025). Sensitivity testing shows the resistance profile of bacteria and the spectrum of effective antibiotics for SBP. The knowledge of local patterns of resistance and susceptibility helps reduce both treatment failure and the use of antibiotics with limited effects. Due to the non-static antibiotic resistance pattern, evaluation of bacterial isolates and their resistance profiles is a must for each healthcare institution to develop optimal treatment policies. Larkana Teaching Hospital Larkana is one of the most prominent healthcare infrastructures in Sindh, Pakistan. Unfortunately, data are scarce in terms of the bacterial profile and antibiotic sensitivity of SBP cases in this local area. Gathering data on bacterial organisms and their pattern of antibiotic resistance can help in the selection of therapeutic antibiotics and improve patient care. Thus, the objective of the present study is to assess the pattern of antibiotic sensitivity of bacterial isolates from SBP cases at Larkana Teaching Hospital, Larkana. This information will assist both clinicians and microbiologists in managing antibiotic resistance and providing the best therapeutic intervention.

Background of Study

Diagnosis of spontaneous bacterial peritonitis (SBP), a common complication of ascites due to chronic liver failure, is initiated when a fluid sample shows signs of infection and inflammation. Fluid analysis may also include bacterial culture. Because of peritonitis, a bacterial infection of the peritoneal cavity, early detection and treatment minimize the infection's spread to other organs. Translocation of bacteria from the intestines to the peritoneal cavity through the mesenteric lymph nodes is a common cause for the development of SBP. This is facilitated by altered intestinal barrier function and altered gut microbiota occurring in conjunction with portal hypertension and reduced immunological defenses of the cirrhotic patient. These factors promote the proliferation of bacteria in ascitic fluid.

The occurrence of SBP is almost always associated with the advanced stages of chronic liver disease and with the decompensated class of cirrhosis. The SBP infection may develop in a community setting or while the patient is hospitalized, and the bacterial organisms and their resistance to antimicrobials may differ among the types of infections. Increasing the

microbial resistance patterns of bacteria and the local antibiotic susceptibility patterns will aid in better control of SBP. (Biggins et al., 2021).

Clinical Importance of Spontaneous Bacterial Peritonitis

Spontaneous bacterial peritonitis presents a serious challenge to clinicians. Its frequent occurrence with high mortality rates among patients with chronic liver disease is a substantial concern. Demanding immediate attention, SBP can lead to septic shock, acute renal failure, hepatic encephalopathy, multi-organ failure, and an even greater high mortality rate. Additionally, the infection is associated with an increased length of stay and additional poor outcomes.

SBP diagnosis is characterized by an increased number of polymorphonuclear leukocytes in the ascitic fluid, as well as its culture results being positive for bacterial growth. However, the absence of bacterial growth in ascitic fluid or prior antibiotic administration frequently results in culture-negative infections. This makes an extensive microbiological workup and evaluation of the infection in the context of drug susceptibility critical. Based on the local resistant micro-flora, SBP treatment can be improved, and potentially harmful drug administration can be avoided (European Association for the Study of the Liver, 2022).

Bacterial Etiology and Common Pathogens

SBP has intestinal origin. In the past Escherichia coli and Klebsiella pneumoniae were believed to be the leading organisms due to their Gram-negative status. They, as well as all Gram-bacteria, were believed to pass from the gut to the bloodstream and to the peritoneal cavity due to Intestinal permeability and immune system failure.

Recently, Gram-positive organisms like Enterococcus species, Staphylococcus aureus, and Streptococcus species, have been showing an increased prevalence. The cause of the changes were presumed to be frequent admissions, more procedures, and increased antibiotic use. As countries and different tertiary care centers are served different pathogens, it is good to have studies on the resistant pathogens in the hospitals to better understand the locally prevalent pathogens (Kim et al., 2023).

Antibiotic Resistance and Drug Sensitivity Patterns

A major difficulty of managing spontaneous bacterial peritonitis (SBP) is that antibiotic resistance is on the rise. Because of the prophylactic and treatment methods that rely on broad-spectrum antibiotics, multidrug-resistant organisms are increasingly common. Therapeutic failure is a real concern when faced with resistant bacterial infections including Enterococcus species and ESBL-producing Enterobacteriaceae.

Antibiotic sensitivity testing is vital to treat SBP. It is important to know how local resistance to a given antibiotic will affect a patient's outcome in order to design an empiric treatment plan at the time of the patient's initial presentation. Resistance patterns vary by city, country, and even the institution within an area, so continual evaluation of antibiotic resistance will help formulate empiric treatment protocols. This will, in turn, decrease antibiotic resistance (Fernández et al., 2024).

Rationale of the Study

Spontaneous bacterial peritonitis is one of the leading infection-related complications in liver disease patients. There is a paucity of literature on the distribution of local bacterial pathogens and their sensitivity to antibiotics in most healthcare centers in Pakistan, including in Chandka Teaching Hospital Larkana. Many studies around the world focus on the patterns of bacterial antibiotic resistance and profiles, but much less is known about them in Pakistan.

Given the rapid upsurge in the antibiotic resistance of bacteria, it is essential to assess the patterns of antimicrobial susceptibility, especially in the context of this study. It is hoped that the results of this study will provide clinicians at Chandka Teaching Hospital and the healthcare community with much valuable information on the predominant pathogens isolated from the patient population in the study hospital, and the antibiotic(s) to which these pathogens are sensitive for the formulation of a more rational approach to the treatment of the patients, to improve the clinical outcome. Thus, this study is particularly

aimed at identifying the bacterial cause of the spontaneous bacterial peritonitis and determining their antibiotic susceptibility from the patient population in the Chandka Teaching Hospital Larkana.

Research Questions

1. What are the most commonly isolated bacterial organisms responsible for spontaneous bacterial peritonitis among patients at Chandka Teaching Hospital, Larkana?
2. What is the antimicrobial sensitivity pattern of the bacterial organisms isolated from ascitic fluid samples?
3. Which antibiotics demonstrate the highest sensitivity against the commonly isolated bacterial pathogens?
4. What is the prevalence of antibiotic resistance among bacterial isolates responsible for spontaneous bacterial peritonitis?
5. How can local drug sensitivity patterns help improve the selection of empirical antibiotic therapy for patients with SBP?

Research Objectives

1. To determine the bacterial profile and antimicrobial drug sensitivity patterns among patients diagnosed with spontaneous bacterial peritonitis at Chandka Teaching Hospital, Larkana.
2. To identify the commonly isolated bacterial pathogens responsible for spontaneous bacterial peritonitis.
3. To determine the antimicrobial sensitivity patterns of bacterial isolates obtained from ascitic fluid samples.
4. To assess the resistance of isolated bacterial organisms to commonly used antibiotics.
5. To identify the most effective antibiotics against the bacterial pathogens associated with SBP.

