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BACTERIOLOGICAL AND ANTIBIOTIC SUSCEPTIBILITY PROFILE OF ISOLATES IN PUS SAMPLES AT A TEACHING HOSPITAL IN NORTH INDIA.

Microbiology

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ABSTRACT

INTRODUCTION: Pyogenic infections are a common presentation in a hospital. Emerging antimicrobial resistance is posing a threat to current treatment protocols. This study was conducted to determine bacteriological and antibiotic susceptibilityprofile of the isolates from pus samples.

MATERIALS AND METHODS: 316 pus samples were received from November 2016 to April 2017. Samples were processed as per standard microbiological methods and antibiotic susceptibility tested using Kirby- Bauer test.

RESULT: Staphylococcus aureus(26.7%)was the most frequent pathogen followed by Escherichia coli (20.7%), Pseudomonas aeruginosa (17.3%),Klebsiella spp (14.7%). 42% of S.aureus isolates were Methicillin Resistant. Ertapenem was uniformly effective for all the E coli isolates.

CONCLUSION: In view of high prevalence of MRSA , strict implementation of infection control measures is needed. Susceptibility data is worrisome with resistance to frequently used drugs. Continuous surveillance is required to look for trends in data to formulate institutional guidelines.

KEYWORDS

Pus, MRSA, Antibiotic susceptibility

INTRODUCTION

Pyogenic infections show features of inflammation with formation of pus by bacterial agents.[1] Any breach of physical barriers can lead to introduction of microorganisms from external environment/ commensal flora. Such discontinuity serve as a good place for microbial colonization due to presence of moisture, warmth and nutrition, thus, helping the microorganisms to thrive and produce localised infection.[1,2]

Wound infections are a common presentation seen in hospital settings.[2]Emergence of antimicrobial resistance further diminishes the prospects of recovery of patients due to few therapeutic options available, in addition to escalated hospital cost due to prolonged stay.[3]

Though, numerous studies on the bacteriological profile of pus from different institutes across the globe are available with similar information, there is a need for further hospital based studies in different geographical locations to provide profile of infecting organisms and their sensitivity patterns. Regular revision of this data helps to formulate local empirical therapeutic guidelines for pyogenic infections. Therefore, this study was planned to determine the prevalence and current susceptibility patterns of the organisms isolated from pus samples.

MATERIALAND METHODS

A cross sectional study was conducted in Department of Microbiology, ESIC Medical College & Hospital in Faridabad. All pus samples received for aerobic culture and sensitivity from different departments from November 2016 to April 2017 were included in the study. All the pus samples were processed aerobically by inoculating on blood agar(BA), Mac conkey agar(MA), nutrient agar(NA) and incubated at 37^{o}C for 24 hours aerobically. After incubation, identification of bacteria from positive cultures was done as per standard microbiological technique which included studying the colonial morphology, Gram stain as well as biochemical reactions.[4] The antibiotic sensitivity testing of all isolates was performed by Kirby-Bauer's disc diffusion method on Mueller Hinton agar using antibiotics as per CLSI guidelines. Confirmation of MIC was done for selected isolates using Vitek. [5]The following drugs were tested. Ampicillin (10µg), Erythromycin (15µg), Clindamycin (2µg), Ciprofloxacin (5µg), Cotrimoxazole (25µg), Chloramphenicol (30µg), Cefoxitin (30 µg), Gentamicin (10µg), Linezolid (10µg), Vancomycin (30µg), Teicoplanin (30µg), Tetracycline (30µg), High level gentamycin (120 µg), Amoxyclavulanic acid (30 µg), Amikacin (30 µg), Cefepime (30 µg), Ceftriaxone(30µg), Ceftazidime (30 µg), Imipenem (10µg), PiperacillinTazobactam (100/10 µg), Meropenem (10 µg), Ertapenem (10µg), Aztreonam (30 µg), Piperacillin (100 µg), Polymyxin B (30 units). Whole data was analysed using MS Excel.

RESULTS

Total of 316 pus samples were received for culture and sensitivity in the department of microbiology. Among them 135(42.7%) samples were culture positive with majority from male patients 53.3% (72/135).More than one isolate was recovered from 15 samples. One sample was positive for Candida (non albicans). Isolated bacteria were identified on the basis of Gram staining, morphological features, culture characteristics, and biochemical tests.[4] *Staphylococcus aureus (S.aureus)*(26.7%)was the most frequent pathogen followed by *Escherichia coli(E.coli)*(20.7%), *Pseudomonas aeruginosa (P.aeruginosa)* (17.3%), *Klebsiella* spp (14.7%)(Table:1).

Table 1. Bacteria isolated from pus

Bacteria	Number (%)
S.aureus	40 (26.7)
*CONS**	9 (6)
Enterococcus spp	4 (2.7)
Group A Streptococcus	1 (0.7)
E coli	31 (20.7)
Klebsiella spp	22 (14.7)
Proteus spp	7 (4.7)
Enterobacter spp	5 (3.3)
Citrobacter spp	1 (0.7)
Pseudomonas spp	26 (17.3)
Acinetobacter baumannii	3 (2)
Total	149

*CONS: *Coagulase Negative Staphylococ*

Table 2. Percentage Susceptibility data of Gram positive cocci.

