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Laboratory Findings of Pyogenic Meningitis in Children: A Study in a Tertiary Care Paediatrics Hospital, Dhaka, Bangladesh

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Abstract **Original Research Article**

We conducted an observational study in the Paediatrics department of Dhaka Shishu (Children) Hospital Dhaka, Bangladesh during the period from December 2012 to May 2013. Our aim was to document laboratory findings of pyogenic meningitis in children under 5 years. We enrolled study participants who were clinically suspected of pyogenic meningitis and aged less than 5 years and admitted in the selected hospital. All the data were collected and recorded systematically in a questionnaire and entered into computer software SPSS (Statistical package for social sciences) and analyzed with graphs and tables. Our study measured outcome mainly, results of CSF cell count, Gram stain, Culture, LAT and Blood culture. A total of 100 cases of suspected meningitis in the age group below 5 years enrolled in the study based on inclusion and exclusion criteria. Majority of the patients belonged to ≤12 months. Male to female ratio was 1.6:1. The most common clinical presentation was fever (100.0%) with median duration of 2 days. Ninety six patients had convulsion and the median duration of continuation of convulsion was 1 day. Thirty eight patients had vomiting and median duration of continuation of vomiting was 1 day. A total of 100 clinically suspected cases of acute bacterial meningitis, laboratory confirmed cases were 36(36.0%), out of which 14(38.9%) cases were CSF culture positive, 10(27.8%) were Gram stain positive and 36(36.0%) were Latex agglutination test positive In the conclusion, we can say Pyogenic meningitis is more common during infancy and is more common in males. Fever, convulsion, vomiting and lethargy were the commonest symptoms. CSF culture is the 'Gold standard' and positive in 38.9% cases, but Latex agglutination test was 100.0% sensitive for detection of Antigen in CSF. Laboratory finding can help to the practitioners to treat children with Pyogenic Meningitis more effectively.

Keywords: Laboratory findings**,** Pyogenic Meningitis, Streptoccous pneumonae.

INTRODUCTION

Pyogenic meningitis, also referred as bacterial meningitis, is a life-threatening CNS infectious disease affecting the meninges, with an elevated mortality and disability rates. Three bacteria (*Haemophilus influenzae*, *Streptococcus pneumonia*, *and Neisseria meningitidis*) account for the majority of cases [1, 2]. Pyogenic meningitis is one of the most potentially serious infections in infants and children. It is associated with acute complications and risk of chronic morbidity [3]. Acute bacterial meningitis is seen more in children than in adults and it is caused by a variety of microorganisms; the most important among them are Haemophilus influenzae, Neisseria meningitidis and Streptococcus pneumoniae [4].They are most commonly associated with bacterial meningitis globally accounting for almost 90% of reported cases between 2 months to 5 years of age [5]. CNS is normally sterile unless the barrier between brain and blood are broken or infection enters from outside. Meningitis is the inflammation of the pia and arachnoid matter surrounding the brain and spinal cord [6].

Fig-1
Source: Google

No pathognomonic signs or symptoms will accurately diagnose the cause of meningitis. The etiological diagnosis mainly depends on CSF analysis and culture. Alternative methods of CSF study has been developed which may be useful in patients commenced with antibiotic therapy before lumbar puncture. Where culture is negative, detection of soluble bacterial antigen can help to reach a diagnosis. This study is undertaken to documents laboratory findings of Pyogenic Meningitis in children under 5 years. CSF study is important in diagnosis and management of a case of meningitis. Identifying the specific agent with their sensitivity helps in management. Although CSF culture is the 'Gold standard' for the diagnosis of meningitis but if antibiotic is given prior any investigation then diagnosis become difficult. For such instances and also for rapid diagnosis, detection of antigen by LAT should be employed. LAT identifies bacterial antigen and this can be identified earliest. Gram stain also identifies organism earliest but in a nonspecific manner.

Objectives

General Objective

- To document laboratory findings of pyogenic meningitis in children under 5 years.

