Antibiogram of klebsiella pneumoniae recovered from blood stream infection at tertiary care hospital, Baroda, Gujarat

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Abstract

Introduction: Antimicrobial abuse is a serious risk factor for the emergence of multi-drug-resistant (MDR) pathogens. Multidrug resistant (MDR) Klebsiella pneumoniae is an increasing cause of blood stream infections in India and in other developing countries.

Aim: This study was undertaken to determine the prevalence of Klebsiella pneumoniae in blood stream infections and their susceptibility pattern at S. S. G. Hospital, Baroda.

Material and Methods: 169 isolates of Klebsiella pneumoniae were obtained from blood culture samples from hospitalized patients. K.pneumoniae species were identified based on biochemical reactions. Their sensitivity pattern were checked by Kirby-bauer disc diffusion technique as per CLSI guideline. Antimicrobial discs used were Ceftazidime (30µg), Cefotaxime (30µg), Imipenem (10 µg), Levofloxacin (5 µg), Aztreonam (30 µg), Co-trimoxzole (25 µg), Ampicilin (10 µg), Gentamicin (10 µg), Amikacin (30 µg), Doxycycline (30 µg).

Results: 950 blood cultures were studied from suspected patients and the prevalence of K. pneumoniae among them was checked with its antimicrobial susceptibility at Department of Microbiology, Tertiary care hospital, Gujarat. Among 950 suspected patients in the study period, K.pneumoniae was found in 169 blood culture samples.

Conclusion: Infections with K.pneumoniae are increasing, particularly among paediatric patients. This pathogen is usually multidrug-resistant and there are limited treatment options available. This result warns us for implementation of infection control measures to limit intra-institutional spread of these organisms.

Keyword: K.pneumoniae, Antimicrobial tests, Infection control.

Introduction

Klebsiella pneumoniae (K. pneumoniae) is a major cause of nosocomial infections among all Enterobacteriaceae and also in community acquired infection. It is associated with various clinical conditions like urinary tract infections, septicaemia, respiratory tract infections, rarely diarrhoea. This bacillus was first isolated by Friendlander (1883) from fatal cases of pneumonia.

Klebsiella is a 'superbug' that causes a range of diseases, depending on which part of the body it infect. K.pneumoniae is a bacterium that normally lives inside human intestines, where it doesn't cause disease. However, K. Pneumoniae gets into other areas of the body, it can cause a range of different illnesses. The inadvertent use of broad-spectrum antibiotics has led to the emergence of multidrug resistant Gram-negative bacteria.[1] Klebsiella species are of significant importance in this regard.[2] Microbiological culture of blood remains gold standard for the diagnosis of bacterial agents and antibiotic susceptibility providing essential information for the evaluation of broad range of diseases like endocarditis, pneumonia, pyrexia of unknown origin and helpful particularly in patients with suspected sepsis allowing for successful recovery of bacteria in 99% patients with bacteraemia.[3]

Early initiation of appropriate antimicrobial treatment is critical in decreasing morbidity and mortality among patients with bloodstream infections. Knowledge of local epidemiology is required for optimal management of sepsis. This study was undertaken to monitor temporal change in prevalence of K. pneumoniae as a causative organism for septicaemia and its antimicrobial sensitivity patterns from blood cultures of patients admitted to different wards at S. S. G. Hospital, Baroda which would be helpful for the selection of appropriate antibiotic therapy and determination of empiric antimicrobial strategies guiding in infection control and rational use of antibiotics in this region.

Material and Methods

Study duration and Sample size: This prospective study was conducted from January 2014 to June 2014 at S.S.G. Hospital, Baroda. During this period total 950 samples of blood culture were tested, of which 169 samples showed growth of K. pneumoniae.

Ethical clearance: All these samples were a part of diagnosis. So ethical consideration is not necessary.

Methodology

Blood samples from culture were collected following aseptic precautions. The venous site was cleaned with 70% alcohol and 2% chlorhexidine with allowing it to dry for 1- 2 minutes. One milliliter (neonates) and 5 ml (children) blood was collected and inoculated into 10 and 50 ml of brain heart infusion broth with 0.025% of Sodium polyanethol sulphonate

as anticoagulant (1:10 dilution) respectively. The culture bottles were incubated at 37°C aerobically and periodic subcultures were done day 2, day 4 and finally on day 6 onto blood agar and Mac Conkey's agar. Plates were examined for the growth of bacteria. All positive cultures were identified by their characteristic appearance on their respective media, Gram staining reaction and were confirmed by the pattern of biochemical reactions using the standard methods.[4] Antibiotic susceptibility test were performed against locally available antibiotics by using disk diffusion methods in accordance with Clinical and Laboratory Standards Institute (CLSI) criteria.[5] Control strains, Escherichia coli ATCC 25922 (Beta – Lactamase negative) disc diffusion method as per CLSI guidelines. Antimicrobial used were Ceftazidime (30µg), Cefotaxime (30µg), Imipenem (10 µg), Levofloxacin (5 µg), Aztreonam (30 µg), Co-trimoxzole (25 µg), Ampicilin (10 µg), Gentamicin (10 µg), Amikacin (30 µg), Doxycycline (30 µg)

Results and Analysis

950 blood cultures were studied from suspected patients and the prevalence of K. pneumoniae among them was checked with its antimicrobial susceptibility at Department of Microbiology, Tertiary care hospital, Gujarat. Among 950 suspected patients in the study period, K. pneumoniae was found in 169 blood culture samples.

