Original Research Paper Microbiology

A STUDY ON THE PREVALENCE OF ACUTE BACTERIAL MENINGITIS IN A TERTIARY CARE CENTRE

Dr.N.ANURADHA M.D (Microbiology) Senior Assistant Professor, Institute of Microbiology, Madurai Medical College, Madurai.

ABSTRACT As the etiology of acute bacterial meningitis varies with age and region of the world, this study aims to detect the prevalence of this infection in a tertiary care centre.

A total of 200 CSF samples were collected from suspected cases of acute bacterial meningitis in the Department of Medicine and Paediatrics. All the samples were subjected to Gram staining , bacterial cultutre and latex agglutination.

SUMMARY

1) Among the suspected cases, 15.5% were positive using various techniques.
2) Among the positive cases, 61% were males and 0-6 years was the common age group irrespective of sex.
3) S.pneumoniae was the commonest organism isolated in all age groups.
4) Gram staining can be used for screening .
5) Latex Agglutination Test can be used for rapid diagnosis

KEYWORDS : bacterial meningitis, culture& latex agglutination

INTRODUCTION

Bacterial meningitis, an acute purulent infection involves the subarachnoid space or the leptomeninges. It is associated with the CNS manifestations like decreased/unconsciousness, seizures, raised intracranial pressure and stroke and is one of the major causes of mortality and disability worldwide [1].The etiology of bacterial meningitis varies with age and region of the world.

Currently, the most common organisms causing community-acquired bacterial meningitis are Streptococcus pneumoniae followed by N.meningitidis , Group B streptococci , and Listeria monocytogenes [2]. Nowadays H.influenzae accounts for <10% of cases of meningitis owing to widespread adoption of Hib vaccine. Many other organisms like Mycobacterium tuberculosis, fungi, protozoa may also cause meningeal inflammation.

Neonatal bacterial meningitis,a rare but serious infection, results in mortality up to 30–40 percent and morbidity in up to 30 percent of survivors. The causative agents differ from those causing bacterial meningitis at other ages. The principal causative organisms include Gram negative enteric bacilli and Group B streptococci. Listeria monocytogenes has become an increasingly important causative agent of meningitis in neonates (<1 month of age), pregnant women, elderly persons and immunocompromised individuals .

Examination of CSF offers the chance of observing, isolating, and identifying the causative organism in bacterial meningitis. Even if bacteria cannot be recovered on culture, microscopy helps in the diagnosis of bacterial meningitis and may indicate the likely causative organism. The other methods of diagnosis include bacterial antigen detection, molecular techniques like PCR.

Mortality and morbidity rates vary with the time of illness and the causative bacterium. The success of proper antibiotic therapy depends on early identification of the causative agent. As the epidemiology is changing swiftly with effective vaccination for the common meningitis etiological agents, we aim at studying the various causative organisms and their prevalence.

MATERIALS AND METHODS

This one year study was conducted at Govt. Rajaji Hospital, attached to Madurai Medical College, Madurai and the CSF samples were obtained from patients admitted in the Department of Medicine and the Department of Paediatrics. The study population included 200 suspected cases of acute bacterial meningitis. Prior to the onset of the study, Ethical committee clearance was obtained. Informed consent was obtained from each participant.

Inclusion criteria:

1.Acute febrile illness with CNS symptoms like head ache, vomiting,altered sensorium, neck rigidity, seizures 2. Rash, 3. Hemorrhagic manifestations 4. Refusal of feeds

Exclusion criteria:

1.Febrile cases without the above symptoms 2.Recurrent meningitis in patients with CNS structural defects 3.Tuberculous meningitis.

CSF samples were collected by lumbar puncture.Soon after the collection of CSF, it was transported to the microbiology laboratory, where it was processed immediately (within one hour from the time of collection). Initially the CSF was centrifuged for 20 minutes at 2000 rpm. Supernatant was used for antigen detection by latex agglutination and the sediment was vigorously vortexed. Two to three drops of the sediment (overlay method) were used for Gram staining and one drop each to streak on the primary culture media (Blood Agar, Chocolate Agar, Chocolate Agar with IsoVitaleX, MacConkey Agar and Nutrient Agar plates).

A presumptive diagnosis of bacterial meningitis caused by S.pneumoniae, N.meningitidis, H. Influenza, Group B Streptococci, Escherichia coli was made by Gram stain of the CSF sediment or by detection of specific antigens in the CSF by the Latex agglutination test. The positive results of either or both tests provided evidence of infection, even if cultures failed to grow.

The morphology of colonies grown on the culture plates were noted. Based on the colonial morphology and other identification tests(Oxidase, CAMP test,,Bile solubility, Optochin sensitivity, CHO Utilization test, Factor X and V Requirement,) isolates were identified and confirmed.

RESULTS

Of the 200 CSF samples tested, thirty one samples(15.5%) were found to be lab proven positives for acute pyogenic meningitis. The samples which showed positivity by any one methodology (Direct Gram stain, Culture, Latex Agglutination test) along with clinical manifestations of meningitis were taken as lab proven positives according to WHO Meningitis Registry. The 31 positive samples were further analysed according to age and sex wise and tabulated.The results are shown in TABLE 1.

