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Bacteriological Profile and Antibiotic Susceptibility Patterns of Bacteria Isolated From Wound Swab Samples from Patients Attending a Tertiary Care Hospital

Dr. M. Nishanthy[1*], Dr. Chitralekha Saikumar[2]
[1]Postgraduate student in Dept. of Microbiology, Sree Balaji Medical College and Hospital, Chennai, Tamil Nadu, India
[2]Professor and Head of Department of Microbiology, Sree Balaji Medical College and Hospital, Chennai, Tamil Nadu, India

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***Corresponding author**
Dr. M Nishanthy

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Abstract: Wound infections are the most serious cause of mortality and morbidity. Wound infection results whenever there is a breach in skins epithelium exposing subcutaneous tissue making easy way for micro-organisms to enter and cause infection. In this study a total of 242 wound swab samples were collected from patients and subjected for antibiotic susceptibility testing. Among them most common organism isolated was Kleibsella, followed by *S. aureus*, Pseudomonas, *E.coli*, Proteus, CONS, and Acinetobacter species. The most sensitive antibiotics against gram positive bacterial isolates were penicillin, cefoxitin, linezolid, vancomycin, cotrimoxazole, gram negative bacterial isolates were sensitive to meropenem, piperacillin tazobactam, amikacin, gentamicin, imipenem, colistin. Knowledge about bacteriological profile of wound infections and sensitivity pattern will guide medical practitioners in appropriate selection of antibiotics and thereby to prevent complications.

Keywords: Wound infections, bacteriological profile, antibiotic sensitivity, pseudomonas, and *staphylococcus aureus*.

INTRODUCTION

Skin provides a natural barrier in preventing entry of micro-organisms, whenever there is a breach in the integrity of skin epithelium, a wound results [1]. The stages of progression of a wound to an infected state involves multifactorial microbial and host factors which includes site, type, depth, of wound and most significantly host immunity [2].

Wound infections can be caused by bacteria, fungi, protozoa, virus [3].Wound infections is one of the most common hospital acquired infections [4].Gram positive bacteria which are predominantly known to cause wound infections are *S. aureus*, CONS, Enterococcus, gram negative bacteria includes Kleibsella, Pseudomonas, *E. Coli*, Proteus, Acinetobacter [5]. Wound infections can either be surgical or due to trauma. But in this study we have excluded surgical site wound infections and included the wound infections due to trauma. Wound contamination with bacterial organisms is a serious problem which increases the duration of hospital stay especially in surgical practice where sterile site gets contaminated and later become infected [6].Wound infections prolong duration of stay in the hospital than the wounds which heel faster without infections [7]. Emergence of resistant strains to antibiotics has become a global threat to community as wound infections are leading causes of mortality and morbidity around (70-80%) in hospitals [8]. Hence this study was done to update on bacteriological profile of wound infections and their sensitivity, resistant patterns to different kinds of antibitoics.

MATERIALS AND METHODS

The study was carried out in Microbiology department, over a period of 6months from May to October 2017 at Sree Balaji Medical College and Hospital, Chennai. A total of 242 wound swab samples were received in the laboratory. All these samples were routinely subjected to gram stain and culture in nutrient agar, blood agar, mac-conkey agar and incubated at 37 deg C overnight; gram staining was performed for all isolates. Gram positive isolates were further tested for catalase test, slide coagulase, tube coagulase test. Gram negative isolates were identified by colony morphology, staining reactions, oxidase test, motility and standard biochemical test was done to confirm them [9].

The antibiotic sensitivity test was done by Kirby-Bauer disc diffusion method on Muller Hinton Agar with commercially available disc penicillin(10units), erythromycin (15mcg), clindamycin (2mcg), tobramycin (10mcg), gentamicin (10mcg), amikacin (30mcg), ciprofloxacin (5mcg), cotrimoxazole (1.25/23.75mcg), ceftazidime (30mcg), ceftriaxone (30mcg), cefoxitin (30mcg), cefotaxime (30mcg), cefuroxime (30mcg), cefazolin (30mcg), ampicillin (10mcg), rifampicin (5mcg), tetracycline (30mcg), tigecycline (15mcg), cotrimoxazole (1.25/23.75µg), vancomycin (30mcg) linezolid (30mcg), high level gentamicin, levofloxacin (5mcg), chloramphenicol (30mcg), piperacillin tazobactam (100/10mcg), amoxyclav 20/10(30mcg), meropenem (10mcg), imipenem (10 mcg), aztreonam (30mcg), colistin.

Results were interpreted according to CLSI guidelines.

