A study of aerobic pyogenic isolates from wounds and abscesses and their antibiograms

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Abstract

Background & objective: Infectious diseases are the world's major threat to human health. They have been a matter of concern due the development of multidrug resistant strains among common isolates in the hospital. So the knowledge of resistivity pattern of different clinical isolates has been the global necessity for the control of emergence of resistance to antimicrobial agents. So this Study was undertaken for the microbiological analysis of infection in various clinical pus samples, to know the presence of different bacterial isolates, their antibiogram and for presence of the resistant strains.

Materials and Methods: A total of 704 clinical pus samples were collected during a period of one year. Identification of the bacterial isolates was determined by standard microbiological techniques. All the isolates identified were subjected to antibiotic susceptibility testing by Kirby-Bauer disc diffusion method.

Results : Of the 704 cultured specimens 488 (69.3%) were culture positive. A total of 540 bacterial isolates were obtained from different cultures. In 388 samples cultures were monomicrobial and 100 were polymicrobial, but no bacterial isolates were obtained in 216 samples. Majority of them were gram negative organisms of Enterobacteriaceae family. Klebsiella species was the predominant microorganism (29.3%), followed by Staphylococcus aureus (19.3%), Pseudomonas species (18.9%), Escherichia coli (12.6%), Coagulase negative Staphylococci (9.6%), Enterococci species (6.7%), Proteus species (2.9%) and Acinetobacter species (0.7%). The frequency of ESBL producers in our study was 29.3% and that of MRSA strains was 34.6% of all the isolates.

Conclusion: The present study reveals the diversity of bacterial isolates in various pus samples and their tendency towards antibiotic resistance.

Key words : Pus culture, Klebsiella species, ESBLs, MRSA.

Introduction

Wounds and abscesses are an important cause of morbidity and mortality. They limit an individual's quality of life. They are of considerable financial burden, undue discomfort to the patient and sometimes death [1]. Besides skin and soft tissue infections that occur primarily as a result of a break in the skin surface [2], wound infections can also occur as complications of surgery, trauma, bites and diseases that interrupt a mucosal or skin surface. Wound infection occurs when one or more microorganisms evade the clearing effect of the host's defenses, replicate in large numbers, attack and harm the host's tissues. It may be endogenous or exogenous. It may be caused by a variety of aerobic and anaerobic species of bacteria [3]. Gram positive and Gram negative pathogenic bacteria are an important cause of community and hospital acquired infections throughout the world. Antibiotics when first introduced were considered magic bullet as a single injection of penicillin could eradicate life threatening infections. Unfortunately with the time due to irrational use of antibiotics and / or natural causes, more and more resistant strains are being encountered [4]. The microbial pathogens as well as

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their antibiotic sensitivity pattern may change from time to time and place to place .Therefore updated knowledge of the drug resistance pattern of the common pathogenic bacteria in a particular region is useful in clinical practice [5].This work gives an account of different bacterial isolates in various pus samples ,their antibiogram and presence of resistant strains in the samples .

Materials and Methods.

Collection of pus samples

This study was carried out at the Department of Microbiology over a period of one year. 704 pus samples were collected from different types of infected wounds during this period. Both inpatients and outpatients samples of different age groups and of both sexes were included in the study .The pus samples were either aspirated by disposable syringes or collected onto sterile cotton tipped swabs.

Characterization of bacterial isolates

Pus samples were aseptically inoculated on to Blood and Macconkey agar plates .The streaked plates were incubated aerobically at 37^0C for 24hours. Identification of the isolates were done based on colony morphology, Gram staining, motility, catalase, coagulase, and other biochemical tests [6,7].

Antimicrobial susceptibility testing

Was performed on Muller-Hinton agar plates by Kirby-Bauer disc diffusion method according to the CLSI guidelines 2012. Escherichia coli, Klebsiella species, Proteus species isolates were screened for ESBL production. Reduced susceptibility to cefotaxime (30µg) and ceftriaxone (30µg) with zone sizes ≤27 mm and ≤25mm respectively were used as screening method for ESBL production. Staphylococcus aureus and Coagulase negative Staphylococci isolates were screened for methicillin resistance according to CLSI guidelines 2012 .Reduced susceptibility to Cefoxitin (30µg) disc with zone sizes ≤21mm for Staphylococcus aureus and ≤ 24mm for Coagulase negative Staphylococci was used as a screening method for MRSA. Vancomycin (30µg) discs were used for screening vancomycin resistance .A zone size of 15mm was considered sensitive [8].

Results

Out of the 704 pus samples studied 604 belonged to inpatients and 100 were outpatients. Among the samples studied 488 were culture positive (69.3%) for aerobic bacterial growth and 216 (30.7%) were culture negative. 388 (79.5%) of the samples showed monomicrobial and 100 (20.5%) showed polymicrobial growth. Gram negative organisms constituting 348 (64.4%) of the culture positives predominated over gram positive organisms 192 (35.6%). Among gram negative organisms, Enterobacteriaceae family predominated with 242 (44.8%) and non-fermenters constituted 106 (19.6%) of the isolates .Klebsiella species 158 (29.3%) was the most frequent isolate in our study followed by Staphylococcus aureus ,Pseudomonas species , Escherichia coli , Coagulase negative Staphylococci, Enterococci species, Proteus and Acinetobacter species(Table-1). The result of antibiogram of the isolates is shown in the Table-2 .Of the 242 enterobacteriaceae isolated 71 (29.3%) were ESBL producers, 48 of them belonged to Klebsiella species , 18 were Escherichia coli and 5 belonged to Proteus species . Cefoxitin resistance was noted in 36(34.6%) of Staphylococcus aureus and 12 isolates of Coagulase negative staphylococci.