Table –1 AGE AND SEX WISE DISTRIBUTION OF POSITIVES

AGE IN YEARS	MALES	FEMALES	TOTAL
0-6	**8**	**3**	**11(35.5%)**
7-12	4	4	8(26%)

13-18	1	1	2(6.5%)
19-24	3	2	5(16%)
25-30	2	2	4(13%)
31-36	1		1(3%)
37-42, 43&above	-	-	
TOTAL	19(61%)	12(39%)	31(100))%

Thus, the study of meningitis positives showed that males were most commonly affected and also revealed that 0-6 years was the commonest age group affectedby meningitis.

Among the 31 lab proven positives, Gram staining showed positivity in 25 samples (81%). Of the 25 positive samples, 17 were Gram positive cocci, 3 were Gram negative cocci and 5 were Gram negative bacilli. Of all the samples cultured for, it was found that 12 samples(6%) were culture positive for various organisms. The samples which showed positivity by Latex agglutination test (using Wellcogen Kit)was 26 in our study. Out of 26 positive samples, 18 (69%) were positive for S.pneumoniae, three (11%) were positive for H.influenzae and two each [8%] were positive for N.meningitidis and E.coli K1 and one(4%) was positive for Gr. B Streptococcus

The samples were further analysed as per the organisms isolated. It was found that Streptococcus pneumoniae was the most common pathogen isolated from 19(61%) samples which included 13 samples from paediatric cases and 6 from adult patients. Neisseria meningitidis was isolated from 3(10%) adult samples. Hemophilus influenzae was isolated in 3(10%) paediatric samples. Escherichia coli K1 was isolated one each (3%) from adult and paediatric samples. Group B Streptococci was isolated from one (3%) paediatric sample. Other Non fastidious bacteria, Klebsiella pneumoniae and Staphylococcus aureus were isolated from two (6.5%) and one(3%) sample respectively. This is shown in Table 2

TABLE –2: COMPARISON OF ORGANISMS IN PAEDIATRIC AND ADULT GROUPS

SPECIES	0– 12 years (paediatric group)	> 12 years (adult group)	Total n=31
S. pneumoniae	13	6	**19(61%)**
N. meningitidis	-	3	**3(10%)**
H.influenzae	3	-	**3(10%)**
Gr B streptococcus	1	-	**1(3%)**
E. coli K1	1	1	**2(6.5%)**
Staph.aureus	-	1	**1(3%)**
K. pneumoniae	1	1	**2(6.5%)**
Total	19	12	**31**

It was noted that S.pneumoniae, the most common pathogen was isolated in all age groups whereas N.meningitidis was isolated only in adult age group. Streptococcus agalactiae, H.influenzae were isolated only in paediatric age group.

DISCUSSION

Acute bacterial meningitis is a medical emergency, which warrants early identification of causative agent and aggressive therapy. The prevalence of common pathogens associated with Community Acquired Acute Bacterial Meningitis may vary in different geographical areas. Despite the availability of potent newer antibiotics, the mortality rate remains significantly high in India and other developing countries, ranging from 16-32% [3] . Hence there is a need for a periodic review of bacterial meningitis worldwide.

Analysis of the patients in the present study revealed the overall prevalence of Acute Bacterial Meningitis was 15.5% and it was noted that irrespective of age the prevalence was more among males (61%). The study by **Viswanath G et al** [4] also showed the general prevalence to be 19.8% and among males it was found tobe 58%. The age group commonly involved in the present study in one year period was 0-6 years (36%).**Sameer Marji et al** [5] reported that 58% of Acute Bacterial Meningitis was seen among the age group of 0-6years.Since his study was a retrospective study involving only children in four years period, there may be slight increase in the incidence in the above age group. **Mani R et al**[6] reported only13.2% among the above age group. As his study population involved immunized children, a slight decrease in the incidence in this age group is expected. Thus the age group involved in Acute Bacterial Meningitis depends upon the study population and the period of study.

The common clinical finding in Meningitis in this study was found tobe fever (100%). **Sameer Marji et al**[5] in their work also showed 92% of cases being presented with fever which is in support of this study. **Farag HFM et al** [7] also reported high fever as a symptom in 92.1% cases. It is well known that fever in meningitis is due to the inflammatory changes taking place in the meninges.

Acquisition of S. Pneumonia infection are due to a number of predisposing conditions, the most important of which is Pneumococcal pneumonia. Other risk factors are coexisting chronic or acute Pneumococcal sinusitis or otitis media, diabetes, splenectomy, alcoholism, hypogammaglobulinemia, complement deficiency. Mortality remains 20% inspite of antibiotic therapy.

Meningitis caused by H. influenzae causes meningitis generally in children less than 5 years of age. Escherichia coli K1 causes meningitis in persons with chronic, debilitating diseases like diabetes, cirrhosis and in those with chronic urinary tract infections and can also complicate neurosurgeries especially craniotomy. GroupBStreptococcus previously responsible for meningitis predominantly in neonates has been reported increasingly in individuals >50 years of age, with underlying diseases.