Limitations of the Study

- **Single-center study:** The research is conducted at Chandka Teaching Hospital, Larkana; therefore, findings may not represent the bacterial sensitivity patterns of all hospitals in Pakistan.
- **Limited sample size:** The number of patients included in the study may affect the generalizability of the findings.
- **Culture-negative cases:** Some patients with SBP may have negative ascitic fluid cultures despite clinical evidence of infection, particularly if antibiotics were administered before sample collection.
- **Antibiotic exposure:** Previous antibiotic use may influence bacterial growth and affect culture results and antimicrobial susceptibility findings.
- **Limited antibiotic selection:** The study may evaluate only selected antibiotics available in the hospital laboratory, which could restrict the overall assessment of antimicrobial resistance.
- **Study duration:** The findings reflect bacterial and antibiotic sensitivity patterns during the specified study period and may change over time.
- **Limited geographical representation:** The results may primarily reflect local bacterial resistance patterns in the study population and may not be applicable to other geographical regions.

Scope of the Study

The study titled "Drug Sensitivity Pattern in Spontaneous Bacterial Peritonitis at Chandka Teaching Hospital, Larkana" focuses on identifying the bacterial organisms responsible for spontaneous bacterial peritonitis (SBP) and determining their antimicrobial sensitivity and resistance patterns. The research is conducted at Chandka Teaching Hospital, Larkana, among patients diagnosed with SBP. It examines ascitic fluid culture findings, identifies commonly isolated bacterial pathogens, and evaluates their response to commonly prescribed antibiotics. The study also aims to provide information about local antimicrobial resistance trends that may help healthcare professionals select appropriate empirical antibiotic treatment and improve patient management.

LITERATURE REVIEW

Spontaneous bacterial peritonitis (SBP) is one of the most common infections associated with cirrhosis and ascites. SBP describes the infection of ascitic fluid in the absence of an intra-abdominal infection that is amenable to surgery. SBP stems from translocation of bacteria within the intestinal tract. With the

help of increased intestinal permeability, bacteria cross into the bloodstream, and eventually, the peritoneal cavity. This phenomenon is worsened by the immune system's inability to defend and the dysbiosis (shift in microbial balance) of the gut. SBP is one of the top contributors to advanced liver disease to be frequently hospitalized and leads to a faster rate of deteriorating health and death.

SBP diagnosis focuses on the analysis of ascitic fluid. The ascitic fluid differential reveals an abundance of SBP cases with a polymorphonuclear leukocyte count of ≥ 250 cells/mm³. Although an important step for the antibiotic treatment and identification of the infecting organism, the fluid culture may be negative due to prior antimicrobial therapy and/or a decrease in bacterial presence. Recognition of SBP should be along the same lines as the administration of antibiotics to limit the progression and complications of the disease. Recent guidelines (Biggins et al., 2021) have offered the best practice of continually assessing the antibiotic resistant pattern as the variability of the infecting organism will dictate the treatment.

Risk Factors Associated with SBP

Several factors that create conditions for impaired host immunity and help bacterial migration contribute to the higher risk of spontaneous bacterial peritonitis (SBP) in patients with chronic liver diseases. The risk factors for development of SBP include: advanced cirrhosis, low concentration of protein in the ascitic fluid, gastrointestinal bleeding, long duration of hospitalization, previous episodes of SBP and frequent use of antibiotics.

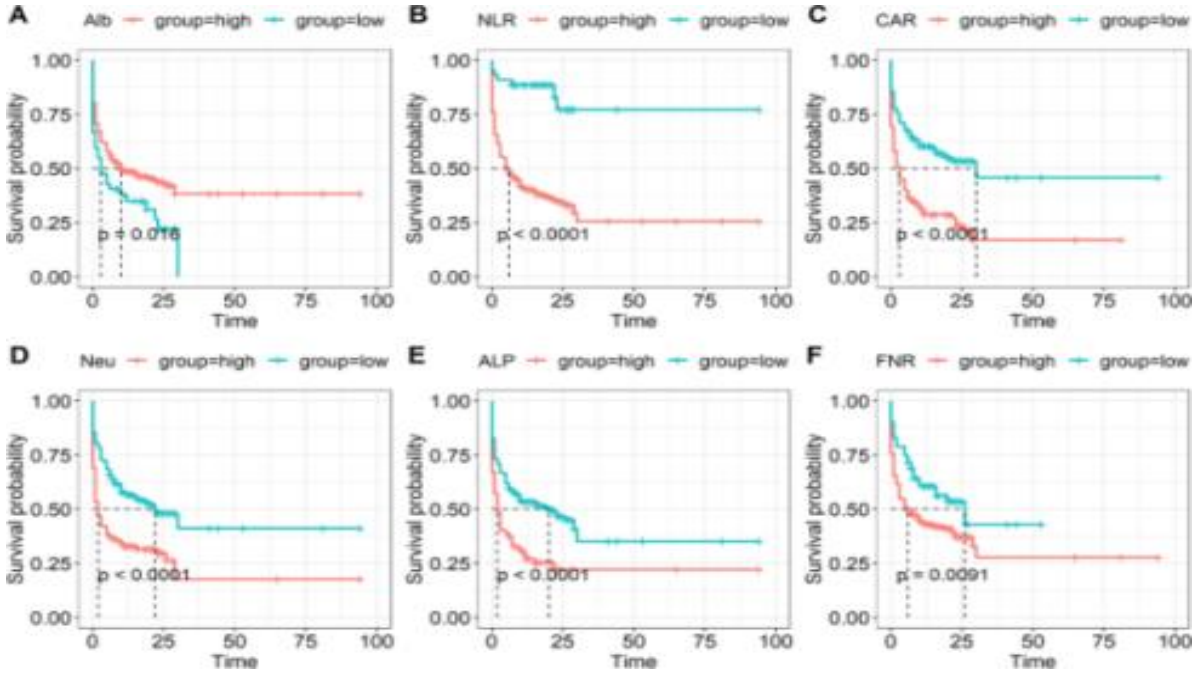


Fig 2.1 Risk Factors Associated with SBP

Chronic liver failure leads to severe dysfunction of the immune system and low levels of complement and phagocytes and increased susceptibility to infection. Frequent hospitalization and invasive medical procedures expose the patient to resistant, hospital-acquired, and nosocomial infections. Development of healthcare-associated SBP with extensive use of antibiotics is especially alarming. Inadequate initial antibiotic treatment for multi-drug resistant organisms will lead to a poor prognosis (Arroyo et al., 2022).

Common Bacterial Isolates in SBP

Over the years, there has been a change in the bacterial causes of SBP. In the past, it was often thought that the major Gram-negative enteric bacterial SPCs were Escherichia coli and

Klebsiella pneumoniae, because traditionally they were the most imported species. In the SBP, these bacteria enter the abdominal cavity from the gut through bacterial translocation. Gram-positive bacteria, of late, have been increasing in the reports of SBP, especially the Enterococcus spp., Staphylococcus aureus, and Streptococcus spp.

It has been observed that increasing duration of hospitalization, more invasive procedures, and increased antibiotic use has resulted in a shift of causative pathogens from community-acquired to healthcare-associated pathogens. It has been documented that although Gram-negative organisms are still one of the major bacteria causing SBP, in addition to them, increasing multidrug-resistant Gram-positive organisms have caused difficulties in the choice of empiric treatment (Alfieri et al., 2024).

Antibiotic Susceptibility Trends in SBP

Patterns in antibiotic resistance of bacteria that cause spontaneous bacterial peritonitis (SBP) vary globally and across health care facilities. Third-generation cephalosporins have been the standard first-line therapy for SBP. However, the resistance of bacterial isolates has rapidly increased, and the efficacy of third-generation cephalosporins has decreased in many institutions.

