ORIGINAL ARTICLE

Prevalence and Antibiogram of *Klebsiella Species* from urine and tracheal samples from ICU patients of Sheikh Zayed Medical College/Hospital, Rahim Yar Khan

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ABSTRACT

Background: *Klebsiella* is Gram negative, capsulated, non-motile, multi-drug resistant (MDR) bacilli, belonging to the Enterobacteriaceae family. *Klebsiellapneumoniae* is the most common causes of pneumonia, urinary tract and bloodstream infections in patients in intensive care unit (ICU). It has become an increasingly important etiologic agent of hospital acquired infections in latest years. The main reason for this is development of resistance to several antimicrobial drugs and expression of virulence factors.

Aim: To determine the prevalence and antibiogram of *klebsiellaspp* from urine and tracheal samples of ICU patients.

Methods: A total of 100 clinical samples of urine and tracheal secretions were collected from emergency intensive care unit (E-ICU) and neuro-surgical intensive care unit (N-ICU). Tracheal secretions were streaked on two agar i.e., MacConkey and Blood agar. Urine samples were streaked on a quarter plate of CLED agar. Plates were placed in incubator aerobically at 35–37°C .The sensitivity testing of all clinical isolates was done by the standard method.

Results: In present study, out of 100 samples, 36% were *klebsiella* isolates, 24% showed other organisms and 40% showed no growth. 92% of *klebseilla spp.*isolated from various clinical samples was not sensitive to amoxicillin clavulanic acid followed by gentamycin (64%), piperacillintazobactam (89%), ciprofloxacin (39%), ceftazidime (100%) and amikacin (39%) and 94% of isolates have growth inhibited to imipenem.

Conclusion: it is critically important to have strict antibiotic policies to prevent the spread of the MDR bacteria. Different surveillance programs for multidrug resistant organisms and infection control procedures should be implemented.

Keywords: Tracheal, Antibiogram, ICU, MDR and CLED.

INTRODUCTION

Septicemia and shock caused by sepsis are the main reasons of mortality and morbidity in ICU. After culturing of clinical samples and identification of microorganism, proper antibiotics are started initially in ICU to cover common sepsisand infection causing pathogens. Early treatmentof critically ill patients with infection with adequate antibiotics improves survival outcomes.A rise in MDR bacteria limits the available treatment options for infections in the intensive care unit. Within a few years a rapid increase of multidrug-resistant organisms, which is a emergence problem in terms of infection control[1].

The genus *Klebsiella*contains Gram negative, capsulated, non-motile bacilli, belonging to the Enterobacteriaceae family. There are five species under this genus, *Klebsiellapneumoniae, Klebsiellaoxytoca, Klebsiellaplanticola, Klebsiellaterrigena,* and*Klebsiellaornithinolytica*.[2] Amongst them, the most common opportunistic and nosocomial pathogen is *Klebsiellapneumoniae*. *K. pneumoniae*is a pathogen and responsible for ~10% of hospital acquired infections, which include pneumonia, UTIs, and hepatic abscess.. The colonization of mucous membranes by bacteria is the due to adhesion between the bacterial capsule and the host's mucous layer[3].

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K. pneumoniae cause pneumonia, pyogenic infections, meningitis, urinary tract infections (UTI) and rarely diarrhoea and attack immunocompromised, hospitalized individuals associated with diabetes mellitus, chronic pulmonary, cardiac, renal and neoplastic diseases. They can colonize in the gastrointestinal tract of humans.[2]Patients who have supportive measures with catheters or ventilators are more prone for infections. Secondly, high risk patient due to the disruption of the normal flora, deeming them more susceptible to pathogens.[4]