RESULTS

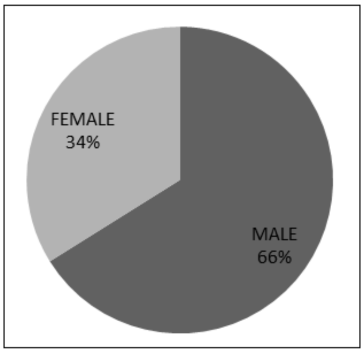

Fig-1: **Total no. of samples was 242.Out of these Male were 160, Female were 82**

Table-1: growth pattern of bacteria

S.No.	Growth	No.Of Samples	% Of Samples
1.	Culture Positive	212	87.6%
2.	Culture Negative	30	12.4%
Total		242	100

Table-2: Gender wise distribution of growth positive cases

Gender	Growth		No Growth		Total
	No.	%	No.	%	
Male	140	87.5	20	12.5%	160
Female	72	87.8	10	12.1%	82
Total	212	87.6	30	12.4	242

Table-3: Distribution of bacterial isolates

Organism	No.Of Isolates	% Of Total Isolates
	Gram Positive Bacteria	
S.Aureus	43(75.43%)	20.33
Cons	13(22.80%)	6.13
Enterococcus	1(1.75%)	0.47

Organism	Gram Negative Bacteria	% Of Total Isolates
Kleibsella pneumoniae	33(21.29)	15.56
Kleibsella oxytoca	15(9.67)	7.07
Pseudomonas species	41(26.45)	19.33
E. coli	34(21.93)	16.03
Proteus vulgaris	12(7.74)	5.66
Proteus mirabilis	6(3.87)	2.83
Acinetobacter species	11(7.09)	5.18
Citrobacter species	1(0.64)	0.47
Providencia	1(0.64)	0.47
Aeromonas hydrophila	1(0.64)	0.47
Total	155	73.07

Table-4: Antibiotic susceptibility of gram positive isolates

Antibiotics	Sensitive		Intermediate		Resistant		Total
	No.	%	No.	%	No.	%	
Ciprofloxacin	22	38.5	5	8.7	24	42.1	61
Penicillin	49	85.9	0	0	1	1.7	50
Cefoxitin	47	82.4	0	0	0	0	47
Cotrimoxazole	39	68.4	0	0	18	31.5	57
Erythromycin	35	61.4	0	3.5	21	36.8	56
Clindamycin	35	61.4	0	0	21	36.8	56
Gentamicin	37	64.9	2	3.5	14	24.5	53
Rifampicin	26	45.6	0	0	1	1.7	27
Vancomycin	51	89.4	0	0	0	0	51
Linezolid	47	82.4	0	0	1	1.7	48
Tetracycline	38	66.6	0	0	6	10.5	44
Chloramphenicol	27	47.3	0	0	1	1.7	28
Tigecycline	1	1.7	0	0	0	0	1

Table-5: Antibiotic susceptibility of gram negative isolates

Antibiotics	Sensitive		Intermediate		Resistant		Total
	No.	%	No.	%	No.	%	
Ciprofloxacin	47	30.3	7	4.5	49	31.6	103
Amoxicillin Clavulanicacid	4	2.5	4	2.5	84	54.1	92
Ampicillin	5	3.2	2	1.2	101	65.1	108
Chloramphenicol	20	12.9	2	1.2	13	8.3	35
Amikacin	59	8.0	3	1.9	20	12.9	82
Gentamicin	53	34.1	9	5.8	43	27.7	105
Ceftriaxone	40	25.8	6	3.8	76	9.0	122
Cefazolin	18	11.6	18	11.6	97	62.5	133
Ceftazidime	27	17.4	12	7.7	56	36.1	95
Cefuroxime	21	13.5	21	13.5	79	50.9	121
Meropenem	75	48.3	3	1.9	9	5.8	87
Imipenem	53	34.1	9	5.8	24	15.4	86
Piperacillin Tazobactam	73	47.0	8	5.1	23	14.8	104
Tetracycline	12	7.7	3	1.9	35	22.5	50
Aztreonam	42	27.0	12	7.7	36	23.2	90
Colistin	41	26.4	0	0	0	0	41

Table-6: Antibiotic susceptibility of s.aureus to different antibiotics

Antibiotics	Sensitive		Resistant		Total
	No.	%	No.	%	
Ciprofloxacin	26	60.4	15	34.8	41
Penicillin	42	97.6	0	0	42
Cefoxitin	42	97.6	0	0	42
Erythromycin	26	60.4	17	39.5	43
Clindamycin	26	60.4	17	39.5	43
Gentamicin	20	46.5	15	34.8	35
Vancomycin	18	41.8	0	0	18
Linezolid	17	39.5	0	0	17
Cotrimoxazole	14	32.5	11	25.5	25
Tetracycline	13	30.2	1	2.3	14
Chloramphenicol	6	13.9	1	2.3	7

Table-7: Antibiotic susceptibility of pseudomonas species to different antibiotics

