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A STUDY OF BACTERIOLOGICAL PROFILE OF STERILE BODY FLUIDS IN A TERTIARY CARE HOSPITAL

Microbiology

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ABSTRACT

Background: Infection of sterile body sites has profound clinical implications and poor outcomes. Hence early diagnosis and prompt management is the key to reduce morbidity and mortality in these patients.
Objectives: To study the bacterial agents responsible for sterile site infections along with their antimicrobial sensitivity pattern.
Methods: A total of 100 body fluids were subjected to cultural analysis according to standard laboratory procedures. Antibiotic sensitivity testing was done by Kirby Bauer Disc diffusion method as per CLSI Guidelines.
Results: Culture positivity rate was 45%. Pleural fluids accounted for 44% of the total, followed by ascitic fluids (25%). A positive culture was seen in 72% and 52.6% ascitic fluids and peritoneal fluids respectively. Gram negative bacilli were isolated in 71.1% culture positive cases, among which, Klebsiella pneumoniae accounted for 46.9%. Antibiogram pattern showed 72.4%, 65.7% and 65.7% sensitivity, respectively, to Colistin, Amikacin and Carbapenems among Gram negative bacilli and 100% sensitivity to Vancomycin in Gram positive cocci. Culture positive patients were predominantly in the age group 31-40 years (42.2%). The male : female ratio was 1.4 : 1.
Conclusion: Timely and appropriate antibiotic treatment; often empiric, can improve the clinical outcome of body fluid infections. Hence, knowledge of bacterial pathogens and their antibiogram pattern, prevalent in a locality, needs to be available and updated on a regular basis.

KEYWORDS

Sterile body fluids, culture, anti bio gram pattern

INTRODUCTION

Infection involves invasion of body tissues or body fluids by disease causing pathogens, their multiplication and subsequent production of toxins.[1] Infectious agents may be bacteria, viruses, fungi and parasites. Infections may be superficial or deep.

Involvement of sterile sites in the body is not infrequent and may present as medical emergencies. They may be life threatening and often require prompt management.

Among bacterial causative agents of infection of sterile body sites, both gram positive and gram negative organisms have been incriminated. These involve specially those that are present as endogenous and exogenous body flora and commensals.

Laboratory evaluation with identification of the invading pathogen is necessary along with their antimicrobial sensitivity pattern.

In many cases, the severity of infection may warrant empirical antibiotic treatment. A knowledge of bacterial susceptibility pattern in a geographical area is therefore necessary so that the choice of antibiotic is effective; thus reducing morbidity and mortality, especially in the present era of bacterial drug resistance.

The present study was therefore undertaken to determine the bacteriology of body fluids and evaluate a clinico-bacteriological correlation, in terms of age and sex of patients, mono / polybacterial type of infection and ward wise distribution.

MATERIALS AND METHODS

A total of 100 body fluids received for aerobic bacterial culture analysis from different wards / units of Goa Medical College and Hospital were included in the study.

The samples were subjected to primary gram staining and culture on solid media ie. Blood Agar and Mac Con key agar along with liquid media ie. Glucose broth. All inoculated media were incubated at 37°C for 18-24 hours. After incubation, the bacterial growth, if any, was identified using standard microbiological techniques.[2] These included colony morphology, gram staining and biochemical reactions. Antimicrobial sensitivity testing was done on all isolates, as per CLSI Guidelines by Kirby Bauer disc diffusion technique.[3] The Glucose broth was sub cultured onto solid media if primary isolation did not yield any growth of bacteria.

RESULTS

A total of 100 body fluids were processed. The study however, did not include Cerebrospinal fluid samples. A positive bacterial culture was obtained in 45% cases (n=45).

Table No. 1 depicts the various types of body fluids processed along with their positivity rate. Ascitic fluids, peritoneal fluids and pleural fluids yielded growth in 72%, 52.6% and 34.1% cases respectively. A single organism was isolated in each culture positive case (mono microbial).

