ORIGINAL RESEARCH PAPER

A microbiological study to find out the incidence of bacterial infections in patients admitted in Intensive Care Units

Microbiology

K.K.Ajisna	Department of Microbiology, DM Wayanad Institute of Medical Sciences, Wayanad, Kerala.
Suresh Gogi	Department of Microbiology, DM Wayanad Institute of Medical Sciences, Wayanad, Kerala.
B.J.Deepthy	Department of Microbiology, DM Wayanad Institute of Medical Sciences, Wayanad, Kerala.
Linda Rose Jose	Department of Microbiology, DM Wayanad Institute of Medical Sciences, Wayanad, Kerala.
Akhil Suresh	Department of Microbiology, DM Wayanad Institute of Medical Sciences, Wayanad, Kerala.
P.V Harish	Department of Microbiology, DM Wayanad Institute of Medical Sciences, Wayanad, Kerala.

ABSTRACT

The aim of this study was to determine the incidence of bacterial infections in patients admitted in intensive care units at the DM WIMS Medical College Wayanad.

Materials and methods: The clinical samples collected from patients admitted to ICU's were cultured and bacterial isolates were identified using standard techniques. Antibiotic susceptibility test was done using Kirbybaur disk Diffusion methods. Result: The most prevalent organisms isolated from specimens were *E.coli*(22%), Enterococcus(14.5%),each of (13.3%) were Klebsiella & CoNS, *Staphylococcusaureus(*10.3%), Candida(8.4%), *Pseudomonas aeruginosa*(8%), Acinetobacter(5.45%), 2.42%each was Enterobacter and Streptococcus pneumonia, each of 1.21%were GN Nonfermenter and Proteus species & 1% organism was identified as Citrobacter species .Here majority of infected patients belongs to the age group of 60- 79 . The proportion of elderly patients from the total ICU population is high. Advanced age should be regarded as a signi cant independent risk factor for mortality, especially for ICU patients older than 75 years. Conclusion: The increasing trends of developing resistance by gram negative organisms is a disturbing factor . Judicious use of antimicrobial agents is essential to prevent the emergence of multidrug resistant bacteria in the ICU. The study also revealed that there is an alarming high prevalence of ESBL E.coli in the hospital settings , This is responsible for most of the infections and the major affected populations are in the age group of 60-79 years.So the present study conclude by stating that there is an urgent need of newer strategies to control the spread of bacteria inside the ICU's.

Introduction

An intensive care unit or ICU is a specialized section of the hospital that provides comprehensive and continuous care for persons who are critically ill and who can benefit from treatment[1].ICU patients are at risk for acquiring nosocomial infection, Patients hospitalized in the ICU's are 5 - 10 times more likely to acquire nosocomial infections than other hospital infections. Gram-positive bacterial pathogens are currently most frequently associated with most of the infections[2]. Nosocomial infection or hospital-acquired infection is a localized or a systemic condition resulting from an adverse reaction to the presence of infectious agents. Many hospitalized patients have compromised immune systems, so they are less able to fight off infections. They are a significant burden to patients and public health. They are a major cause of death and increased morbidity in hospitalized patients, which is a matter of serious concern todayThe most frequently isolated microorganism was *Escherichia coli, Pseudomonas aeruginosa*, Acinetobacter, *Klebsiella pneumoniae* followed by other organisms respectively[3]. The aims of the study was, to find out the incidence of bacterial infection among ICU patients, To detect the most prevalent microbial pathogen which causes ICU infections and to track the resistance rate among the isolates.

Materials and methods

The study was carried out in the Department of Microbiology DM WIMS Medical College ,Wayanad,Kerala for a period of 4 months starting from January 2017.A total of 619 samples were collected out of that 150 samples showed significant bacterial growth ,which include 52 urine,48 sputum ,21 exudates,17 blood.The organisms were isolated and identified by using standard techniques.Antimicrobial susceptibility testing was performed by Kirby bauer's disc diffusion method on mullerhinton agar different antibiotics like ampicillin, amikacin, gentamicin,

ciprofloxacin,ofloxacin, cotrimoxazole, nitrofurantoin, linezolid, vancomycin, cefuroxime, cefotaxime, ceftazidime, cefoperazone, meropenum, imepenum, and rifampicin are tested .

Results

A total of 619 clinical samples were obtained from patients admitted in critical care units during the period of study, out of which only 150 showed significant growth of pathogenic bacteria .Among the 150 isolates , 36 were *E.coli*, 24 were Enterococcus species, 22 each were Klebsiella species&CoNS, 17 were *Staphylococcus aureus,* 14 were Candida, 13 were *Pseudomonas aeruginosa*, 9 were Acinetobacter species, 4 were Enterobacter species, 4 were *Streptococcus pneumonia*,each of 2 were GN Non fermenter and Proteus species & one organism was identified as Citrobacter species .

