

PATTERN AND ANTIBIOTIC SUSCEPTIBILITY OF BACTERIA ISOLATED IN CLINICALLY SUSPECTED CASES OF ACUTE PYOGENIC MENINGITIS IN CHILDREN IN KRH, GWALIORR. D. Dutt¹, Vipendra Kumar Bhadkaria², Chandrakala Dutt³**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: This study was conducted in Department of Pediatrics, Kamla Raja Hospital Gwalior, (MP), during a period of a year September 2011 to August 2012. It was prospective and investigational study. Two hundred cases were enrolled for the study confirmed by either CSF r/m and or CSF c/s. Their history, complete physical examination and investigation like CSF, RBS, Blood c/s and Urine c/s were sent. Out of 200, male were 66% and female were 34% making a ratio of 1.9:1. Maximum cases were below the age group of 6year (80%). About 60% cases were from the rural area and 40% from urban area. More cases found in the months of May, Jun and July (45%). Commonest manifestations were fever (96%), irritability/ lethargy (88%), vomiting (80%), convulsion (75%), unconsciousness (53%) and headache (31%). Signs of meningeal irritation were neck rigidity (57%); kerning's sign (51%), brudzinki's sign (45%) and photophobia (28%). Anterior fontanel Bulging were found in (30%) cases. Sensitivity of gram stain of the CSF was 88%. Culture was found positive in 35%. Out of 70 cases of culture positive 52 cases were gram negative and 18 cases were gram positive. Bacteria isolated from CSF were common below 3 years age group and there was very less difference in sex distribution. The bacteria isolated from the CSF culture were pseudomonas, Klebsiella, Acinetobacter, Streptococci pneumonia, Staph. Aureus, E.coli, Gm -ve bacilli, Citrobacter, Proteus, Enterobacter. Overall sensitivity pattern were for meropenem (90%), vancomycin (87.5%), ceftriaxone (85.7%), Amikacin (85.7%), Ceftazidime (82.2%), Piperacillin-Tazobactam (81.4%), Amoxyclav (77.1%), Cefotaxime (70%), Gentamicin (70%), and Netilmicin (70%). Blood and urine culture were positive 5% and 2% respectively. Case fatality rate was 11.5%. Acute bacterial meningitis in children has a considerable mortality, morbidity and serious long term sequelae therefore neurodevelopmental follow up and therapy should begin early. The study concluded that up to eighty percent of all cases of bacterial meningitis admitted to Gajra Raja Medical College were children less than six years old. There is change in the trends of organism causing meningitis. The most common microorganisms responsible were pseudomonas, Klebsiella and Acinetobacter. There is increasing resistance to the commonly used antibiotics like cefotaxime, gentamicin and amoxyclav. Therefore prompt treatment is essential whenever presumed cases of meningitis are encountered so that the incidence of bacterial meningitis and its complications can be reduced.

KEYWORDS: Antimicrobial Resistance, Antibiotic pattern, case fatality rate.

INTRODUCTION: Meningitis is a very serious infection of the meninges that surround the brain and the spinal cord. It is usually caused by viral, bacterial or fungal pathogens. Bacterial meningitis can be quite severe and may result in brain damage, hearing loss, or learning disability and death if not

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treated early. Despite advances in vaccine development and chemoprophylaxis, bacterial meningitis remains a common disease worldwide. The disease is more common in developing countries.

A major risk factor for meningitis is the lack of immunity to specific pathogens associated with young age. Additional risks include recent colonization with pathogenic bacteria, close contact, overcrowding, poverty and male gender. The mode of transmission is person to person contact through respiratory tract secretions or droplets. Altered immunoglobulin production in response to encapsulated pathogens is another risk factor. CSF leak across a mucocutaneous barrier, lumbosacral dermal sinus and meningocele are associated with an increased risk of meningitis.

Cerebrospinal fluid (CSF) culture is the best diagnostic method and is positive in the majority of the cases. But the use of antibiotics by patients usually causes problems in isolating the infective agents. Blood culture in bacterial meningitis is positive in 40-60% of patients and may provide the only definitive clue to the causative agents if CSF culture is negative. Furthermore Gram stain of CSF permits presumptive identification of the causative agents in most cases.