Infection is acquired by ingesting foods contaminated by Listeria. Foodborne human Listerial infection has been reported from contaminated milk, soft cheeses, and several types of "ready-to-eat" foods.

Staphylococcus species can cause meningitis following invasive neurosurgical procedures, particularly shunting procedures for hydrocephalus.

In this study, S.pneumoniae seemed to be the commonest (61%) pathogen among both adults and paediatric cases equally. Similar studies by **Mani R et al**[6] (61.8%), **Shameem et al** [8] (44.7%), **Sameer Marji et al**[5](41%), **Marlene L et al** [9](37%), **Al Khorasani et al** [2] (30.1%) also showed S.pneumoniae as the predominant pathogen causing acute bacterial meningitis. Similarly H.influenzae and Group B Streptococcus were commonly seen in paediatric age group and N.meningitidis seen only in adults. **Nihar Dash et al** [10] **and Vadher et al** [11] confirmed these findings

CONCLUSION

The study on the Prevalence and diagnosis of Acute Bacterial meningitis in a tertiary care centre revealed the following findings

1) Among the suspected acute bacterial meningitis cases, 15.5% were proven positive using various techniques.
2) Among the positive cases, 61% were males.
3) The common age group involved was 0-6 years irrespective of sex.
4) S.pneumoniae, N.meningitidis, H.influenzae, Gr B.Streptococ cus and E.coli K1 were the common organisms det ected as causative agents. S.pneumoniae was the comm onest organism isolated in all age groups. N.meningitidis was more common in adults and H.influenzae and Gr B.Stre ptococcus was more common in paediatric age group.
5) 81% of the cases were detected by Gram staining, 39% by direct culture, 58% by TI culture and 84% by Latex agglutination test.
6) Since, Gram staining cannot detect specified organisms it can be used as a screening methodology. Even though cultures are the gold standard for confirmation, Direct culture does not yield growth of fastidious pathogens readily whereas cultures in TI

medium yielded growth of fastidious organisms readily revealing TI medium as the best method for culture. But it a laborious method for the preparation of media and the reagents are not readily available in India. Hence Direct culture has to be relied for the confirmation and TI culture for the confirmation of fastidious pathogens.

7) Latex Agglutination Test seems to be the more rapid and specific method for identification of 5 specified pathogens like S.p neumoniae, N.meningitidis, H.influenzae, Gr B.S treptococcus and E.coli K .The prohibitive cost of LAT restricts the use of this test, except in reference laboratories.

This study clearly proved that acute bacterial meningitis is still a problem among both adults and paediatric cases in the study population. Early diagnosis and treatment is very much needed in this emergency. For the early diagnosis, rapid, easily available, less laborious and cost effective methods are needed . Of the four techniques evaluated in this study, Gram staining can be the only method which satisfies the above needs but it will not help in identifying the pathogens upto the species level. Hence for all the suspected cases, Gram staining can be suggested as a screening technique and the treatment can be initiated accordingly. For the confirmation of suspected pathogens, cultures can be adopted. For the final diagnosis of specified pathogens commonly responsible for meningitis, rapid tests like LAT can be recommended but with scrutinization as the kits are very costly.

REFERENCES

1. Achtman M. Global epidemiology of meningococcal disease. Meningococcal disease.1995; p159-75.
2. Al Khorasani A, Banajeh S et al. Bacterial profile and clinical outcome of childhood meningitis in rural Yemen. J Infect 2006 oct; 53(4):228-34.
3. Kabra SK, Praveen Kumar et al. Bacterial meningitis in India:An IJP survey. Indian J Pediatr 1991; 58:505-11.
4. Viswanath G, Praveen et al. Bacteriological study of pyogenic meningitis with reference to latex agglutination. Indian J Pathol Microbiol 2007; 50:97-100.
5. Sameer Marji .Bacterial meningitis in children. Rawal Med J 2007; 32:109-111.
6. Mani R, S Pradhan et al. Bacteriological profile of community acquired acute bacterial meningitis. Ind J Med Microl 2007; 25:108-14.
7. Farag HFM,MM Abdel Fattah et al. Epidemiological and clinical profile of acute bacterial meningitis in children in Egypt. Ind J Med Microl 2005; 23(2):95-101.
8. Shameem S, Vinod Kumar CS et al. Bacterial meningitis: Rapid diagnosis and microbial profile. J Commun Dis. 2008 June; 40(2):111-20.
9. Marlene L, Durand et al. Acute bacterial meningitis in adults. N Engl J Med 1993; 328(23): 1712.
10. Nihar Dash, Debadatta et al. Acute bacterial meningitis among children <5 yrs of age in Oman.J Infect Developing Countries.2008; 2(2):112-115.
11. Vadher PJ, Vaidya NS et al. Bacteriological study of meningococcal meningitis. J Postgrad Med 1991; 37(1):76-78.