Bacterial isolates encountered in the study can be seen in Table No. 2. Gram negative bacilli were isolated in 71.1% cases. These included Klebsiella pneumoniae (46.9%), Escherichia coli, Pseudomonas aeruginosa and Acinetobacter baumannii (15.6% each) and Enterobacter species (6.3%). Klebsiella pneumoniae predominated in pleural fluids, while Escherichia coli predominated in ascitic fluids. Gram positive cocci isolated were 28.9%. Staphylococcus aureus contributed to 69.2% of all gram positive organisms.

Antimicrobial sensitivity pattern can be observed in Table nos. 3 and 4. A low overall sensitivity of 23.6% was observed to Penicillins among gram positive bacteria and 23.9% sensitivity to Cephalosporins in gram negative bacteria. All Staphylococci were resistant to Cefoxitin ie. 100% isolates were MRSA. These were all sensitive to Vancomycin.

Age distribution of culture positive cases revealed that 42.2% belonged to the age group 31-40 years, followed by 24.4% in the age bar 21-30 years. The male : female ratio was 1.4 : 1, males being 57.8% of the total.

Ward wise/unit distribution of culture positive cases revealed that a large number of patients were admitted in Surgical wards (37.8%; n=17), followed by Medical wards (31.2%; n=14) and Pulmonology wards (22.2%; n=10). Two patients each (4.4%) were admitted in the Obstetrics and Gynecology ward and Orthopedic ward.

DISCUSSION

Infection of sterile body sites present as clinical emergencies. These conditions can be life threatening and need to be addressed promptly, to reduce both mortality and morbidity. Sterile body fluids include pleural fluid, peritoneal fluid, ascitic fluid, pericardial fluid, synovial fluid, cerebrospinal fluid, among others.

In the present study, 45% of such samples yielded growth of bacteria on culture. Sharma et al observed a culture positivity rate of 30% in their study.[4] Rouf et al encountered an isolation rate of 10.81% in their study on sterile body fluids.[5] A higher occurrence of these infections in our locality is probably related to cases being referred to the Tertiary Hospital as a last resort, after treatment failure elsewhere.

Among all fluids processed in the present study, 44% comprised of pleural fluids, while ascitic and peritoneal fluids were 25% and 19% respectively. In the study of Rouf et al, pleural fluids contributed to 23.68% and peritoneal fluids studied were 16.23%.[5]

A positive bacterial culture was 34.1% among pleural fluids, 52.6% in peritoneal fluids and 72% in ascitic fluids, in the present study.

Pleural effusion is an abnormal collection of fluid in the pleural cavity and is bacteriologically different from pneumonia. It requires treatment to include antibiotics against both aerobic and anaerobic bacteria.

Bacterial peritonitis is a life threatening infection in patients with cirrhosis and ascitis and occurs in 10-30% of patients.[6] It is secondary to impaired humoral and cellular immune responses that result in indirect intestinal bacteria translocating into the ascitic fluid.

Synovial fluid bacterial culture positivity was 28.6% in the present study. Fluid accumulation with subsequent septic arthritis can cause joint destruction. Clinical diagnosis of this condition can be substantiated by laboratory parameters and a positive culture result.

In the present study, bacterial types isolated from all body fluids were predominantly gram negative bacteria. Klebsiella pneumoniae was isolated in 33.4% samples. Pseudomonas aeruginosa and Acinetobacter baumannii, each, were isolated in 11.1% cases. Fortunately, isolation of Acinetobacter species was low, given the fact that this organism is associated with severe infections and high mortality rate.[7] Similar predominance of gram negative bacteria in sterile body fluids was also seen in the study of Rouf et al.[5] Clinical relevance of gram positive cocci, especially Enterococci in peritoneal fluids is a matter of debate, as they are of low virulence and often seen as secondary invaders.[8]

The spectrum of bacteria incriminated in body fluid infection varies and is modified by introduction of antibiotics, surgical procedures undertaken, trauma or underlying conditions.[5] Rouf et al opine that variations in methodology employed also play a role ie. specimen collection, transport and diagnostic techniques undertaken.[5]

In the present study, gram negative bacteria were overall sensitive to amikacin and carbapenems (65.7% each), and colistin (72.4%). These findings are in agreement with those of Rouf et al[5] and Sharma et al.[6] All gram positive isolates were sensitive to Vancomycin in the present study. All Staphylococcus isolates were MRSA.