Haemophilus influenzae type b (Hib) was the leading cause of bacterial meningitis but new vaccines being given to all children as part of their routine immunizations have reduced the occurrence of invasive disease due to H. influenzae. Today, Streptococcus pneumoniae and Neisseria meningitidis are the leading causes of bacterial meningitis.

In India Meningococcal disease is endemic. Cases of meningococcal meningitis are reported sporadically or in small clusters.

Even when the disease is diagnosed early and adequate therapy is instituted, the case-fatality rate ranges from 5-10% and may exceed 40% in patients with meningococcal sepsis. Among those who survive the meningococcal disease, 10-20% experience neurological sequelae. The most common neurological sequelae include hearing loss, mental retardation, delayed milestones, speech problem, visual impairment and motor deficit.

Antimicrobial resistance of bacteria is a worldwide problem. Microbiology laboratories play a critical role not only in the early identification of the causative bacterium and its antibiotic susceptibility pattern but also in providing valuable information regarding the common incriminating pathogens in that area and also which drugs to start empiric treatment.

AIMS AND OBJECTIVES

- To identify the bacterial pathogen that causes meningitis
- To find out the Antibiotic susceptibility pattern of isolates from the Cerebrospinal fluid of acute bacterial meningitis cases.

METHODS

- Children in the age group of 3 months to 14 years with the clinical diagnosis of meningitis were investigated for CSF.
- Those children with either CSF routine microscopy and/or culture suggestive of pyogenic meningitis were included in the study.
- Data were collected after taking informed and written consent in the structured proforma which included history, complete physical examination and investigation.
- Complete blood count, RBS, urine culture in a sterile vial and blood culture sent in the blood culture broth issued from the microbiology department. CSF was drained under aseptic

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precaution, one part studied for routine and microscopy (gram stain) and other sent for culture and antibiotic susceptibility.

- CSF Routine and Microscopy:

Colour turbid,

CSF R/M: Protein - 100-500 mg/dl

(Pyogenic): Glucose - < 50% of Blood sugar or < 40 mg/dl

Cells - > 100-10000 /cmm with PMN predominance

Gram staining

Above picture of CSF was included as pyogenic meningitis.

- CSF culture samples were sent to the department of microbiology where sample were inoculated on blood agar, chocolate agar and mac Conkey's agar, the plates were incubated at 35-37°C with 5-10% CO₂ in candle jar and with 60-70% humidity for 24-48 hrs.
- All the bacterial isolates were identified by standard laboratory techniques which included colony morphology, as well as staining, biochemical and serological test.
- Antibiotic susceptibility was conducted on pure culture isolates performing the Kirby-Bauer disc diffusion method.
- Sensitivity was studied for commonly used antibiotics: Cefotaxime, Ceftriaxone, Ceftazidime, Amoxyclav, Piperacillin-Tazobactam, Gentamicin, Amikacin, Vancomycin, Meropenem and Netilmicin

OBSERVATIONS: The study “pattern and antibiotic susceptibility of bacteria isolated in clinically suspected cases of acute pyogenic meningitis in children in KRH, Gwalior” was Prospective and investigational study on all suspected cases of meningitis admitted in Kamla Raja Hospital, Gwalior during July 2011 to October 2012 conducted in Department of Pediatrics, Kamla Raja hospital, G. R Medical College, Gwalior. The data was collected, analyzed and observations presented in form of tables are as follows: - Total number of cases registered was 200.

Age	No.	%
3 month - 3 yrs.	120	60
3 yrs. - 6 yrs.	40	20
6 yrs. - 10 yrs.	24	12
10 yrs. - 14 yrs.	16	8

Table No. 1: Age wise distribution

Eighty (80%) children of Acute Bacterial Meningitis were below the age of 6 years.

Gram Stain	Culture +ve	Culture -ve	Total
Gram stain +ve	60	50	110 (55%)
Gram stain -ve	10	80	90 (45%)
Total	70 (35%)	130 (65%)	200 (100%)

Table no 2: Correlation of Gram Stain and Culture in Pyogenic Meningitis (n=200)

Out of 200 cases of Acute bacterial meningitis, 110 cases (55%) were positive for Gram stain and out of 110, 60 cases (54%) showed culture positivity, out of those of gram stain positive and out of 90 cases of gram stain negative, 10 were positive for culture.

