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Original Research Article

Bacteriological Study of Pyogenic Meningitis and their Antimicrobial Sensitivity Pattern, In a Tertiary Care Hospital, at Bihar, India

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Abstract
Objective: *Bacterial meningitis is an important and frequent devastating disease. Present study was carried out to know the incidence of pyogenic meningitis in our hospital, to study the bacteriology of acute pyogenic meningitis, antibiogram of the isolates and usefulness of C- reactive protein (CRP) in cerebrospinal fluid in the diagnosis of acute pyogenic meningitis in comparison with culture and to know the sensitivity of Grams staining and culture.*
Materials and Method: *A total of 165 clinically suspected meningitis patients between the age group of 2 days to 14 years including both sexes admitted to department of pediatrics were included in the study. The CSF sample was collected under aseptic precautions in a sterile container and centrifugation was done. After centrifugation, the supernatant was aliquot to another test tube and used for cell, sugar, protein and CRP tests. The sediment was used for Grams stain, Ziehl-Neelsen staining and culture and sensitivity test. Identification and antibiotic susceptibility test done by the standard Kirby-Bauer disc diffusion method according to CLSI guidelines. The zone of inhibition were measured and interpreted according to CLSI guidelines. All media and antibiotic disks were supplied from Himedia, Mumbai, India.*
Result: *Out of 165 CSF samples studied, 45(27.2%) were diagnosed as pyogenic meningitis. H.influenzae was the commonest organism 10(22.2%), followed by Streptococcus pneumonia 8 (17.7%), Staphylococcus aureus 6(13.3%), Acinetobacter species 2(4.4%), Coagulase Negative Staphylococci 5(11.11%), E. coli 2(4.4%), and one case each of Klebsiella species, Group B streptococci species, Proteus species, Pseudomonas species and Enterococci species. The sensitivity of Grams staining test was 91% and that of CRP test was 64.5%. As most of the cases included in our study were treated earlier, the culture positivity was only 62.2%.*
Conclusion: *Grams staining, C- reactive protein, culture and sensitivity tests if done properly are most rapid and reliable tests for the diagnosis of pyogenic meningitis.*
Keywords: *pyogenic meningitis, Grams staining, C - reactive protein.*

Introduction

Bacterial meningitis is a very important and frequent devastating disease. Many bacterial pathogens have been reported to cause meningitis. Despite the large number of bacterial pathogens that have been reported to cause acute meningitis, certain microorganisms are isolated with higher frequency. Bacterial meningitis continues to be an important cause of morbidity and mortality in India and throughout the world despite the availability of effective antimicrobial therapy. Therefore, accurate information on the etiological agent, population at risk, trends in antimicrobial resistance, morbidity and mortality is critical, to develop public health measures and ensure appropriate management.

The present study was carried out to determine the prevalence of pyogenic meningitis in our hospital in children and to find out the sensitivity of Grams staining and CRP for the diagnosis of pyogenic meningitis from CSF sample.

Materials and Methods

The Present study was conducted in the Department of Microbiology, Government Medical College, Bettiah, West Champaran, Bihar, with the help of Department of Medicine and Pediatrics, during the period of November 2017 to April 2019. A total of 165 clinically suspected meningitis patients between the age group of 2 days to 14 years including both sexes admitted to department of pediatrics were included in the study.

The CSF sample was collected under aseptic precautions in a sterile container and centrifugation was done at 1500 rpm for 10 minutes. After centrifugation, the supernatant was aliquot to another test tube and used for cell, sugar, protein and CRP tests (serological tests). The sediment was used for Grams staining, Ziehl-Neelsen staining and Antimicrobial sensitivity tests. For culture, the CSF sample was inoculated on sheep blood agar, BHI broth, chocolate agar with X and V factor, and on Mac Conkey's agar media. Subcultures were done after 6-8 hours and 24 hours on above mentioned media. The inoculated plates were incubated at 37°C with 5% CO, using a candle jar in an incubator. The culture plates were observed for any growth next day. The isolated organisms were identified by standard biochemical tests. Antibiotic sensitivity test was done by the standard Kirby-Bauer disc diffusion method according to CLSI guidelines. The zone of inhibition were measured and interpreted according to CLSI guidelines. All media and antibiotic disks were supplied from Himedia, Mumbai, India. Antibiotics used are Amoxyclav, Moxifloxacin, Amikacin, Vancomycin, Imipenem, Piperacillin+Tazobactum, Ceftazidime, Cefepime and Levofloxacin.

Results

Out of 165 children who were clinically suspected of meningitis, 45 children (27.2%) were diagnosed as pyogenic by laboratory investigations. Out of the 45 cases of pyogenic meningitis, males (122) were affected more than females (43) with a ratio of 2.83:1. Most of the cases were between the age group 2 month to 14 year. Out of 45 cases of pyogenic meningitis, H. influenzae was the commonest organism 10(22.2%), followed by Streptococcus pneumoniae 8 (17.7%), Staphylococcus aureus 6(13.3%), Acinetobacter species 2(4.4%), Coagulase Negative Staphylococci 5(11.11%), E. coli 2(4.4%), and one case each of Klebsiella species, Group B streptococci species, Proteus species, Pseudomonas species and Enterococci species. No Growth was observed in 7(15.55%) cases.

Among 45 cases studied, 28 (62.2%) cases were positive for both Grams staining and culture. One case (2.2%) was Negative for Grams staining but culture was positive for Coagulase Negative Staphylococci. 14 (31.1%) cases were positive by Grams staining but negative for culture.

Of the 45 cases studied, 27 (60%) were positive for both C-reactive protein (CRP) and Grams staining. 2 (4.4%) cases, which were positive for CRP, were negative by Grams staining. 15(33.3%)

cases which were negative for CRP were positive by Grams staining. 1(2.2%) case was negative for both CRP and Grams staining.