Statistical analysis was done manually. Qualitative variables were expressed as percentages and the culture reports were issued.[6]

Table 1: Gender wise distribution of patients

Gender of patients	No. of positive blood cultures (n=169)	% of positive blood culture (n=169)
Male	109	64.5%
Female	60	35.5%
Total	169	100%

Table 1 shows gender wise distribution of samples. Klebsiella pneumoniae was isolated from (64.5%) males and (35.5%) females.

Table 2: Ward-wise distribution of Klebsiella pneumoniae from blood culture

Wards	No. of Klebsiella pneumoniae isolate (n=169)	% of Klebsiella pneumoniae isolate (n=169)
Paediatric	86	50.9%
Neonatal ICU	78	46.1%
Surgery	3	1.8%
Medicine	2	1.2%

Table 2 shows Ward- wise distribution of Klebsiella pneumoniae.

Maximum Klebsiella pneumoniae were isolated from Paediatric ward (50.9%) followed by neonatal ICU (46.1%) then Surgical ward (1.8%) followed by Medicine ward (1.2%).

Table 3: Antibiotic sensitivity pattern of Klebsiella pneumoniae recovered from blood culture

Antibiotic drugs	Sensitivity pattern of Klebsiella pneumoniae (n=169)
Ceftazidime	143 (84.6%)
Cefotaxime	143 (84.6%)
Imipenem	168 (99.4%)
Levofloxacin	157 (92.8%)
Aztreonam	143 (84.6%)
Co-trimoxazole	144 (85.2%)
Ampicillin	134 (79.2%)
Gentamicin	107 (63.3%)
Amikacin	109 (64.4%)
Doxycycline	121 (71.5%)

Table 3 shows Antibiotic sensitivity of Klebsiella pneumoniae isolated from blood culture.

Klebsiella pneumoniae isolated from blood culture samples were sensitive to Imipenem (99.4%), Levofloxacin (92.8%) followed by Co-trimoxzole (85.2%), Ceftazidime (84.6%), Cefotaxime (84.6%), Aztreonam (84.6%), Ampicilin (79.2%), Doxycycline (71.5%), Amikacin (64.4%), Gentamicin (63.3%)

Discussion

Changing trend in microbiology, epidemiology of the infecting agent and the clinical and prognostic significance of bacteraemia has been observed over the last 20 years. The timely detection of bacteraemia can have a profound influence on the clinical outcome.[7] The study demonstrates bacteraemia caused by Klebsiella pneumoniae and their susceptibility pattern to the most commonly used oral and parenteral antimicrobial agents.

Klebsiella pneumoniae (K. pneumoniae) is a major cause of nosocomial infections among all Enterobacteriaceae and also in community acquired infection. It is associated with various clinical conditions like urinary tract infections, septicaemia, Respiratory Tract Infection and Diarrhoea. But the usual transmissibility of the responsible plasmids has lead to the spread of this resistance to other members of Enterobacteriaceae. The implementation of rational antibiotic use and changes in the hospital antibiotic policies such as antibiotic cycling and class restriction for a time period have been reported beneficial.[8] A sincere effort or stewardship on the part of the clinicians to restrict the use of empirical therapy is mandatory.

Lack of infection control procedures, inadequate sterilization of multiuse instruments, understaffing and crowded nurseries in developing country provide means for transmission of neonatal infections.[9] Higher incidence in children were also quoted by other studies.[10]

In present study the isolation rate of Klebsiella pneumoniae was comparable with other studies. In the present study sex wise prevalence of clinical isolates shows that infections caused by Klebsiella pneumoniae are more common in males (64.5%) compared to females (35.5%). This is comparable with study of V.N. Venkatesh et al.[6]

In present study the highest percentage (97%) of Klebsiella pneumoniae infections were observed in the paediatric and neonatal ward and ICU, followed by medicine and surgery ward. This is comparable with study of A. Ramy et al.[11]

Klebsiella pneumoniae isolated from blood culture samples were sensitive to Imipenem (99.4%).This study shows that the clinical isolates of Klebsiella pneumoniae are becoming resistant to commonly used antibiotics and gaining more and more resistance to newer antibiotics. The antimicrobial agents are losing their efficacy because of the spread of resistant organisms due to indiscriminate use of antibiotics, lack of awareness, patient non compliance and unhygienic condition. It is the need of the time that antibiotic policies should be formulated and implemented to resist and overcome this emerging problem.

Conclusion

To prevent the spread of the resistant bacteria, it is critically important to have strict antibiotic policies while surveillance programmes for multidrug resistant organisms and infection control procedures need to be implemented. It is desirable that the antibiotic susceptibility pattern of bacterial pathogens like Klebsiella pneumoniae in specialized clinical units to be continuously monitored and the results readily made available to clinicians so as to minimize resistance. The solution can be planned by continuous efforts of microbiologist, clinician, pharmacist and community to promote greater understanding of this problem. Frequent hand washing to prevent spread of organism should be encouraged.

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