Organisms identified	Number	Percentage
Escherichia coli	36	22%
Enterococcus species	24	14.5%
Klebsiella species	22	13.3%
CoNS	22	13.3%
Staphylococcus aureus	17	10.3%
Candida	14	8.48 %
Pseudomonas aeruginosa	13	8%
Acinetobacter species	9	5.45 %
Enterobacter species	4	2.42%
Streptococcus pneumonia	4	2.42%
Others	5	3.03%
Total	165	100%

Incidence of bacterial infections among ICU patients
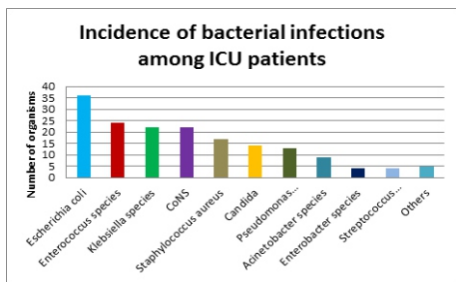
Specimen site	Organisms	No. of isolates	% of total
Urine	Escherichia coli	24	48
	Enterococcus species	7	14
	Candida species	4	8
	Klebsiella species	3	6
	Pseudomonas aeruginosa	3	6
Sputum	Klebsiella species	14	28
	Candida species	8	16
	Pseudomonas aeruginosa	7	14
	Acinetobacter species	5	10
	Staphylococcus aureus	5	10
Exudates	CoNs	9	26
	Enterococcus species	8	23.5
	Staphylococcus aureus	6	18
	Escherichia coli	4	12
	Acinetobacter species	2	6
Blood	CoNs	6	35
	Klebsiella species	4	23
	Escherichia coli	2	12
	Pseudomonas aeruginosa	1	6
	MRSA	1	6

Out of 150 cases with significant ICU infections 50 were in the age group of 60 – 79, 25 were in the age group of 40- 59, 24 were in the age group of 80 – 89, 17 were in the agr group of 0 – 19and this was followed by 12 cases with the age group of 20– 39 .

Age group	Number	Percentage
0 – 19	17	13.28%
20 – 39	12	9.6%
40- 59	25	19.6%
60 – 79	50	38.52%
80 – 99	24	19%
Total	128	100%

AGE GROUP
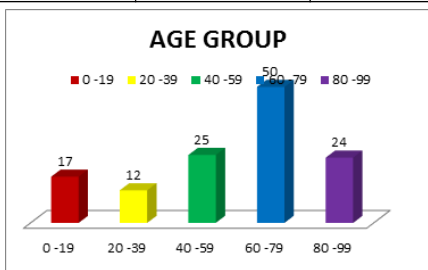
Drug resistant Isolates : Out of the 36 isolates of E.coli 25 were ESBL producers, out of the 22 klebsiella species 5 were ESBL , 2 were MBL , and 5 were MDR . Out of 9 Acinetobacter 4 were ESBL producers ,and 2 were MDR , Finally out of 4 Enterobacter only one isolate showed ESBL producion and 1 was MDR .

ORGANISMS	ESBL	MBL	MDR
E.coli	25	-	-
Klebsiella	5	2	5
Acinetobacter	4	-	2
Enterobacter	1	-	1

Discussion

A total of 619(80%) clinical samples only 150 showing the growth of significant isolates, Among the 150 isolates, 36(22%) were E.coli, 24(14.5%) were Enterococcus,each of 22(13.3%) were Klebsiella &CoNS, 17(10.3%) were Staphylococcus aureus,

14(8.4%) were Candida, 13(8%) were Pseudomonas aeruginosa, 9 (5.45%) were Acinetobacter, 4 (2.42%)each were Enterobacter and Streptococcus pneumonia, 2 (1.21%) were GN Non fermenter and Proteus species & one organism was identified as Citrobacter species (0.60%) . This was from various clinical samples like urine(35%), sputum (32%), exudates(23%) and blood (10%), Most of the isolates were from urine sample . In a study conducted by Pampita Chakraborty reported that The most predominant organism in our study was E.coli (35%) followed by Pseudomonas (33%), Acinetobacter (14%), Klebsiella (12.1%), & Enterococcus .

The present study reports that , majority of infected patients belongs to the age group of 60- 79 (39%) , Followed by the age group of 40-59 (19.53%) , and least in the age group of 20-39 (9.375%) . This may be due to the decreasing immunity , and so these age groups are more vulnerable to infections . The proportion of elderly patients from the total ICU population is high. With advancing age, the proportion of various preexisting comorbidities and the primary reason for ICU admission change. Advanced age should be regarded as a significant independent risk factor for mortality, especially for ICU patients older than 75. A study conducted by Lior Fuchs et al ., In 2012 , Reports that , 8,916 (46 %) were admissions of patients older than 65. These included 2,585 (13.2 %) between 65 and 74, 3,003 (15.4 %) between 75 and 84, and 1,677 (8.6 %) older than 85. This analysis focused on 7,265 first admissions of patients above the age of 65[4].