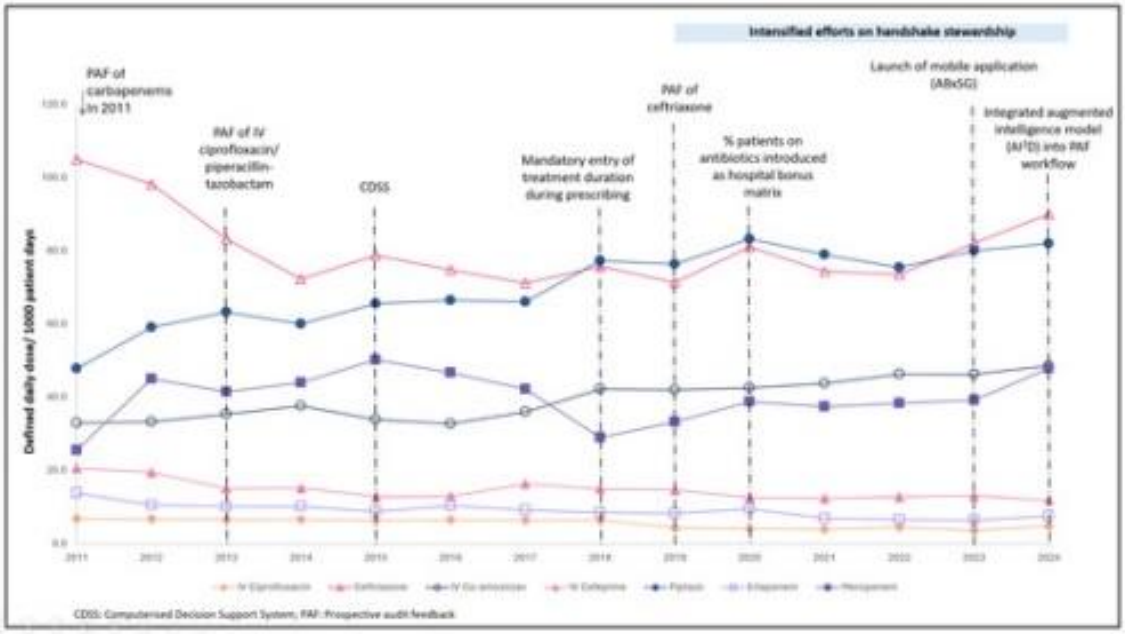


Fig 2.2 Antibiotic Susceptibility Trends in SBP

The emergence of extended-spectrum beta-lactamase (ESBL)-producing organisms, carbapenem resistant and resistant bacteria, and multidrug resistant bacteria have made treatment even more difficult. Some reports describe a connection between the choice of empiric antibiotic and SBP patient mortality. Therefore, restriction of empiric antibiotics to those agents to which the bacteria in the facility are least resistant improves the chance of SBP patient survival. Continuous surveillance of the results of bacterial sensitivity in order to apply the most effective treatment in a timely manner is of critical importance (Fiore et al., 2024).

Global and Regional Antibiotic Resistance Patterns

The management of spontaneous bacterial peritonitis (SBP) is particularly affected by the worldwide issue of antibiotic resistance. Prophylactic antibiotic use, broad-spectrum antibiotic use, and multiple hospital visits are increasing the selection of resistant bacteria. More cases of SBP are reporting more multidrug-resistant organisms, resistant Enterobacterales, and vancomycin-resistant Enterococcus. The disparity of antibiotic resistance globally is greatly affected by the differences in antibiotic prescribing practices, infection control, and the overall organization of a country's healthcare system. The

developing world suffers from the over-prescription of antibiotics and a lack of surveillance disciplines to track antibiotic use. So that clinicians can choose the best options for empirical and targeted infection control, studies based on the region are necessary to gather information on bacterial isolates and their sensitivity to the drugs available.

MATERIALS AND METHODS

A descriptive cross-sectional study design was used to investigate the bacterial profiles as well as the drug sensitivity patterns of patients who had SBP. The study aimed to find the bacterial isolates with the collection of ascitic fluid and the profiles of antimicrobial susceptibility.

Study Setting (Chandka Teaching Hospital Larkana)

The study took place at Chandka Teaching Hospital Larkana, a significant tertiary care facility in Sindh, Pakistan. The hospital caters to a large number of Patients who have liver diseases with associated complications. The study performed a microbiological analysis of the ascitic fluid samples conducted in the hospital laboratory using the standard microbiological procedures.

Study Duration

During this time, samples from patients with suspected spontaneous bacterial peritonitis and collecting ascitic fluid were included in the study and analyzed.

Study Population

The study population included patients who were clinically suspected of or diagnosed with spontaneous bacterial peritonitis and were admitted to Chandka Teaching Hospital larkana. Patients who met the inclusion criteria were selected for the study to undergo microbiological analysis of the ascitic fluid and the antibiotic susceptibility test.

Inclusion Criteria

- Patients included in the study fulfilled the following criteria
- Diagnosed or suspected of having spontaneous bacterial peritonitis.
- Ascites undergoing diagnostic paracentesis.
- Presence of ascitic fluid with features of a possible bacterial infection.
- Availability of some related clinical and laboratory data for analysis.

Exclusion Criteria

1. Secondary bacterial peritonitis from surgical or intra-abdominal causes
2. Patients with incomplete clinical information
3. Contaminated and/or improperly collected samples of ascitic fluids
4. Samples which are unsuitable for microbiological processing

Sample Collection and Processing

Patients had ascitic fluid collected by the clinical team via diagnostic paracentesis. This invasive procedure was done under aseptic conditions, and samples were transported to the microbiology lab as soon as possible. Established procedures were upheld to reduce the chances of assay contamination and promote precise identification of bacteria.

Ascitic Fluid Examination

Ascitic fluid samples were evaluated using traditional laboratory methods. Cell counts were done to evaluate inflammatory changes, including the polymorphonuclear leukocyte counts, a major diagnostic indicator for spontaneous bacterial peritonitis. Gram stain results and cultures, when available, were also done in the workup to help with the identification of the infection and to help with the diagnosis.

Microbiological Identification of Bacterial Isolates

Bacterial isolates taken from ascitic fluid cultures were recognized using standardized microbiological method. Recognition was based on morphology of the colony, features of gram staining, biochemical reactions, as well as other laboratory recognition methods that the microbiology department used.