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Sensitivity of gram stain was 85% and specificity was 38%.

Culture	CSF R/M +VE	CSFR/M -VE	Total
Culture + ve	37	33	70(35%)
Culture - ve	130	0	130(65%)
Total	167(88.5%)	33(16.5%)	200 (100%)

Table No. 3: Correlation of CSF R/M and Culture in Pyogenic Meningitis (n=200)

Out of 200 cases of Acute bacterial meningitis 70(35%) were culture positive with sensitivity of 22%. CSF Routine and Microscopy was positive in 167(88.5%) out of 200.

Bacterial isolated	Gm stain	No.	%
Pseudomonas	Negative	13	18.6
Klebsiella	Negative	11	15.7
Acinetobacter	Negative	10	14.3
Strep. pneumoniae	Positive	9	12.9
Staph. aureus	Positive	9	12.9
E. coli	Negative	7	10
Gram -ve bacilli	Negative	5	7.1
Citrobacter	Negative	4	5.7
Proteius	Negative	1	1.4
Enterobacter	Negative	1	1.4
Total		70	100

Table No. 4: Microbial isolates from CSF cultures

Maximum bacteria isolated were gram negative (58) and less gram positive (18). Of these gram negative, pseudomonas (13) 18.6%, Klebsiella (11) 15.7%, Acinetobacter (10) 14.3% were common and those of gram positive, str. Pneumonia (9) 12.9% and staph aureus (9) 12.9% were equally found.

Bacterial isolated	CFT	CTR	CTZ	PZT	AMX	VAN	AMK	GEN	MER	NET
Pseudomonas (13)	8	11	12	10	9	11	12	8	12	8
Klebsiella (11)	7	10	10	9	9	9	10	8	10	10
Acinetobacter(10)	7	8	9	8	8	9	9	7	10	8
St pneumoniae (9)	8	8	7	8	8	7	8	8	8	5
Staph. aureus (9)	7	7	6	7	6	8	7	7	7	5
E. coli (7)	5	7	5	5	5	6	6	5	6	6
Gr -ve bacilli (5)	3	3	4	4	4	5	5	3	5	3
Citrobacter (4)	2	4	3	4	3	4	2	2	3	2
Proteus (1)	1	1	1	1	1	1	-	1	1	1
Enterobacter (1)	1	1	1	1	1	1	1	-	1	1
Total (70)	49	60	58	57	54	61	60	49	63	49
(%)	(70)	(85.7)	(82.8)	(81.4)	(77.1%)	(87.1)	(85.7)	(70)	(90)	(70)

Table No. 5: Sensitivity Pattern of Microbial Isolates from CSF

CFT- Cefotaxim, CTR- Ceftriaxone, CTZ - Ceftazidime, PZT - Pip-tozobactum,

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AMX-Amoxycylav, VAN- Vancomycin, AMK- Amikacin, GEN- Gentamycin, MER-meropenem, NET- Netilmicin.

Overall sensitivity pattern were for Cefotaxime (70%), Ceftriaxone (85.7%), Ceftazidime (82.2%), Piperacillin-Tazobactam (81.4%), Amoxycylav (77.1%), Vancomycin (87.5%), Amikacin (85.7%), Gentamicin (70%), Meropenem (90%) and Netilmicin (70%).

Different organism showed different sensitivity pattern for each antibiotic like *Pseudomonas* had good sensitivity (92%) against ceftazidime, amikacin and meropenem and less sensitive (61%) against cefotaxime, amoxycylav, gentamicin and Netilmicin. *Klebsiella* had good sensitivity (90%) against ceftriaxone, ceftazidime, amikacin, meropenem and Netilmicin and less sensitive (63%) against cefotaxime and gentamicin.

Acinetobacter was more sensitive (100%) against meropenem and less sensitive (70%) against cefotaxime and gentamicin. *Str. Pneumoniae* had good sensitivity against most of the antibiotics except Netilmicin. *Staph. Aureus* was more sensitive (88.8%) against vancomycin and less sensitive against ceftazidime, amoxycylav, Netilmicin. *E.coli* was more sensitive against ceftriaxone. Gram -ve bacilli were more sensitive against vancomycin, amikacin, meropenem. *Citrobacter* had good sensitivity against ceftriaxone, piperacillin-tazobactam and vancomycin.