Nosocomial infections (NIs) are considered as a urgent problems in health care centers, because 8.7% of the hospitalized patients are affected worldwide.As an opportunistic pathogen, Klebsiella spp. primarily attacked immune-compromised individuals.Antimicrobial resistance (AMR) is the main problems globally and it is defined as the ability of bacteria and other microorganisms to resist different drugs. There are different important mechanisms of AMR such as target alterations, and efflux pump.Klebsiella spp. are exhibiting an increase in antimicrobial resistance making it essential for the identification of resistant bacteria. These resistances of Klebsiella spp. is mainly due to the production of ESBLs, which are enzymes that hydrolyze and inactivate beta lactam drugs like penicillin, third generation cephalosporins, aztreonam.[5] ESBLs are different enzymes that deactivate beta-lactam antibiotics by hydrolysis. These can be genetically transferred on plasmids and hydrolyze antibiotic third generation cephalosporins which are

inactivated by tazobactam or sulbactam and clavulanic acid. The ESBL enzymes are basically found in Escherichia coli and Klebsiellaspp..ESBLs are coded by transferable, conjugative plasmids which can lead to outbreaks. These multi drug resistant (MDR) bacteria mostly do not respond to the available antibiotics.[6]

There has been no study that is carried out in Sheikh Zayed Hospital, RYK about the prevalence and antibiogram of Klebsiella spp. from urine and tracheal samples of ICU patients. It is multi-drug resistant organism. It is always neglected in clinical wards and it shows increase rate of mortality and morbidity. This research project has two steps first we isolated the klebsiella species from urine and tracheal samples and in next step we determined antibiogram against MDR Klebsiellaspecies. The main objectives of the study to determinethe prevalence of Klebsiella in urine and tracheal samples from ICU patients and to assess the Antibiogram of Klebsiella isolates from the samples.

MATERIALS AND METHODS

This is a cross sectional study and it was conducted in the Microbiology section of pathology department Sheikh Zayed Medical College/ Hospital, Rahim yar khan, Pakistan in a four months (October 2017 to January 2018).A total of one hundred clinical samples urine and tracheal secretions were collected from emergency ICU and neuro-surgical ICU patients. Only midstream urine (MSU) was used to reduce impurity with natural flora in genitourinary tract. It was ensured that the patient was not on medication. 10-20 ml of freshly void urine was taken from non-catheterized patients in a sterile container. This was labeled with the information about patient .The samples immediately brought to the microbiology laboratory for further processing. Tracheal aspirates were collected in profusion tube.

Isolation of bacteria: Urine specimens were inoculated on a quarter plate of CLED agar (OXOID company)and tracheal secretions were inoculated on Blood and MacConkeyagar (OXOID company) provided by Microbiology Department. Plates were incubated aerobically at 35–37 °C in incubator. All positive cultures that have growth i.e., their characteristics colony appearance on the media plates were further identified and then confirmed by the specific biochemical reactions.

Antimicrobial susceptibility testing: The antimicrobial susceptibility testing of all clinical isolates was done by the standard disk diffusion method on Muller Hilton agar. The turbidity of the isolated colony suspension was compared to the density of a McFarland 0.5 in order to standardize the inoculums. The swab was used to distribute the bacteria evenly over the entire surface of Muller Hinton agar (Oxoid).

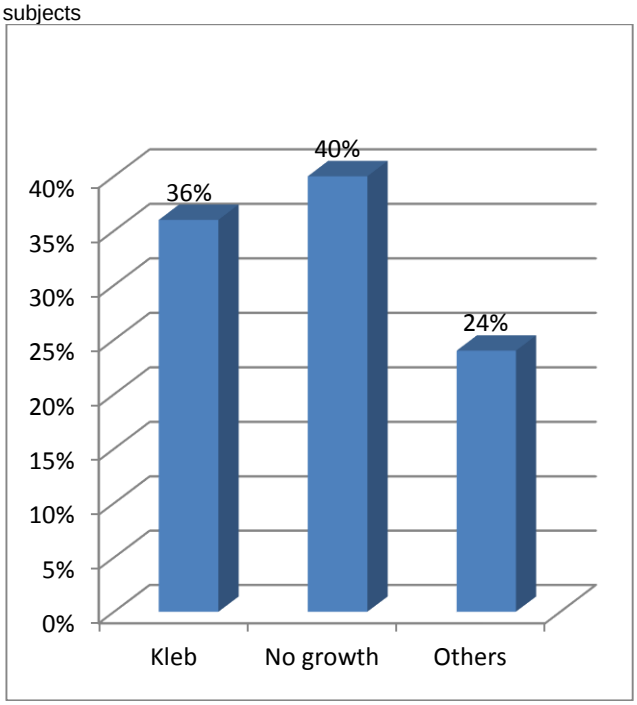
Interpretation of susceptibility testing: The plated were placed in the incubator for overnight. After 24 hours of plates were examined by Vernier calipers method to read the zone of inhibition and results were interpreted according to CLSI 2014 .