CONCLUSION

Regular periodic evaluation of the bacteriological profile of body fluids is essential, in any geographic location, along with antibiotic sensitivity pattern. This will help to empirically manage these life threatening infections with the most appropriate antimicrobial that will be effective, thus reducing mortality and morbidity.

Table 1: Types Of Body Fluids And Their Positivity Rate

Samples	Total number processed	No. yielding growth	Percentage
Pleural fluid	44	15	34.1
Peritoneal fluid	19	10	52.6
Ascitic fluid	25	18	72
Pericardial fluid	5	0	0
Synovial fluid	7	2	28.6

Table 2: Bacterial Isolates Obtained On Culture

Organisms	Total No. isolated	Pleural fluid	Peritoneal fluid	Ascitic fluid	Synovial fluid
Staphylococcus aureus	9 (20)	3 (20)	1 (10)	3 (16.7)	2 (100)
Enterococcus	4 (8.9)	-	2 (20)	2 (11.1)	-
Escherichia coli	5 (11.1)	-	-	5 (27.8)	-
Klebsiella pneumoniae	15 (33.4)	8 (53.3)	4 (40)	3 (16.7)	-
Enterobacter species	2 (4.4)	-	-	2 (11.1)	-
Acinetobacter baumannii	5 (11.1)	3 (20)	1 (10)	1 (5.5)	-
Pseudomonas aeruginosa	5 (11.1)	1 (6.7)	2 (20)	2 (11.1)	-
Total	45 (100)	15 (33.4)	10 (22.2)	18 (40)	2 (4.4)

NB: Figures in parenthesis indicate percentages

Table 3: Antimicrobial Sensitivity Pattern Of Gram Positive Cocci (percentage)

Antibiotic	S. aureus	Enterococcus
Penicillin	22.2	25
Ampicillin	33.3	25
Amoxycillin	66.7	-
Azithromycin	44.4	-
Trimethoprim + Sulphamethoxazole	77.8	-
Chloramphenicol	66.7	-
Ciprofloxacin	66.7	75
Levofloxacin	66.7	75
Gentamicin	55.6	50
Doxycycline	77.8	50
Tetracycline	-	75
Clindamycin	77.8	-
Linezolid	88.9	75
Cefoxitin	0	-
Vancomycin	100	100

Table 4: Antimicrobial Sensitivity Pattern Of Gram Negative Bacilli (percentage)

Antibiotic	Enterobacteriaceae	Pseudomonas aeruginosa	Acinetobacter baumannii
Ampicillin	18.2	-	-
Cefazolin	31.8	-	-
Gentamicin	54.5	60	20
Amikacin	77.3	60	40
Tobramycin	54.5	60	20
Amoxycillin + Clavulanate	27.3	-	-
Ampicillin + Sulbactam	31.8	-	20
Piperacillin + Tazobactam	63.6	80	60
Cefuroxime	27.3	-	-
Cefepime	31.8	20	20
Ceftriaxone	31.8	-	20
Ceftazidime	31.8	20	20
Ciprofloxacin	63.6	60	20
Levofloxacin	-	60	-
Imipenem	77.3	60	60
Meropenem	77.3	60	60
Trimethoprim + Sulphamethoxazole	54.5	-	40
Aztreonam	63.6	60	-
Colistin	77.3	80	60
Chloramphenicol	63.6	-	-
Doxycycline	-	-	20
Netilmycin	-	60	-

Table 5: Age And Sex Distribution Of Culture Positive Cases

Age in years	Male		Female		Total	
	No.	%	No.	%	No.	%
0-10	-	-	-	-	-	-
11-20	2	66.7	1	33.3	3	6.7
21-30	6	54.5	5	45.5	11	24.4
31-40	10	52.6	9	47.4	19	42.2
41-50	4	66.7	2	33.3	6	13.3
51-60	2	66.7	1	33.3	3	6.7

> 61	2	66.7	1	33.3	3	6.7
Total	26	57.8	19	42.2	45	100

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