DISCUSSION: Acute bacterial meningitis is a medical emergency which warrants early diagnosis and aggressive therapy. Bacterial meningitis has an unacceptable mortality and frequency of neurological sequelae. Mortality varies with the age. Most often therapy for bacterial meningitis has to be initiated before the etiology is known.

The choice of initial antimicrobial therapy in ABM is based on the most common pathogen prevalent in a particular geographical area and age group and its antibiotic sensitivity pattern.

Pyogenic meningitis occurs at all ages but it is commonest in infancy. Morbidity and mortality also varies with age and extremes of ages associated with greater mortality. In our study, 60% (n=120) were aged between 3 months to 3 years and within 6yr of age, 80% (160) of cases were found. Rai Muhammad Asghar and Fatima Khan et al¹ study showed 53.3 % and 58% cases of meningitis in children aged between 2months to 2yrs. H Erleen Nur and I Jamaiah of Malaysia² study also showed about 93% cases below the age of 5 years.

In our study, similar results were obtained 66 % (n=132) were male and 34 % (n=68) were females. This may be due to the parents seeking more medical help for male than female child.

In our study most of the cases were from the rural 59.5% (no-119) and 40.5% (no-81) were from urban area. Similar types of finding were also reported by Fatima et al.³

Maximum cases were found in the month of May (25), Jun (35) and July (30). Similar study by Fatima et al showed the maximum incidence in the month of May and Jun.

In our study fever (96%), irritability and lethargic (88%), vomiting (80%), convulsion (75%), neck rigidity (57%) were the commonest manifestation of meningitis. Most of the study showed fever being the commonest presentation as similar to E.Sonavane et al.⁴

In our study, Gram stain provided an evidence of the causative bacteria in 110 (65.7%) patients with sensitivity of 88%. Of these 60 CSF samples yielded growth on culture while 50 were culture negative. R Mani⁵ study also showed gram stain positivity of 65.7%. James A Berkley showed the sensitivity 60.90% and spasticity >97%.⁶

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CSF samples taken from 200 patients, only 70 (35%) patients were positive on culture in our study. Of these 58 organisms were gram negative and 18 organisms were gram stain positive. In our study, we observed that gram negative bacteria pseudomonas has emerged as the most common pathogen causing acute bacterial meningitis in all age groups followed by Klebsiella and Acinetobacter.

The other important pathogens for the pyogenic meningitis were staph aureus, Streptococcus Pneumoniae, E.coli, gram -ve bacilli and Citrobacter.

There were no cases of H. Influenza and N. Meningitides found in our study. Some study like Anthony O. Oniped et al⁷ showed gram positive predominance.

Julius P Kiwanukul et al,⁸ A Sonawane et al and some study showed that there is change in the trend of organism causing meningitis from west to south East Asia.

VP Bardakar studies report culture negative cases of meningitis range from 6-50%.⁹ In our study most of the organism were more sensitive to meropenem (90%), vancomycin (87.1%), ceftriaxone (85.7%), amikacin (85.7%), and Piperacillin Tazobactam (82.4%) and were less sensitive against cefotaxime, Netilmicin, gentamicin and amoxycylav as similar to Behnam Sobouti et al.¹⁰

In our study Blood and urine culture positive were 6% and 2% respectively. Study by Dr. Andargachew Mulu showed higher yield on blood culture.¹¹

The case fatality rate was 11.5% despite treatment. Although lower mortality rates have been reported from the Western countries (2.6%), higher rates had been reported in some developing countries (20-30%) which are higher than ours as reported by Susana Chavez¹² In our institution case fatality rate was low because of good care of patient.

CONCLUSION: The study concluded that up to eighty percent's of all cases of bacterial meningitis admitted to Gajra Raja Medical College were children less than six years old. There is change in the trends of organism causing meningitis. The most common microorganisms responsible were pseudomonas, Klebsiella and Acinetobacter.

There is increasing resistance to the commonly used antibiotics like cefotaxime, gentamicin and amoxycylav. Therefore prompt treatment is essential whenever presumed cases of meningitis are encountered so that the incidence of bacterial meningitis and its complications can be reduced.

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