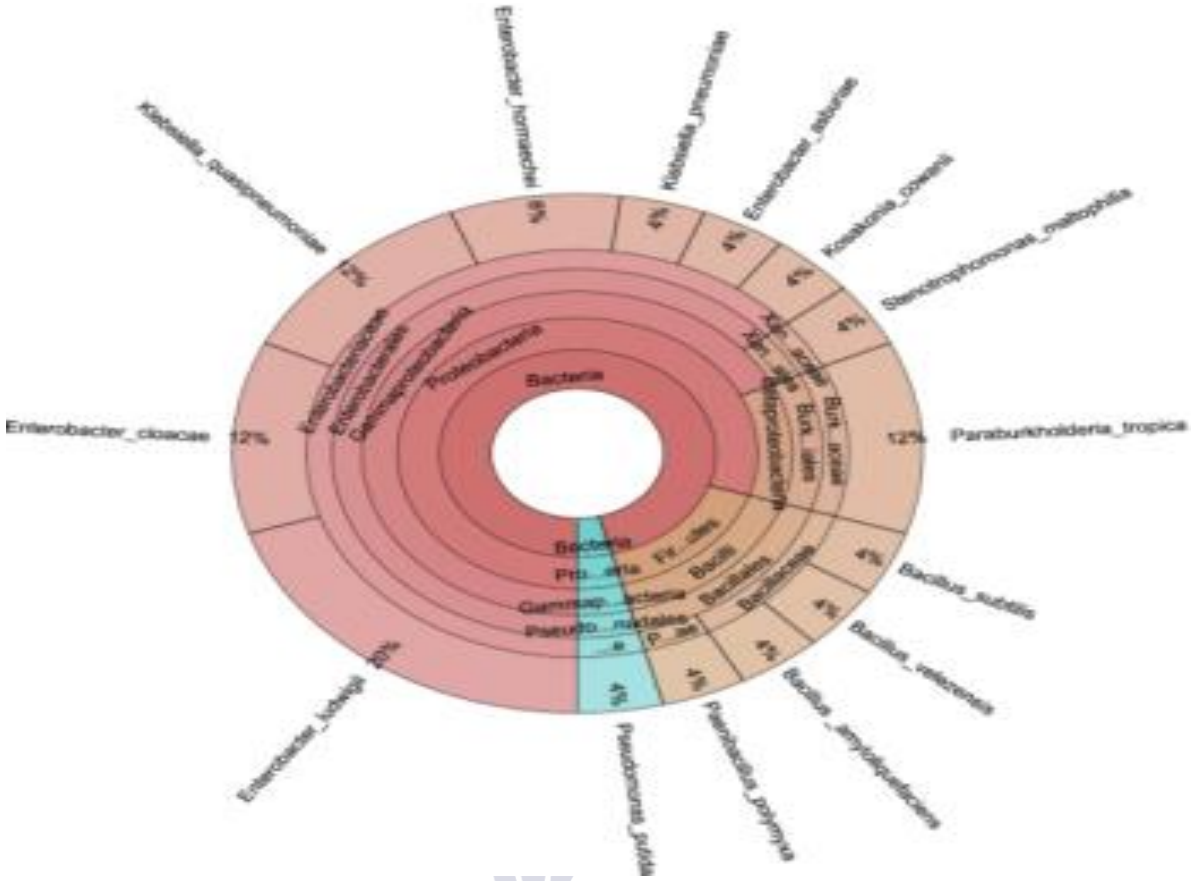


Fig 3.1 Microbiological Identification of Bacterial Isolates

Isolated organisms were classified as being Gram-positive or Gram-negative bacteria, and their distribution among SBP cases was noted.

Antibiotic Sensitivity Testing Method

Antibiotic susceptibility testing was done to check the response of the bacterial isolates to the antimicrobial agents. For these tests, the standard laboratory practices for the application of the disk diffusion method were used.

The measurement of the antibiotic sensitivity results involved the assessment of the diameters of the zones of inhibition and grading the bacterial isolates as sensitive, intermediate, or resistant as per the standard reference.

Antibiotics Tested

According to the availability and significance at the lab, the bacterial isolates were exposed to some of the antimicrobial agents. The antibiotics that were tested were ones that are prescribed most commonly when treating SBP and also to treat other bacterial infections and include:

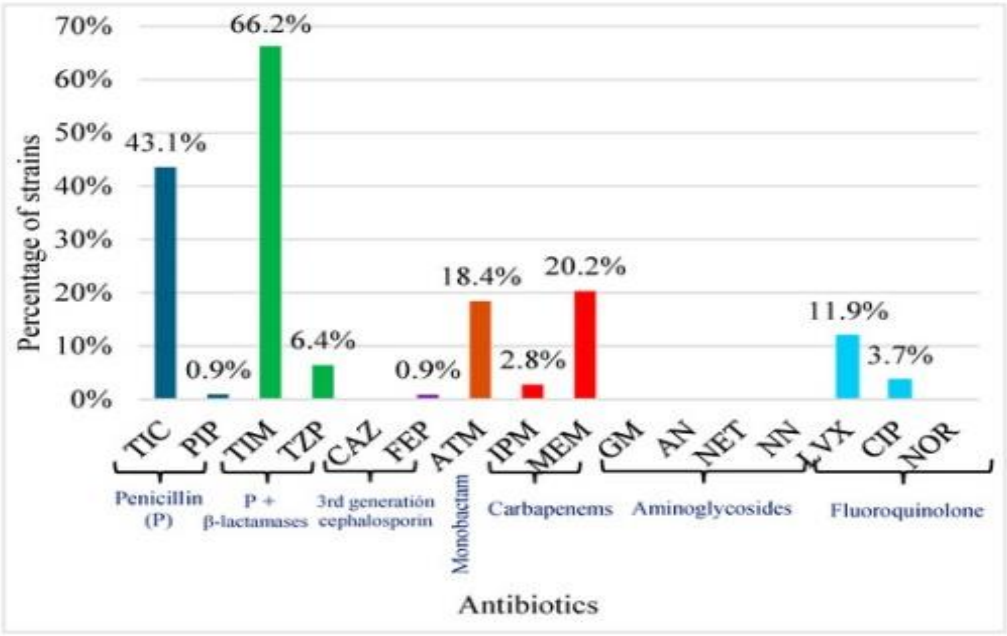


Fig 3.2 Antibiotics Tested

- Cefotaxime/Ceftriaxone
- Piperacillin-Tazobactam
- Meropenem
- Ciprofloxacin
- Gentamicin
- Amikacin

Data Collection and Statistical Analysis

A structured data collection form was used to collect clinical and laboratory data. Patient demographics and data regarding bacterial isolates and antibiotic sensitivity were collected and analyzed.

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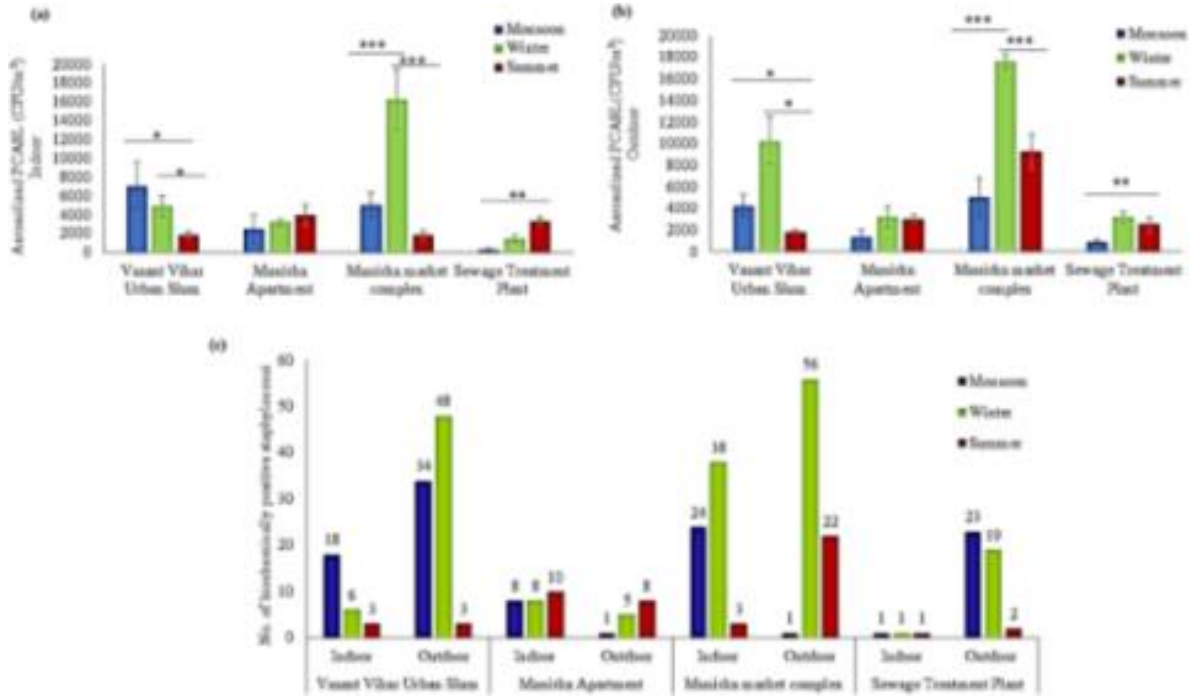