Table 1 .Different organisms isolated

Organisms	Number	%
Klebsiella species	158	29.3
Staphylococcus aureus	104	19.3
Pseudomonas aeruginosa	102	18.9
Escherichia coli	68	12.6
Coagulase negative Staphylocci	52	9.6
Enterocci species	36	6.7
Proteus mirabilis	12	2.2
Proteus vulgaris	4	0.7
Acinetobacter	4	0.7

Table 2 . Antibiotic sensitivity pattern

Antibiotic	Klebsiella species		Escherichia coli		Pseudomonas species		Staphylococcus aureus	
	R	S	R	S	R	S	R	S
Amoxyclav	58.2%	41.8%	36.8%	63.2%	82.3%	17.7%	38.5%	61.5%
Piperacillin	-	-	-	-	25.4%	74.6%	-	-
Erythromycin	-	-	-	-	-	-	34.6%	65.4%
Azithromycin	-	-	-	-	-	-	19.2%	80.8%
Ofloxacin	35.4%	64.6%	38.2%	61.8%	23.5%	76.5%	7.7%	92.3%
Cefoxitin	-	-	-	-	-	-	34.6%	65.4%
Cefotaxime	23.4%	76.6%	22.1%	77.9%	-	-	38.5%	61.5%
Ceftriaxone	30.4%	69.6%	26.5%	73.5%	56.8%	43.2%	44.2%	55.8%
Ceftazidime	-				11.7%	88.3%	-	-
Gentamicin	12.7%	87.3%	14.7%	85.3%	19.6%	80.4%	30.8%	69.2%
Tobramycin	-	-	-	-	33.3%	66.7%	-	-
Cefoperazone & Sulbactam	18.9%	81.1%	20.5%	79.5%	11.8%	88.2%	9.6%	90.4%
Cotrimoxazole	47.4%	52.6%	38.2%	61.8%	-	-	-	-
Imipenem	5.1%	94.9%	2.9%	97.1%	0.9%	99.1%	-	-
Vancomycin	-	-	-	-	-	-	11.5%	88.5%

Discussion

Infectious diseases are the highest reported ailments encountered in many developing countries. They are the world's major threat to human health. Rapid development of multidrug resistance by the microorganisms to available antimicrobial agents has further complicated the threat of infectious diseases to human health. The discovery of antibiotics revolutionized the management of infectious diseases .However, the overuse and misuse of antibiotics is leading to the emergence of resistance to these life saving drugs. Hospital antibiograms are commonly used to help guide empiric antimicrobial treatment and are an important component of detecting and monitoring trends in antimicrobial resistance [5].

The present study showed wide range of microbes involved in wounds and abscesses .Culture positivity in our study was 68.3% of the samples which is in agreement with S.Valarmathi et al [9]. The predominance of monomicrobial infections observed in our study is similar to study of S.Pramodhini et al [10]. Gram negative bacilli dominance in our study is similar to the study by Poonam verma et al [11]. Among gram negative bacilli, enterobacteriaceae accounted for majority. Klebsiella species was the predominant pathogen accounting for 29.3% of all the isolates, this data is similar to the study of S.Valarmathi [9] and Dr.R.Sarathbabu et al [12]. Higher prevalence of infections due to Klebsiella species in the present study probably reflects both an increase in nosocomial and community acquired infections due to the organism .Most of the isolates in our study were not multidrug resistant .The frequency of ESBL producers in our study was 29.3% of the isolates which is in good agreement with reports from Pramodhini et al [10]. The most frequent ESBL producing isolates in our study were Klebsiella species and Escherichia coli [13]. Frequency of ESBL producers was high among inpatients (30.7%) in comparison to outpatients (16.7%) [14]. The frequency of MRSA strains in our study was 34.6% of isolates which is in good correlation with study by Pramodhini et al [10,15]. Similar to ESBL strains , MRSA strains in our study were more common in inpatients (40.5%) in comparison to outpatients (20%). Our study showed good sensitivity to vancomycin accounting to 88.6% of gram positive isolates .Sensitivity to imipenem in our study was 95.8% among enterobacteriaceae and that among non-fermenters was 97.2%. Sensitivity to cefoperazone & sulbactam was also good in our study.

Conclusion

The prevalence of ESBLs among members of enterobacteriaceae and MRSA is a serious threat, leading to treatment failure and complications. There is an urgent need to emphasize rational use of drugs , to minimize the misuse of available antimicrobials . This explains the need for continuous surveillance of resistant bacteria to provide the basis for empirical therapy and reduce the risk which in turn explains the need for prioritizing the health care need so that based on the prevalence rate of resistant strains in health care facility an institutional antibiotic policy can be tailored to reduce morbidity and mortality and achieve superior therapeutic outcome to overcome this emerging problem ,bring about a reduction in health care costs and also for infection control intervention programmes.

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