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Study of the Antibiotic Resistance Profile of *Klebsiella Pneumonia* in Patients Infected with Covid- 19

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Abstract: Antimicrobial resistance (AMR) is a global public health challenge. AMR is the ability of a microorganism to resist antimicrobial attack, which in turn prevents successful treatment of an infection. Massive antibiotic therapy has led to an increase in the antibiotic resistance of pathogens of infectious diseases. The problem of antibiotic resistance is especially acute in the treatment of nosocomial infections. Nosocomial infections also called "hospital-acquired infections", are infections acquired during hospital care which are not present or incubating at admission. Infections occurring more than 48 hours after admission are usually considered nosocomial. The main reason for the prolonged hospitalization of patients infected with COVID-19 is to internal infections of the hospital and complications caused by their influence. it was important to determine the bacterial spectrum of etiological agents of nosocomial infections in patients infected with COVID-19 and the profile of antibiotic resistance. The research materials were collected at the different hospital resuscitations from patients undergoing treatment for a long time and who were resistant to antibiotics. As the resalts showed the highest resistance to amp/sulbactam, Aztreonam, ampicillin, meropenem, moxifloxacin, cefepime, ceftazidime, cefotaxime, ciprofloxacin Levofloxacin, amox/clavulanate, norfloxacin, pip/tazobactam, ceftriaxone was detected in 100 %, resistance to cefoxitin, trim/sulfa and amikacin in 90%, resistance to tobramycin in 80%, and the relatively low resistance was detected to gentamycin in 20 %.

Keywords: Klebsiella pneumonia, Antibiotic resistance, Covid- 19, Nosocomial infection

Introduction

The antibiotic resistance profile of *Klebsiella pneumoniae* in COVID-19 patients is an important topic of investigation since secondary bacterial infections frequently aggravate the clinical course of COVID-19. *Klebsiella pneumoniae* is a bacterial pathogen that has been linked to healthcare-associated illnesses and has been linked to pneumonia and other severe diseases. Understanding the antibiotic resistance profile of COVID-19 is critical for successful patient care and infection control. Coronavirus disease of 2019 (COVID-19), the disease caused by infection with the SARS-CoV-2 virus, has caused the worst pandemic since the 1918 influenza. Through the end of October 2022, 627 million confirmed cases and 6.5 million deaths from COVID-

19 have been reported globally. Patients infected by SARS-CoV-2 can be coinfected with Klebsiella pneumoniae while in the intensive care unit (ICU). During the pandemic, the capacity of many ICUs was exceeded due to the large increase in hospital admissions, which could have increased the frequency of co-infection with nosocomial microorganisms such as carbapenemase-producing Enterobacterales (CPE). (Cañada-García et al., 2023). Bacterial and fungal nosocomial infection is a common complication of ICU admission in patients with COVID-19. It usually presents as a severe form of infection, and it is associated with a high mortality and longer course of ICU stay. (Bardi et al., 2021).

The COVID-19 era brought about new medical challenges, which, together with nosocomial bacterial infections, resulted in an enormous burden for the healthcare system. One of the most alarming nosocomial threats was carbapenem-resistant Klebsiella pneumoniae (CRKP). Monitoring CRKP incidence and antimicrobial resistance globally and locally is vitally important. (Ficik et al.,2023).

In recent years, the rapid spread of resistance caused by the production of extended-spectrum beta-lactamase (ESBL) among bacteria has increased the importance of *Klebsiella pneumoniae* bacteria. Regular monitoring of antibiotic resistance rates of bacteria is very important for the treatment of infections and new treatment methods that can be developed. In the study, it was aimed to determine the antibiotic resistance profiles and ESBL positivity rates of *Klebsiella pneumoniae* isolated from patients. (Doganay et al., 2023)

Materials and Methods

Susceptibility profile and identification of the infection *klebsiella pneumonia (*n=12) isolates collected in different hospital services were performed by disc diffusion methods according to the EUCAST guidelines, and API 20E, respectively. The research materials were collected at the different hospital resuscitations from patients undergoing treatment for a long time and who were resistant to antibiotics. The biological fluid, urine, blood and sputum were used as the study materials. Within the grant have been done (Targeted scientific research projects of BSU) - Collecting nosocomial infections in suspected patients in the resuscitation of hospitals in Adjara; Doing bacteriological research of a sample to determine the possible causative agents in the material, the isolation using the method of pure culture, the plating of a sample on the various media; Selecting, staining and microscopy of suspicious colonies on the basis of the first examination of the Petri dishes; Obtaining pure cultures by subculturing; The final identification of the microorganisms by using the identification systems Api- 20E.