Fig 3.3 Data Collection and Statistical Analysis

The data were analyzed using appropriate statistical methods. Findings were shown using frequencies and percentages, and data were summarized in tables and graphs to depict the distribution of bacteria and the patterns of antimicrobial susceptibility.

Ethical Considerations

The pertinent institutional authority gave us their ethical approval for this study. During the research, we kept the patient's privacy. During the complete study, no personal patient information was revealed. Samples were collected and processed as per the clinical laboratory standards.

RESULTS ANALYSIS

One hundred patients were recruited for this study with a diagnosis of spontaneous bacterial peritonitis (SBP) suspected. Samples of peritoneal fluid were collected. Microbiological processing of these samples was conducted. The samples were examined through culture, identification of the bacteria, and antimicrobial susceptibility testing. Out of 100 samples of peritoneal fluid, 38 samples showed bacterial growth and 62 samples showed no bacterial growth. The isolated bacterial organisms were analyzed further based on demographics and distribution, as well as the pattern of antibiotic sensitivity and resistance.

Demographic Characteristics of Patients

Categorizing study participants by demographic characteristics helps understand the distribution of spontaneous bacterial peritonitis (SBP) in different patient populations. We categorize participants by gender and age groups Of the total 100 study participants, the majority were male. Males were 64 (64%) and females were 36 (36%). Higher rates of SBP in males may reflect higher rates of chronic liver disease, specifically liver cirrhosis, in the male population. Ages 41 to 60 years had the most representation among study participants, with 52% of participants. Participants over 60 comprised the next most represented age group. It is evident that the combination of chronic liver disease and chronic immune dysfunction among the middle-aged and elderly population respectively, explains the higher rates of SBP in these age groups.

Table 4.1: Distribution of Patients According to Age and Gender

Demographic Variable	Frequency (n)	Percentage (%)
Gender		
Male	64	64%
Female	36	36%
Age Group		
21–40 years	18	18%
41–60 years	52	52%
Above 60 years	30	30%
Total	100	100%

Clinical Characteristics of SBP Patients

Patients experiencing spontaneous bacterial peritonitis exhibit symptoms from both the infection and the failing liver. We needed to determine prevalence of the specific symptoms. For this study, the most common clinical observation was abdominal swelling, present in 82% of the study participants, followed by fever in 67% and abdominal pain in 61% of study participants. Many of the study participants experienced chronic liver disease, a strong precursor of developing bacterial infection in the ascitic fluid.

Table 4.2: Clinical Presentation of SBP Patients

Clinical Feature	Frequency (n)	Percentage (%)
Abdominal distension	82	82%
Fever	67	67%
Abdominal pain	61	61%
Nausea/Vomiting	38	38%
Altered consciousness	24	24%
Chronic liver disease	89	89%

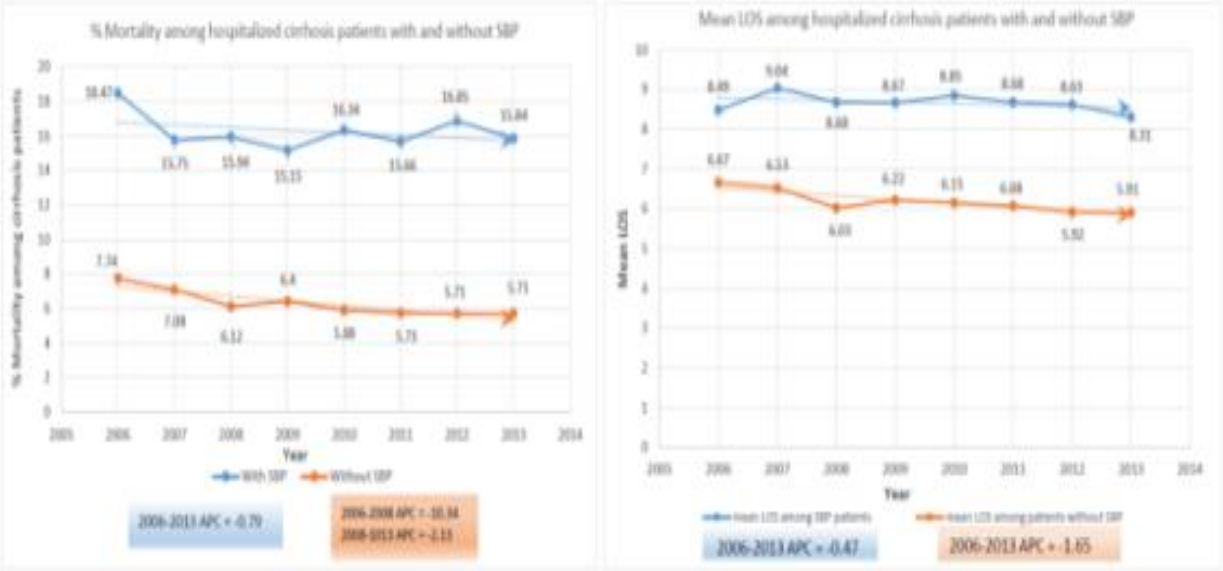


Fig 4.1 Clinical Presentation of SBP Patients

Distribution of Bacterial Isolates

Culture examination of samples of ascitic fluid discovered bacteria in 38 samples. Isolated species were identified by traditional microbiological techniques Of the isolated organisms, Escherichia coli had the highest occurrence (39.5%), followed by Klebsiella pneumoniae (23.7%). Pseudomonas species, Staphylococcus aureus, and Enterococcus species were also obtained.

Medicine-related ascending bacterial translocation remains the normal occurrence of SBP. The dominance of Gram-negative species of bacteria that were isolated points to the variable dominance of organisms in SBP from Gram-positive to those of Gram-negative organisms.

However, the presence of Gram-positive bacteria indicates a changing pattern of bacteria due to hospital exposure and antibiotic utilization.