Out of the 45 cases studied, 20 (44.4%) cases were treated and 25 (55.5%) cases were not treated before CSF was drawn. Among the 20 treated cases, 4 (8.8%) were positive and 16 (35.6%) were negative by culture. All the 25 untreated cases were positive by culture.

Table 1 shows Age wise distribution of bacterial Isolates.

Age of Patients	Bacterial Isolates	No. of Isolates
1 Month	Group B-streptococci	1
	Hemophilus influenzae	2
	Klebsiella pneumoniae	1
1 Month - 1 year	Hemophilus influenzae	3
	Streptococcus pneumoniae	2
	Enterococci	1
	Proteus	1
	S. aureus	2
1 year - 6 years	Hemophilus influenzeae	3
	E. coli	2
	Coagulase negative staphylcocci	2
	Streptococcus pneumoniae	2
	Acinetobacter	1
	Pseudomonas	1
6 year - 12 years	Streptococcus pneumoniae	4
	Acinetobacter	1
	Hemophilus influenzeae	2
	S. aureus	4
	Coagulase negative staphylcocci	3

Table -2 shows causative organism of Pyogenic Meningitis

Causative organism of Pyogenic Meningitis	Total no. of Isolates N=38	Percentage
Hemophilus influenza	10	22.2
Streptococcus pneumoniae	8	17.7
Staphylococcus aureus	6	13.3
Acinetobacter	2	4.4
Coagulase negative staphylococci (CONS)	5	11.1
E.coli	2	4.4
Klebsiella	1	2.2
Group B-streptococci	1	2.2
Pseudomonas	1	2.2
Proteus	1	2.2
Enterococci	1	2.2
NO GROWTH	7	15.5
TOTAL	45	

Table-3 Shows Antimicrobial Sensitivity Pattern of Isolates.

Antibiotics	Hemophilus influenzae	Streptococcus pneumoniae	Staphylococcus aureus	Enterococci
Amoxyclav	27 (71%)	14(36.84%)	18(47.36%)	15(39.17%)
Moxifloxacin	29(76.31%)	28(73.68%)	21(55.26%)	26(68.42%)
Amikacin	19(50%)	12(31.57%)	14(36.8%)	28(73.68%)
Vancomycin	38(100%)	38(100%)	38(100%)	24(63.15%)
Imipenem	38(100%)	38(100%)	38(100%)	25(65.78%)
Piperacillin+Tazobactum	38(100%)	38(100%)	38(100%)	28(73.28%)
Ceftazidime	36(94.7%)	36(94.7%)	36(94.7%)	27(71.05%)
Cefepime	34(89.5%)	34(89.5%)	34(89.5%)	31(81.5%)
Levofloxacin	16(42.1%)	19(50%)	18(47.3%)	19(50%)

Discussion

Among 165 cases studied, 45(27.2%) cases were identified as pyogenic meningitis of which, 16 (35.55%) were between 1 month to 1 year, followed by 14 (31.11%) cases between 6 years to 12 years, and 11 (24.11%) cases between 1 year to 6 years. Only 4 (8.88%) cases belong to neonatal age group. Males were affected more than females with a ratio of 2.82:1.

Grams staining is said to be highly reliable in diagnosis of bacterial meningitis. In our study, the sensitivity of Grams staining was 91% and is more than that of Rajkumar et a1 44%, Gaitonde et al 55% and Lidia Hristeva et al 68%. Our result correlates well with that of Rao B.N. et al 86%.

In our study, the culture positivity was 62.2% and is more than that of Johny Vincent et al 43%, Rajkumar et al 53%, Manita Williamson et al 23%. Our culture positivity report correlates well with that of Rao B.N. et al 66% and Gaitonde et al 68%, but is less than that of Lidia Hristeva et al 81%.

Various studies have shown up to 100% sensitivity for CRP test. In our study the sensitivity of CRP was 64.5%.

Most of our cases (44.4%) were treated before admission. Hence, the culture positivity was only 28 out of 45 (62.2%).

H.influenzae isolates were sensitive to Moxifloxacin, Vancomycin, Imipenem, Piperacillin+Tazobactum, Cefepime, Ceftazidime, and resistant to Levofloxacin and Amoxyclav,

The antibiotic sensitivity of Str.pneumoniae to Vancomycin, Imipenem, Piperacillin+Tazobactum was 100% and Moxifloxacin was 73.68% and resistant to Amikacin, Amoxyclav, Ceftazidime,Cefepime and Levofloxacin.

The antibiotic sensitivity of Staphylococcus aureus to Amikacin, Moxifloxacin and Amoxyclav was 36.84%, 55.26%, 47.36% respectively. All the isolates were sensitive to vancomycin, Imipenem, Piperacillin+ Tazobactum, Ceftazidime and Cefepime.

Enterococcus isolate was sensitive only to Amikacin Piperacillin+Tazobactum, Ceftazidime and Cefepime.

The antibiotics which were found useful in Acinetobacter species, E.coli, Klebsiella and Proteus species are Amikacin, Moxifloxacin Imipenem and Ceftazidime.

Conclusion

45 (27.2%) cases were diagnosed as pyogenic meningitis. Commonest age group was between 2 month to 14 year. Males were affected more than females with a ratio of 2.83:1. Hemophilus influenzae was the commonest isolate and next common isolate was Streptococcus pneumoniae. Gram negative bacilli meningitis accounted for 16%. No single case of meningococcus was isolated in our place. Culture positivity in our study was 62.2%. Grams staining were a better indicator than the culture (sensitivity 91%). Sensitivity of C-reactive protein was 64.5% are most rapid and reliable for the diagnosis of pyogenic meningitis.

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