In this study, Out of 50 urine samples analysed, Most predominant organism was E. coli(48%), Followed by 14% Enterococcus species, 8% were Candida species, 6% each were Klebsiella species and Pseudomonas aeruginosa, 2each were Entrobacter, Staphylococcus aureus, CoNs, Acinetobacter each contribute to 4% and 2% was identified as citrobacterspecies.Most of the urinary tract infections were caused by Escherichia coli(48%), and are treated using ciprofloxacin, amikacin, cotrimoxazole, and nitrofurantoin, This is same like a study conducted by Smita et al , in 2013 ,In Urinary tract infections , E. coli was the most common (33%) uropathogen followed by enterococci (16.5%)[5].

In the present study , 150 isolates processed 48 were from sputum sample, out of 48(32%) sputum samples 14(28%) was Klebsiella species, 8(16%) were Candida species,7 (14%) were Pseudomonas aeruginosa,4(8%)were E. coli,5(10%)each were Acinetobacter& Staphylococcus aureus,3(6%) were CoNs,2(4%) were Streptococcus pneumonia .In this study , Out of the 34 exudates samples 9 (26%)were CoNS, 8(24%) were Enterococcus , 6(18%) were Staphylococcus species, 4(12%) were E .coli, 2(6%) each were Acinetobacter and Proteus,1 (3%) each were GN Non fermenter, Enterobacter and pseudomonas species. In another study conducted by Pampita Chakraborty et al., In 2016 Respiratory Tract Infection was most frequently caused by Acinetibacter (40%) followed by Pseudomonas (29.80%), Klebsiella (21.70%) and E.coli (8.50%)[3].

In this study, Out of 16 fungal species obtained, 68.75% were from sputum sample and 25% were isolated from urine sample.Another study by Christine M,etal.,2016,Candidiasis encompasses a host of infections involving mucosal surfaces and the urinary tract, as well as more disseminated diseases.In this study ,Out of 150 sample studied, 16 fungal growth were obtained ,From which 68.75% were Candida species & 25% were Aspergillus species .Another study conducted by Christine M,et al., in 2016 reports that Candidiasis is the leading cause of Invasive fungal infections occurring in ICU patients[9].

Conclusion

The present study showed that Eschecichia coli, Enterococcus species. Klebsiella species, CoNs , Staphylococcus aureus, Candida species, Pseudomonas aeruginosa, Acinetobacter species, Enterobacter species, and Streptococcus pneumoniae are the common causative agents of infections in ICU's. The increasing trends of developing resistance by gram negative organisms is a disturbing factor . Judicious use of antimicrobial agents is essential

to prevent the emergence of multidrug resistant bacteria in the ICU. The study also revealed that there is an alarming high prevalence of ESBL *E.coli* in the hospital settings , This is responsible for most of the infections and the major affected populations are in the age group of 60-79 years.So the present study conclude by stating that there is an urgent need of newer strategies to control the spread of bacteria inside the ICU's . Because the patients admitted in ICU's are the most debilitating and vulnerable group of infections .

References

1. Ambanna Gowda Durgad, SudarshanVaradarajan, Prevalence of nosocomial infections in the intensive care unit DOI .2015;10.18203:2320-6012.
2. BanerjeeSEmoriG, CulverDH.Trends in nosocomial bloodstream infections in the United States, 1980–89. The National Nosocomial Infections Surveillance (NNIS) System, Am J Me , 1991,vol. 91.
3. Pampita Chakraborty,Sukumar Mukherjee A Study on the Prevalence and Microbiological Profile of Nosocomial Infections in the ICU of a Tertiary Care Hospital in Eastern India ,Int.J.Curr.Microbiol.App.Sci.2016; 5(5): 920-925.
4. L. Fuchs V. Novack, D. Talmor Dpt of Anesthesia, Critical Care and Pain Med, Beth Israel Deaconess Medical Center and Harvard Medical School, 2015; Deaconess Rd. CC-470, Boston, MA 02215
5. Smita U Shevade, Gopal N Agrawal, study of nosocomial and community acquired uropathogens and their drug resistance .National J of Community Medicine.2013;Vol 4/Issue4 Akhtar N. Hospital Acquired Infections in a Medical Intensive Care Unit. J of the College of Physicians and Surgeons Pakistan. 2010;20(6): 38690.
6. Akhtar N. Hospital Acquired Infections in a Medical Intensive Care Unit. J of the College of Physicians and Surgeons Pakistan. 2010;20(6): 38690.
7. Basharat Ali Khan, Sami Saeed, AdeelAkram, FarazBasharat Khan, AmjadNasim Department of Surgery,Pathology, Foundation University Medical College,Fauji Foundation Hospital, †Basharat Hospital, ††Department of Medicine, Foundation University Medical College, Rawalpindi, Pakistan, J Ayub Med Coll Abbottabad 2010;22(1).
8. Richard A. Polin, MD, Lisa Saiman, MD, MPH , Nosocomial Infections in the NICU.2003; Vol.4 No.3 :e81.
9. Christine M. Groth, Pharm.D., BCPS; and Elizabeth S. Dodds-Ashley, Pharm.D., MHS, BCPS, AQ-ID , Fungal Infections in the ICU;2016:CCSAP 2016 Book 1 .