Antimicrobial agents (amp/sulbactam, cefoxitin, Aztreonam, ampicillin, meropenem, moxifloxacin, cefepime, trimethoprim–sulfamethoxazole, tobramycin, ceftazidime, cefotaxime, ciprofloxacin, Levofloxacin, amox/clavulanate, norfloxacin, piperacillin–tazobactam, gentamicin, ceftriaxone, imipenem, amikacin) for *Klebsiella pneumoniae* were used for AST. Because of differences in the concentrations of some antimicrobial agents between the EUCAST , BD BBL Sensi-Disc (Becton, Dickinson and Company) and Thermo Scientific Oxoid disc (Oxoid, Basingstoke, UK) were selectively used according to the EUCAST (European Committee on Antimicrobial) Susceptibility Testing (EUCAST) guidelines. For *Klebsiella pneumoniae* (gram-negative bacilli), disk diffusion tests were performed using Oxoid disks containing piperacillin–tazobactam, cefotaxime, and ceftazidime and BD disks containing imipenem, meropenem, ciprofloxacin, amikacin, gentamicin, tobramycin, and trimethoprim–sulfamethoxazole.

The antibiotic resistance of klebsiella *pneumonia* to 19 various antibiotics was determined. The test of antibiotic resistance clearly showed a high resistance. Disk diffusion method was employed to evaluate antimicrobial susceptibility against amp/sulbactam, cefoxitin, Aztreonam, ampicilin, meropenem, moxifloxacin, cefepime, trimethoprim–sulfamethoxazole, tobramycin, ceftazidime, cefatoxim, ciprofloxacin, Levofloxacin, amox/clavulanate, norfloxacin, piperacillin–tazobactam, gentamicin, ceftriaxon, imipenem, amikacin.

Results and Discussion

As the results of microbiological research (by using the disc diffusion method of antibiotic sensitivity, the method of carbapenem resistance, ESBL testing method), it has been found that antibiotic resistance condition is enough severe. Antibiotics of different generations, used in this study, have shown a high-quality of resistance, which should be considered. Antibiotic sensitivity was studied by using the disc diffusion method where the variety of antibiotics has been used. The indicators of sensitivity for each microbe were calculated according to the regulation European Committee on Antimicrobial Susceptibility Testing (EUCAST).

meropenem, moxifloxacin, cefepime, ceftazidime, cefotaxime, ciprofloxacin, Levofloxacin, amox/clavulanate, norfloxacin, pip/tazobactam, ceftriaxone, was detected in 100 %, resistance to cefoxitin, trim/sulfa and amikacin in 90%, resistance to tobramycin in 80%, and the relatively low resistance was detected to gentamycin in 20 % (Figure 1 & Figure 2).
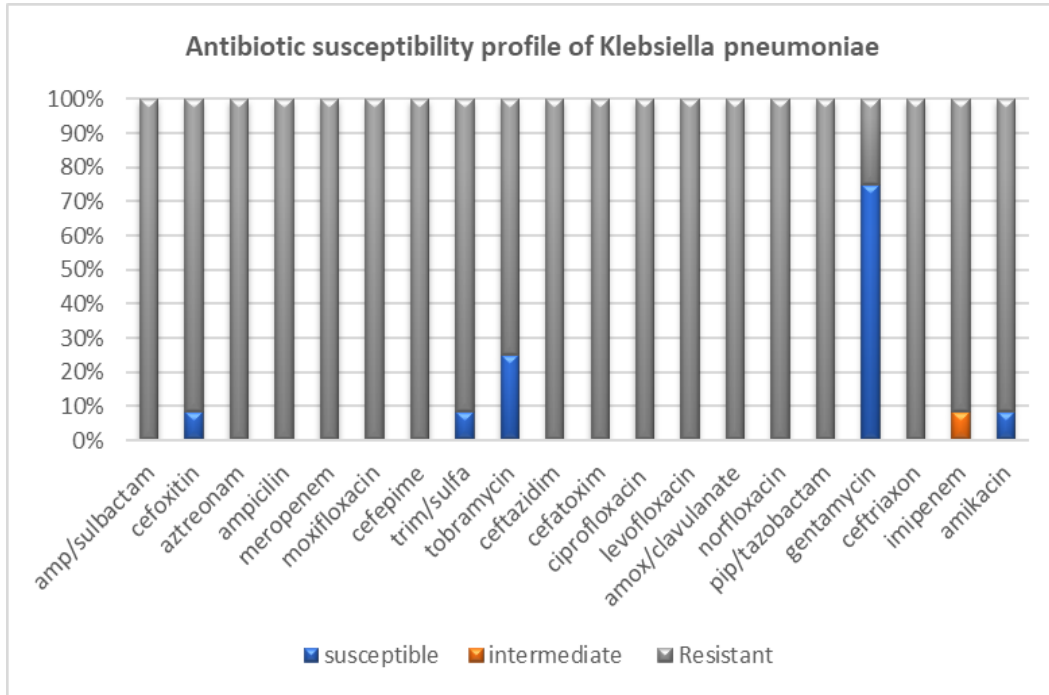