RESULTS

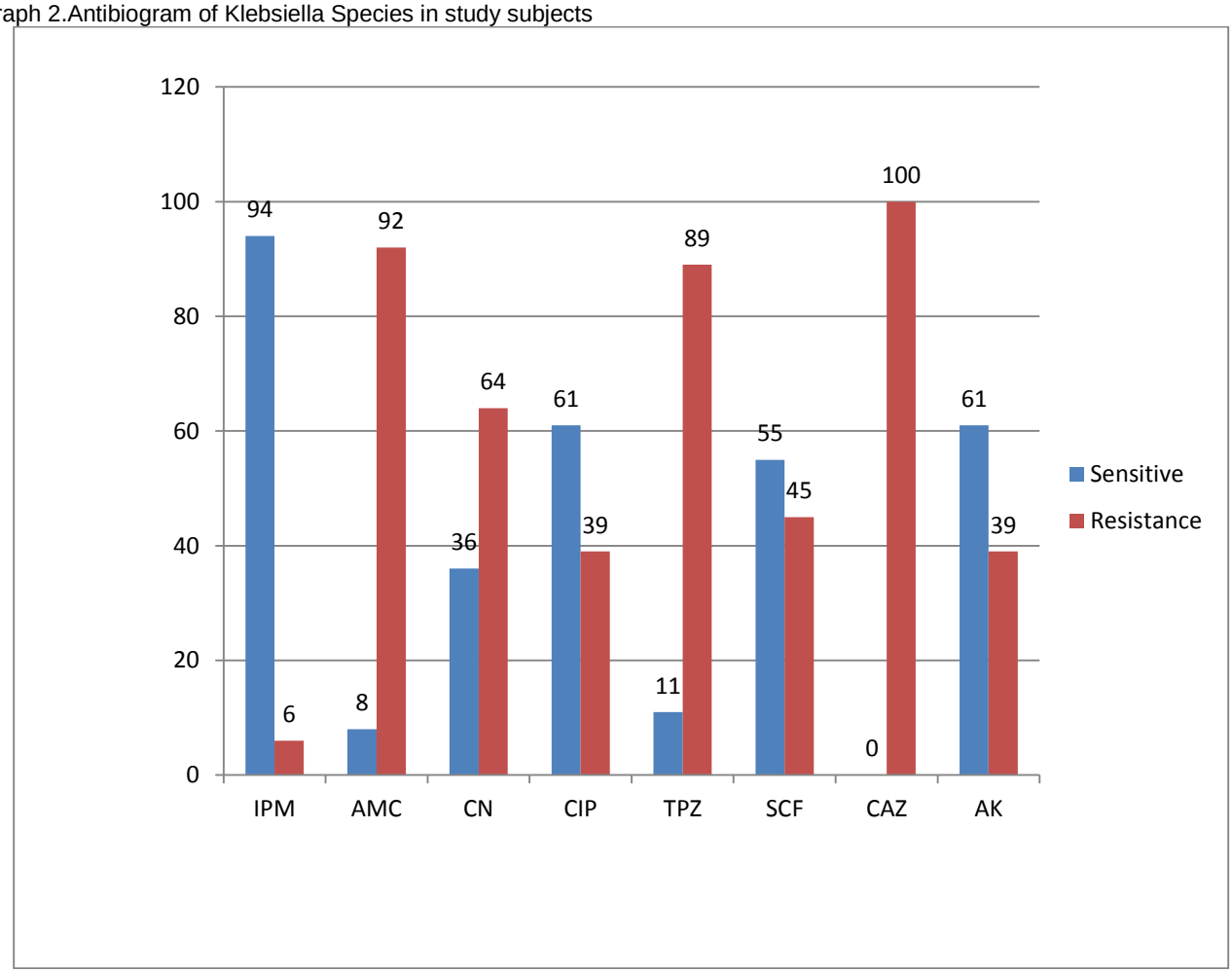
A total of one hundred samples were collected from Emergency-ICU (48%) and Neuro-surgical ICU (52%).In present study, out of 100 samples, 36% were klebsiella isolates, 24% showed other organisms and 40% showed no growth. Clinical samples include urine (48%) and Tracheal secretions (52%) (Fig. 2). Klebsiella species showed 6% resistance against imipenem (IPM), 92% against amoxicillin clavulanic acid (AMC), 39% resistance against ciprofloxacin (CIP), 100% against ceftazimide (CAZ), 39% resistance against amikacin (AK), 64% resistance against gentamicin (GEN), 45% resistance against sulzone (SCF) and 89% against piperacililintazobactam (TPZ).