Table 4.3: Frequency of Bacterial Isolates from Ascitic Fluid

Bacterial Isolate	Frequency (n)	Percentage (%)
Escherichia coli	15	39.5%
Klebsiella pneumoniae	9	23.7%
Pseudomonas aeruginosa	4	10.5%
Staphylococcus aureus	5	13.2%
Enterococcus species	3	7.9%
Other organisms	2	5.2%
Total	38	100%

Frequency of Gram Positive and Gram Negative Organisms

The separated bacteria were organized using the Gram staining traditional method. Compared to Gram-positive organisms, Gram-negative organisms were found to be more prevalent. In all the positivity samples, 73.7% of the bacteria were Gram-negative, while the remaining 26.3% were Gram-positive.

Table 4.4: Distribution of Gram Positive and Gram Negative Bacteria

Bacterial Category	Frequency (n)	Percentage (%)
Gram-negative bacteria	28	73.7%
Gram-positive bacteria	10	26.3%
Total	38	100%

Antibiotic Sensitivity Pattern of Isolated Bacteria

Antimicrobial susceptibility testing was carried out to analyze the efficacy of frequently used antibiotics on the isolated bacteria. The results showed different sensitivity patterns with different antimicrobial agents.

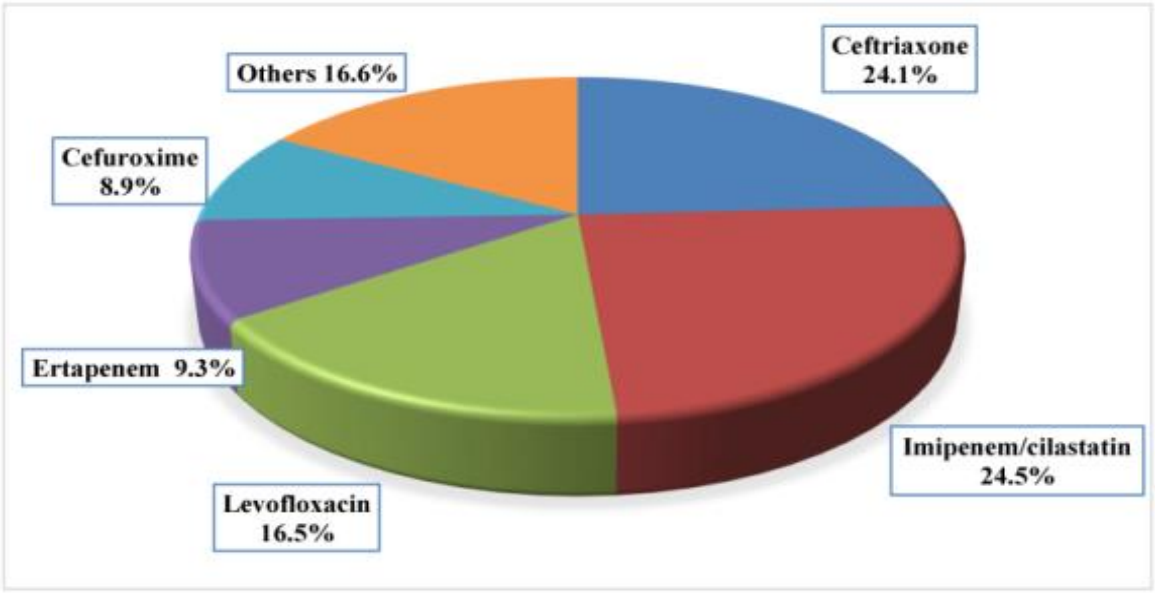


Fig 4.2 Antibiotic Sensitivity Pattern of Isolated Bacteria

Among all the antibiotics tested, Meropenem had the highest sensitivity (89%). This was followed by Amikacin and Piperacillin-Tazobactam. Increased resistance was shown among the SBP-associated bacterial isolates for Ciprofloxacin and the third generation of cephalosporins.

Table 4.5: Overall Antibiotic Sensitivity Pattern

Antibiotic	Sensitive (%)	Resistant (%)
Meropenem	89%	11%
Amikacin	79%	21%
Piperacillin-Tazobactam	76%	24%
Gentamicin	63%	37%
Ceftriaxone	55%	45%
Cefotaxime	52%	48%
Ciprofloxacin	42%	58%

Antibiotic Resistance Pattern Among Bacterial Isolates

Multidrug resistant bacteria were noted to be primarily E. Coli and Klebsiella pneumoniae Gram-negative isolates. This study showed that there are resistant bacterial strains in SBP patients.

Because resistant bacteria were noted, the selection of the final therapy should be preceded by performing routine antimicrobial susceptibility testing.

Table 4.6: Antibiotic Resistance Pattern Among Major Isolates

Organism	Resistant Antibiotics	MDR Cases
E. coli	Ciprofloxacin, Ceftriaxone	6
Klebsiella pneumoniae	Ceftriaxone, Cefotaxime	5
Pseudomonas aeruginosa	Ciprofloxacin	2
Staphylococcus aureus	Penicillin, Ciprofloxacin	2
Enterococcus species	Ciprofloxacin	1

DISCUSSION

Spontaneous bacterial peritonitis (SBP) refers to the rapid onset of life-threatening sepsis in a subset of patients with advanced liver cirrhosis complicated by the accumulation of abdominal fluid (ascites). This study aimed to investigate the bacterial patterns and their antimicrobial sensitivity in patients of SBP with reference to their ascitic fluid samples, attending Chandka Teaching Hospital Larkana, Pakistan. This survey describes the pattern of bacterial pathogens in this region. It also describes the pattern of antimicrobial resistance, which might help improve empirical antibiotic therapy and modify the overall patient management.

In this study, bacterial growth in ascitic samples was observed in 38% of samples, whereas the rest showed no growth. Ascitic fluid culture showed a comparable positive growth to other similar previously conducted studies. A number of studies have documented that a variable bacterial positive growth may be observed. This may be due to the characteristics of the patient, their recent antibiotic treatment, sample handling, and/or laboratory techniques. Culture negative SBP is common as a patient may be pre treated with antibiotics and/or a low concentration of bacteria may exist in ascitic fluid.

Demographic data showed that SBP was found to be more common in males, and in the middle-age and elderly age groups. It can be assumed that this is due to the greater prevalence of chronic liver diseases, and especially cirrhosis, in older males. Reported studies on patients with chronic liver disease have also shown a male predominance (Biggins et al., 2021).

Interpretation of Major Findings

Results from this study indicate that the predominant causes of SBP were found to be Gram-negative organisms, with Escherichia coli being the most isolated and Klebsiella pneumoniae the second. These results define the role SBP developing from the translocation of intestinal Gram-negative bacteria due to the translocation of bacteria from the gut.

Enteric E. coli is one of the leading organisms in SBP, and is also associated with gut translocation, and is able to penetrate extra intestinal sites when immunity is impaired, and intestinal permeability is increased. Cirrhotic patients' translocation of bacteria is facilitated by decreased complement activity and deteriorated intestinal bacterial clearance.

Staphylococcus aureus and Enterococcus spp, both Gram-positive organisms, were also isolated. While Gram-negative organisms were the most plentiful, the presence of Gram-positive organisms illustrates the effect of prolonged stays in hospitals, invasive practices, and over-prescription of antibiotics.