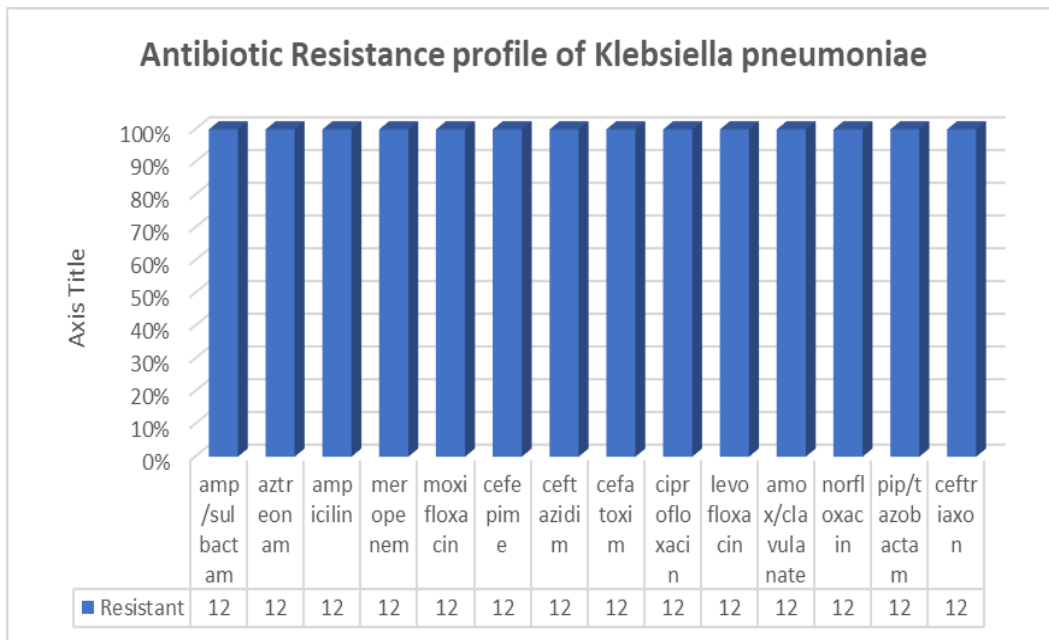Figure 1. Antibiotic susceptibility profile of *Klebsiella pneumonia*

Figure 2. Antibiotic resistance profile of *Klebsiella pneumoniae*

The reasons to develop the antibiotic resistance should be - Making mistakes associated with antibiotic therapy carried out for respiratory infections; Taking an antibiotic without diagnosing the disease of the bacterial origin; The irreducibility of the local situation of resistance in prescribing a medicine; Controlling the antibiotics taken by patients all their life; Starting the antibiotic therapy in the wrong dose; Taking the insufficient sample for the microbiological research; Making an improper evaluation of the severity of infection; The unjustified change of antibiotic; The long or short course antibiotic therapy; The irreducibility of the side effects of antibiotics; Using

the antibiotics, which can not penetrate deep into the tissue; Choosing the wrong antibiotic; Giving the wrong dose of antibiotics.

Conclusion

The COVID-19 pandemic has underscored the importance of addressing nosocomial infections within healthcare settings. Combating the silent threat of healthcare-associated infections requires a coordinated effort, with healthcare facilities, staff, and policymakers working together to implement and enforce infection control measures. As the world continues to navigate the challenges of the pandemic, understanding and mitigating the risk of nosocomial infections is crucial to protect both patients and healthcare workers.

The result of the current study showed the growing number of nosocomial infections associated with *klebsiella pneumonia Resistant* strains increasingly cause public health problems; therefore, their early detection is essential for healthcare centers. It is important to determine not spontaneous, but the correct course of antibiotic therapy, which will be the key to the patient**'s** recovery**.** The bacterial spectrum of nosocomial infections identified during the study and specific antibiotics that are sensitive to the microbes that cause these infections will allow healthcare workers to properly deal with the infection and, most importantly, save the patient's life. Therefore, the study of this issue on a regional scale is very important.

Antimicrobial resistance (AMR) is a global public health challenge. AMR is the ability of a microorganism to resist antimicrobial attack, which in turn prevents successful treatment of an infection. Massive antibiotic therapy has led to an increase in the antibiotic resistance of pathogens of infectious diseases. The main reason for the prolonged hospitalization of patients infected with COVID-19 is to internal infections of the hospital and complications caused by their influence. it was important to determine the bacterial spectrum of etiological agents of nosocomial infections in patients infected with COVID-19 and the profile of antibiotic resistance. The research materials were collected at the different hospital resuscitations from patients undergoing treatment for a long time and who were resistant to antibiotics.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the authors.

Acknowledgements or Notes

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