Antibiotics	Sensitive		Resistant		Total
	No.	%	No.	%	
Ciprofloxacin	15	36.5	3	7.3	18
Ceftazidime	12	29.2	10	24.3	22
Cefipime	9	21.9	3	7.3	12
Amikacin	25	60.9	8	19.5	33
Gentamicin	23	56.0	12	29.2	35
Aztreonam	27	65.8	11	26.8	38
Tobramycin	9	21.9	21	51.2	30
Piperacillin Tazobactam	19	46.3	0	0	19
Meropenem	30	73.1	2	4.8	32
Imipenem	19	46.3	9	21.9	28
Colistin	41	100	0	0	41

Table-8: Antibiotic susceptibility of kleibsella species to different antibiotics

Antibiotics	Sensitive		Resistant		Total
	No.	%	No.	%	
Ciprofloxacin	10	20.8	12	25	35
Cefazolin	8	16.6	33	68.7	41
Ceftriaxone	5	10.4	4	8.3	9
Ampicillin	2	4.1	44	91.6	46
Amoxicillin Clavulanicacid	2	4.1	39	81.2	41
Gentamicin	19	39.5	18	37.5	37
Cefuroxime	14	29.1	34	70.8	48
Piperacillin Tazobactam	23	47.9	11	22.9	34
Meropenem	42	87.5	3	6.2	45
Imipenem	27	56.2	8	16.6	35
Cotrimoxazole	18	37.5	28	58.3	46

Table-9: Antibiotic susceptibility of E.coli species to different antibiotics

Antibiotics	Sensitive		Resistant		Total
	No.	%	No.	%	
Ciprofloxacin	17	50	13	38.2	30
Cefazolin	8	23.5	22	64.7	30
Ceftriaxone	8	23.5	20	58.8	28
Ampicillin	2	5.8	27	79.4	29
Amoxicillin Clavulanicacid	1	2.94	33	97	34
Gentamicin	17	50	10	29.4	27
Cefuroxime	5	14.7	29	85.2	34
Piperacillin Tazobactam	20	58.8	11	32.3	31
Meropenem	24	70.5	4	11.7	28
Imipenem	15	44.1	6	17.6	21
Cotrimoxazole	6	17.6	19	55.8	25

DISCUSSION

Out of 242 samples ,culture positive cases are 212(87.6%),culture negative cases are 30(12.4%).Among 160 (66%)male patients and 82 (34%) female patients,140(87.5%) and 72(87.8%) were found growth positive respectively. Most common gram positive isolates were s.aureus, followed by CONS, enterococci. The most sensitive antibiotics against gram positive isolates were penicillin, cefoxitin, linezolid, vancomycin, cotrimoxazole. Most common gram negative isolates were kleibsella species, followed by pseudomonas aeruginosa, E.Coli, proteus vulgaris, proteus mirabilis, Acinetobacter, providencia, Citrobacter species. The most effective antibiotics against gram negative bacterial isolates were meropenem, piperacillin tazobactam, amikacin, gentamicin, imipenem, colistin.

Out of 43 isolates of s.aureus ,there was 85.9% percent sensitivity towards penicillin,82.4% sensitivity to cefoxitin, followed by vancomycin(89.4%), linezolid(82.4%), cotrimoxazole(68.4%) and resistance was higher with erythromycin(39.5%) followed by clindamycin(39.5%), ciprofloxacin(34.8%).The most sensitive antibiotics against kleibsella species were meropenem(87.5%), imipenem(56.2%), Piperacillin tazobactam(47.9%), gentamicin(39.5%) and resistant pattern was observed with ampicillin(91.6%),followed by amoxicillin clavulanic acid(81.2%), cefuroxime(70.8%) and cefazolin (68.7%). Pseudomonas species were highly sensitive to colistin (100%), meropenem(73.1%), aztreonam(65.8%), amikacin(60.9%), gentamicin(56%), imipenem (46.3%), and were resistant to tobramycin(51.2%), gentamicin (29.2%), ceftazidime (24.3%), imipenem (21.9%). E.Coli isolates were highly sensitive to meropenem (70.5%), piperacillin tazobactam (58.8%), ciprofloxacin (50%), imipenem (44.1%). E. coli isolates were highly resistant to amoxicillin (97%), cefuroxime (85.2%), ampicillin (79.4%), cefazolin (64.7%), ceftriaxone (58.8%). Gram negative bacterial isolation increases with cases of hospital acquired infections [10]. Regarding antibiotic susceptibility testing penicillin, cefoxitin, vancomycin, linezolid were most effective antibiotics against gram positive bacterial isolates and meropenem, imipenem, piperacillin tazobactam were most effective against gram negative bacterial isolates.

CONCLUSION

It is necessary for every medical practitioner to update his knowledge on profile of bacteriological wound infections as it is the major cause of mortality and morbidity. Wound infections are predominant cases in hospital setup. Hence profound knowledge regarding antibiotic sensitivity pattern is essential in selecting appropriate drug for management of bacterial wound infections. A proper control of antibiotic usage will prevent the emergence of resistant strains of bacteria.

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