	Mssa (22)	Mrsa (17)	Visa (1)	Mrcons (9)	Enterococcus spp(4)
Ampicillin	20	0	0	0	75
Erythromycin	60	26.5	0	14.3	25
Clindamycin	75	55.5	0	28.6	NA
Ciprofloxacin	21.5	17	0	50	33.3
Cotrimoxazole	70	64	100	50	NA
Chloramphenicol	100	83.5	0	80	100
Gentamicin	82	38.5	100	66.7	50**
Linezolid	100	100	100	100	100
Vancomycin	100	100	0*	100	100
Teicoplanin	100	100	0*	100	100
Tetracycline	25	58.5	100	50	58.5

** High level gentamicin

The department-wise distribution showed that surgery ward (52%) was the single largest contributor of pus samples followed by Obs & Gynae (20.7%), medicine (4.7%), orthopaedics (16%), and ENT (6.7%) Of 149 bacterial isolates, 54 were gram positive cocci (Table 1).

42% of *S.aureus* isolates were Methicillin Resistant. Chloramphenicol was the most effective drug for methicillin susceptible *S. aureus*.

In case of Gram negative isolates, *E.coli* were the most common pathogen reported. Ertapenem was uniformly effective for all the *E coli* isolates.

Table 3. Percentage Susceptibility profile of Gram Negative Bacilli

	E coli (31)	*K oxytoca (22)*	*K pneumoniae (10)*	*Proteus sp (7)*	*P.aeruginosa (26)*
Imipenem	93.3	50	55.5	75	60
Ertapenem	100	100	60	100	NA
Meropenem	83.3	43	66.7	100	50
Pip-taz	60.8	30	55.5	33.3	63.5
Ciplox	26	25	28.5	100	40
Gentamicin	33.3	33.3	33.3	0	43
Ceftazidime	38.1	20	50	100	33.3
Cotrimoxazole	24	18	22.2	33.3	NA
Cefepime	21.5	0	0	NA	NA
Ampicillin	20	NA	NA	NA	NA
Amoxy-clav	20	33.3	25	50	NA
Amikacin	85	45.5	62.5	50	59
Ceftriaxone	15.5	16.6	40	50	NA
Chloramphenicol	91	75	0	100	NA
Piperacillin	NA	NA	NA	NA	48
Cefaperozone-sulbactum	NA	NA	NA	NA	46
Aztreonam	NA	NA	NA	NA	57
Colistin	100	100	100	NA	100

High resistance to cephalosporins & fluoroquinolones was observed among *E coli & Klebsiella* spp *(Table 3)*.

All Pseudomonas isolates were sensitive to Polymyxin B. 63.5% were sensitive to Piperacillin-Tazobactam and 60% were sensitive to Imipenem .

DISCUSSION

Forty-three percent (approx.) of pus samples were culture positive. Culture rate of 45-90% has been reported in different studies.[1,2,6]

Majority of pus samples were received from department of surgery (52%), which is in accordance with other studies. [1,2]

In the present study, Gram negative bacilli (GNB) were the predominant and leading cause of wound infections which is also reported by similar national & international studies. [3,6,7]

Among the GNBs, *E.coli* was the most common isolate (20.7%) which has been also reported by authors in other studies. [1,8,9,10]

Pseudomonas has been the second most frequent GNB in our set up but it also has been reported by Basu et al & Duggal et al as the most common GNB. [11,12]

The most common isolate in our setting was *S.aureus*. This pathogen has been repeatedly reported in worldwide literature to be the most common skin and soft tissue pathogen.[3,8] Presence of *S.aureus* on skin & anterior nares predisposes the wound to get colonized and later on get infected with it. *S.aureus* is an efficient pathogen with an arsenal of virulence factors that help in adapting to a wide spectrum of environmental conditions. Prevalence of Methicillin Resistant *S.aureus* (MRSA) in this study was 42 %,which is in accordance with average prevalence found in study by Indian Network for Surveillance of Antimicrobial Resistance (INSAR) group .[1,9,13]

Susceptibility to ciprofloxacin was low in both MSSA (21.5%) and MRSA (17%). MSSA isolates showed a higher susceptibility to gentamicin , cotrimoxazole, erythromycin and clindamycin

Presence of MRSA in hospital setting with a lack of stringent hand washing practices can increase the chances of wound infection.

97% of *S.aureus* were susceptible to Vancomycin as also reported in other studies.[6] Most studies have reported 100 % susceptibility to Vancomycin & Linezolid. [1,8,14]

Among *Enterobacteriaceae*, AST showed a diverse trend. Amikacin was found to be more effective compared to gentamicin similar to other studies.[1]The reason could be the antibiotic prescribing habit with an inclination towards gentamicin which could possibly cause emergence of resistant isolate.

Quinolones showed a wide spectrum of efficacywith least activity against *E coli* (25-100%).High degree of resistance was observed for 3rd generation cephalosporin.

Carbapenems are reserve drugs. We observed a variable trend with least efficacy against *Klebsiella(* 52.7%)(Table3).

All *Pseudomonas* isolates were sensitive to Polymxins and showed least efficacy against Gentamicin & ceftazidime(Table3).

Among the GNB, high resistance was observed for commonly prescribed and easily available drugs like ciprofloxacin & cotrimoxazole. These factors along with no formal antibiotic policies lead to emergence of bacterial resistance.

CONCLUSION

With emergence of resistance to most of commonly used antibiotics, therapeutic options have become very limited. Antimicrobials should be guided by culture and sensitivity results and empirical therapy must be based on local epidemiological data, which should be constantly updated. High prevalence of MRSA in this study necessitates urgent need for implementation of hospital infection control measures such as hand washing and barrier nursing.

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