Comparison with Previous Studies

Other studies have reported Escherichia coli and Klebsiella pneumoniae as the primary culprits of SBP and our findings matched with those studies. SBP caused by the Community Acquired Infection has been predominantly caused by enteric Gram-negative organisms. More recently Gram-positive organisms and multi-drug resistant organisms have been

reported, especially in Healthcare Associated Infections.

As reported by other studies, the organisms that cause SBP differ by area and by the healthcare organizations that treat patients. Reports from hospitals with high antibiotic usage, especially those that report a high usage of specific antibiotics, show a higher resistance to antibiotics when compared to organizations with lower usage. The reports from Chandka Teaching Hospital Larkana show the importance of monitoring the patterns of usage and resistance, as the variation can depend on area and possibly the organization that provides the hospital.

Changing Trends in Antibiotic Sensitivity

The study showed that antibiotic sensitivity varied greatly across the different classes of antimicrobials tested. The most active antibiotic tested was Meropenem, followed by Amikacin and Piperacillin-Tazobactam. Conducted studies have shown that the sensitivity of patients to antibiotics like Ceftriaxone, Cefotaxime, and Ciprofloxacin, which are commonly used antibiotics, is substandard.

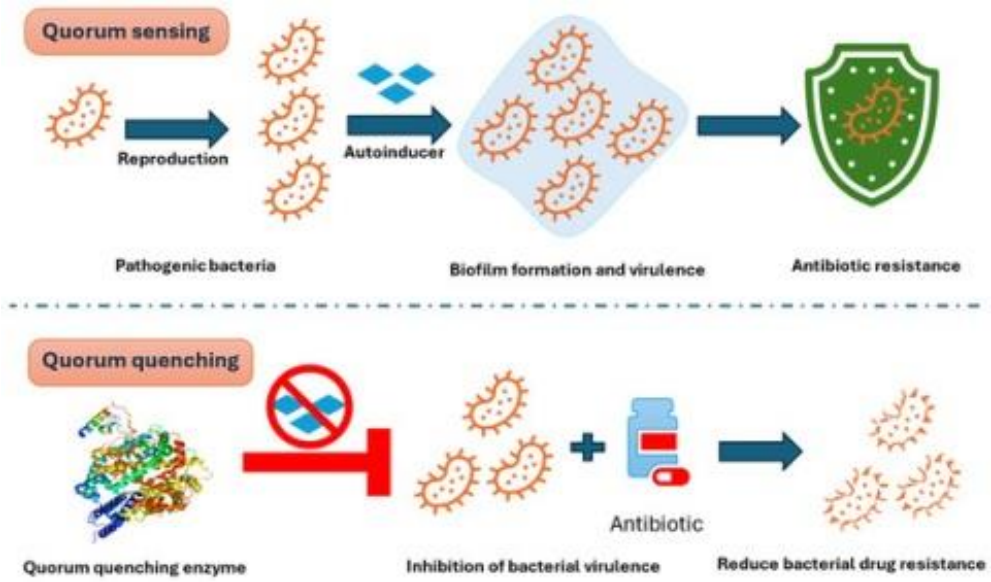


Fig 5.1 Changing Trends in Antibiotic Sensitivity

The observed ineffectiveness of commonly used antibiotics is probably because of the rampant trumped up empirical antibiotics and the inappropriate use of antibiotics. The incessant liberalization of antibiotics creates a selective pressure for the resistant bacterial strains. Trends for increased resistance of the SBP (Spontaneous Bacterial Peritonitis) pathogens are reported globally, especially for patients with repeated hospitalizations and previous exposure to antibiotics (Fernández et al, 2024).

Multidrug resistance pathogens pose considerable therapeutic obstacles because treatment failure from inappropriate empirical therapy will cause increased mortality in SBP patients. Therefore, empirical therapy must be tailored to local antibiotic resistance patterns.

Implications for Empirical Antibiotic Therapy

This research expands knowledge of the management of SBP at Chandka Teaching Hospital Larkana. In continuously evolving profiles of pathogens, resistance patterns periodically report on local susceptibility to aid in the formulation of appropriate empirical measures.

SBPs have been more effectively managed at Chandka Teaching Hospital using third generation cephalosporins. However, resistance of some of the bacterial isolates may hinder their usefulness in other healthcare setups. The isolation of resistant Gram-negatives also necessitates the selection of antibiotics with greater discrimination, requiring the alteration of therapeutic regimes based on culture results.

Continuing routine microbiological analysis of the ascitic fluid is necessary to aid the management of SBP. The early discovery of

pathogenic bacteria and their antimicrobial action will decrease the incidence of treatment failures and the misuse of broad-spectrum antibiotics, which will help in preventing the further increase in antimicrobial resistance.

Study Strengths and Limitations

There is local information and evidence concerning bacterial isolates and drug sensitivity patterns in SBP patients at a tertiary care hospital. This study is worth reading for clinicians in medical care and clinical microbiology. There are some weaknesses in the study. The data was collected in only one hospital, meaning the information cannot be generalized to other hospitals. The sample size and the time duration of the study can determine bacterial distribution and resistance. Patient history and taking antibiotics before can also influence results in bacterial culture and sensitivity. Future directions of research must include multicenter studies and larger samples to determine the continued changes in bacterial resistance and the local trends of antimicrobial resistance in SBP.

CONCLUSION

Spontaneous bacterial peritonitis (SBP) is a serious complication of liver cirrhosis and ascites. This study evaluated bacterial profiles and antibiotic sensitivity patterns at Chandka Teaching Hospital, Larkana. Gram-negative bacteria were predominant, while multidrug-resistant organisms were also identified. Meropenem showed the highest antibiotic sensitivity. Regular culture and sensitivity testing, antibiotic resistance surveillance, and appropriate antibiotic use are essential to improve patient outcomes. Further multicenter studies are recommended.

RECOMMENDATIONS

The study results concerning bacterial isolates and their antibiotic sensitivity in situations of spontaneous bacterial peritonitis (SBP) led to several recommendations.

Culture and Sensitivity Testing

In cases of suspected SBP, and prior to the start or change of antibiotic treatment, ascitic fluid should be routinely sent for culture and antimicrobial susceptibility testing.

Antibiotic Treatment Guidelines

Local antibiotic treatment guidelines should be developed in as much as the pattern of local bacterial populations and resistance shape appropriate treatment. Hospital-specific antibiotic resistance surveillance provides the best basis for the selection of empiric antibiotics, as opposed to generalized or regional guidelines.

Surveillance of Antimicrobial Resistance

To understand and respond to changes in antimicrobial resistance, SBP and the surveillance of the antibiotic resistance should be routinely practiced. The assessment of antimicrobial susceptibility should be conducted prior to the emergence of resistant bacterial strains.

Antimicrobial Stewardship

The use of antibiotics should be restricted to the necessary instances and justified clinically, with the least amount of exposure possible to narrow the development of resistance. The use of broad-spectrum antibiotics should be limited to only justified cases.

Infection Control

Hand hygiene and aseptic techniques should be standardized and implemented along with intentional practices to minimize patient exposure to bacterial populations that are resistant to multiple drugs.

Management of SBP

Cirrhotic patients with ascites should be evaluated for SBP, especially when there are signs of infection. Early detection along with the timely use of appropriate antibiotics can help reduce complications and save lives.

To gain additional data on the patterns of bacteria and antimicrobial resistance related to SBP, further studies of multiple centers with wider populations of different regions of Pakistan are essential.