Table 1 shows that Mean ± S.D of Age (years) was 40.18 ± 10.515.

Graph 1: Frequency of Bacterial Growth and no growth in study subjects



Graph 2.Antibiogram of Klebsiella Species in study subjects



DISCUSSION

There was a total of 100, non-repeat isolates of *Klebsiella* from October 2017 to January 2018. The maximum isolates, (66.6%) were tracheal secretions from age group ranging 41-50 years and the isolates were recovered more from males (61%).So the current study was conducted to determine theprevelance and antibiogram of *Klebsiella spp.* from urine and tracheal samples of ICU patients. In recent study the growth rate of *klebsiella species* was similar with other studies conducted in different parts of world. Out of hundred clinical samples 36 klebseilla were identified for antibiotic sensitivity testing.

In this study, the major clinical isolates of *klebsiella* were isolated from tracheal secretion of N-ICU (66.6%), followed by urine from E-ICU (25%). These results are in agreement with studies of Asha et al 2 and other studies. In our study, most of isolates were *klebsiella*from various clinical samples were resistant to amoxicillin: clavulanic acid (92%) followed by gentamycin (64%), piperacillin (89%), ciprofloxacin (39%), ceftazidime (100%) andamikacin (39%). In our study, more than 94% of isolates were sensitive to imipenem and only 6% were resistant to this antibiotic.

This study almost matches to a study from Bangladesh by Jesmine et al. that showed significant resistance to amoxicillin clavulanic acid at (80%)[7]. In another study conducted in Kawait by Hassan et al showed ceftazidime resistance at 71.2% which is not in accordance with our study in which ceftazidime is 100% resistant[8].

This study is comparable with the study results of Bangladesh (Dhaka) by Chakraborty et al. in which gentamicin is 45% resistance[9]. These results mismatched with our findings in which gentamicin is 64% resistance.We estimated increase resistant against ceftazidime (100%) as matched to other studies. Imipenem (carbapenem) shows extraordinary activity in our study and this could be due to its occasional use in the treatment.

CONCLUSION

*Klebsiella*is one of the most important resistant bacterial pathogen due to the irrational and inappropriate use of antibiotics. Antimicrobial surveillance should be done periodically to monitor the current susceptibility patterns in different local hospitals of Pakistan. The programme can be strategic by continuous efforts ofclinician, pharmacist, microbiologistand community. Regular hand washing to prevent spread of organism should be encouraged. Simple

hand washing can protect ourselves and our nearby from the dangerous infection. Better surgical and medical care should be provided to patients during hospital stay.

Therefore we recommend careful empirical prescription, culture and sensitivity testing and selection of drugs consequently.

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