The application of antibiotic stewardship programs in hospitals can yield the proper selection of antibiotics and the right dose and duration of the therapy and can limit antimicrobial resistance.

REFERENCES

American Association for the Study of Liver Diseases. 2021 practice guidance for the diagnosis and management of ascites, spontaneous bacterial peritonitis and hepatorenal syndrome. In: Biggins SW, Angeli P, Garcia-Tsao G, editors. Hepatology. Vol. 74. 2021. p. 1014–48.

European Association for the Study of the Liver. Journal of Hepatology. 2022;77(3):807-824.

Fernández J, Prado V, Trebicka J. Journal of Hepatology. 2024;80(1):120-135.

Kim JH, Lee JS, Kim MN. Clinical and Molecular Hepatology. 2023;29(4):650-663.

Piano S, Singh V, Caraceni P, et al. Hepatology International. 2020;14:1-12.

Marciano S, Díaz JM, Dirchwolf M, Gadano A. Annals of Hepatology. 2021;24:100345.

De Mattos AA, Wiltgen D, Jotz RF, et al. Clinical Liver Disease. 2020;15(2):85-91.

Alexopoulou A, Vasilieva L, Agiasotelli D, et al. European Journal of Gastroenterology & Hepatology. 2021;33(4):522-530.

Piano S, Tonon M, Angeli P. Journal of Hepatology. 2021;75(3):590-602.

CDC. Antibiotic resistance threats report. Atlanta: 2022.

Runyon B. Management of ascites in cirrhosis. Hepatology. 2020;72(1):248-264.

Ginès P, Cárdenas A, Arroyo V, Rodés J. Complications of cirrhosis, ascites and SBP: A review. New England Journal of Medicine. 2020;382:1619-1630.

Moreau R, Jalan R, Gines P, et al. Acute-on-chronic liver failure and bacterial infection. Journal of Hepatology. 2021;75:124-137.

Elfert A, Abo Ali L, Soliman S. The SBP pathogens and their antibiotic resistance: A review. Arab Journal of Gastroenterology. 2022;23:210-216.

Chen J, Huang J, Wang Q. Spontaneous bacterial peritonitis: clinical features and antimicrobial resistance. Frontiers in Medicine. 2023;10:1156789.

Lee WS, Lee CH. Emerging antimicrobial resistance in cirrhotic patients with bacterial infection. Infection and Drug Resistance. 2021;14:3001-3012.

Piroth L, Pechinot A, Minello A. The SBP microbial challenge. Clinical Microbiology and Infection. 2020;26:1281-1287.

Fernández J, Navasa M, Gómez J, et al. Cirrhosis and bacterial infections: An epidemiologic and antimicrobial review. Hepatology. 2021;74:185-195.

Wong F. Cirrhosis and the challenge of managing bacterial infections. Canadian Journal of Gastroenterology. 2020;34:315-324.

Piano S, Caraceni P, Angeli P. Cirrhosis, antibiotic prophylaxis, and resistance: Challenges and progress. Liver International. 2022;42:1201-1212.

Singal AK, Bataller R, Ahn J. Infectious complications of chronic liver disease: A clinical overview. Clinical Gastroenterology and Hepatology. 2020;18:1806-1818.

1. Biggins SW, Angeli P, Garcia-Tsao G, et al. Diagnosis, evaluation, and management of ascites, spontaneous bacterial peritonitis and hepatorenal syndrome: 2021 practice guidance by the American Association for the Study of Liver Diseases. Hepatology. 2021;74(2):1014–1048. doi:10.1002/hep.31884.

European Association for the Study of the Liver. EASL clinical practice guidelines for the management of patients with decompensated cirrhosis. Journal of Hepatology. 2018;69(2):406–460.

Piroth L, Pechinot A, Di Martino V, et al. Evolving epidemiology and antimicrobial resistance in spontaneous bacterial peritonitis: a two-year observational study. BMC Infectious Diseases. 2014;14:287. doi:10.1186/1471-2334-14-287.

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Oey RC, de Man RA, Erler NS, Verbon A, van Buuren HR. Microbiology and antibiotic susceptibility patterns in spontaneous bacterial peritonitis: a study of two Dutch cohorts at a 10-year interval. United European Gastroenterology Journal. 2018;6(4):614–621. doi:10.1177/2050640617744456.

Sheikhbahaei S, Abdollahi A, Hafezi-Nejad N, Zare E. Patterns of antimicrobial resistance in the causative organisms of spontaneous bacterial peritonitis: a single centre, six-year experience of 1981 samples. International Journal of Hepatology. 2014;2014:917856. doi:10.1155/2014/917856.

Friedrich K, Nüssle S, Rehlen T, Stremmel W, Mischnik A, Eisenbach C. Microbiology and resistance in first episodes of spontaneous bacterial peritonitis: implications for management and prognosis. Journal of Gastroenterology and Hepatology. 2016;31(6):1191–1195. doi:10.1111/jgh.13266.

Fiore M, Maraolo AE, Gentile I, et al. Nosocomial spontaneous bacterial peritonitis antibiotic treatment in the era of multi-drug resistance pathogens: a systematic review. World Journal of Gastroenterology. 2017;23(25):4654–4660. doi:10.3748/wjg.v23.i25.4654.

Fiore M, Di Franco S, Alfieri A, et al. Spontaneous bacterial peritonitis caused by Gram-negative bacteria: an update of epidemiology and antimicrobial treatments. Expert Review of Gastroenterology & Hepatology. 2019;13(7):683–692. doi:10.1080/17474124.2019.1621167.

Bibi S, Ahmed W, Arif A, Khan F, Alam SE. Clinical, laboratory and bacterial profile of spontaneous bacterial peritonitis in chronic liver disease patients. Journal of the College of Physicians and Surgeons Pakistan. 2015;25(2):95–99.

Haider I, Ahmad I, Rashid A, Bashir H, Faheem M. Causative organisms and their drug sensitivity pattern in ascitic fluid of cirrhotic patients with spontaneous bacterial peritonitis. Journal of Postgraduate Medical Institute. 2008;22(4).

Baqai K, Laique N, Ziauddin F. Ascitic fluid cultivated organisms and their antimicrobial resilience pattern in patients with liver cirrhosis. Pakistan Journal of Medicine and Dentistry. 2018;7(4).

Chachar AZK, Haider M, Ali S, Yaqoob N, Lashari NA, Ahmed HB. A study of ascitic fluid of cirrhotic patients with spontaneous bacterial peritonitis: common microorganisms and their antibiotic sensitivity. Pakistan Journal of Medical and Health Sciences. 2021;15(6):1415–1418. doi:10.53350/pjmhs211561415.

Ahmad B, Ishaq MS, Ali Q, Khan MA, Khan MI. Microbiological analysis and antibiotic susceptibility for spontaneous bacterial peritonitis in hospitalized patients with and without hepatitis C. The Journal of Microbiology and Molecular Genetics. 2023;4(3):86–94. doi:10.52700/jmmg.v4i3.137.

Sarwar S, Tarique S, Waris U, Khan AA. Cephalosporin resistance in community acquired spontaneous bacterial peritonitis. Pakistan Journal of Medical Sciences. 2019;35(1):4–9. doi:10.12669/pjms.35.1.17.

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