Specific Objectives

- To evaluate Gram stain, culture and Antigen detection in CSF.
- To evaluate demographic conditions in children with pyogenic meningitis in Bangladesh

METHODS AND MATERIALS

We carried out an observational study in the Paediatrics department of Dhaka Shishu (Children) Hospital Dhaka, Bangladesh during the period from December 2012 to May 2013. Our aim was to document laboratory findings of pyogenic meningitis in children under 5 years. We enrolled study participants who were clinically suspected of pyogenic meningitis and aged less than 5 years and admitted in the selected hospital. All the data were collected and recorded systematically in a questionnaire and entered into computer software SPSS (Statistical package for social sciences) and analyzed with graphs and tables. Our study measured outcome mainly, results of CSF cell count, Gram stain, Culture, LAT and Blood culture. The study conducted after having approval from the respective department. Informed written consent also taken from the guardians of the study participants (children).

RESULTS

We enrolled study participants who were clinically suspected of pyogenic meningitis and aged less than 5 years and admitted in the selected hospital. All the data were collected and recorded systematically in a questionnaire and entered into computer software SPSS (Statistical package for social sciences) and analyzed with graphs and tables. Our study measured outcome mainly, results of CSF cell count, Gram stain, Culture, LAT and Blood culture. A total of 100 cases of suspected meningitis in the age group below 5 years enrolled in the study based on inclusion and exclusion criteria's. Majority of the patients belonged to ≤12 months. Male to female ratio was 1.6:1. The most common clinical presentation was fever (100.0%) with median duration of 2 days. Ninety six patients had convulsion and the median duration of continuation of convulsion was 1 day. Thirty eight patients had vomiting and median duration of continuation of vomiting was 1 day. A total of 100 clinically suspected cases of acute bacterial meningitis, laboratory confirmed cases were 36(36.0%), out of which 14(38.9%) cases were CSF culture positive, 10(27.8%) were Gram stain positive and 36(36.0%) were Latex agglutination test positive.

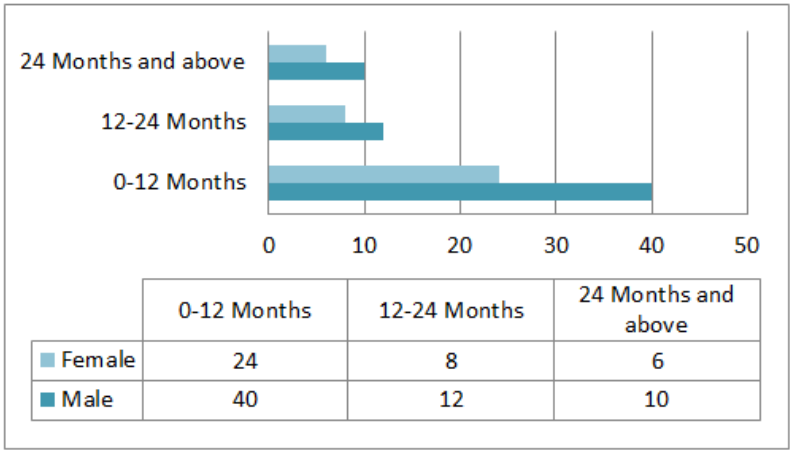

Fig-1: Distribution of the study patients by age & Sex (n=100)

Table-1: Presenting symptoms with duration of the study patients (n=100)

Symptoms	Number	Duration of symptoms (days)	
		Median	Range(Min/max)
Fever	100	2	1.5
Convulsion	96	1	1.3
Vomiting	38	1	1.2
Lethargy	35	1	1.2
Excessive Crying	11	1	1.2
Unconsciousness	7	1	1.1

Table-2: CSF findings of the study patients (n=100)

Investigation	Median	(Min/Max)
Total Cell Count/cu mm	700	45,12000
Neutrophil (%)	83	10,95
Lymphocyte (%)	16	5,90
Sugar(mg/dl)	45	6,58
Protin(mg/dl)	220	80,1000

Table-3: laboratory confirmed cases of acute bacterial meningitis by different lab methods (n=36)

Tests	Number of Patients
Gram stain+LAT+ Culture	10
Culture+LAT	14
LAT	12
Culture alone	0
Total	36

DISCUSSION

This observational study was carried out with an aim to detect capsular polysaccharide antigen in CSF by latex agglutination test and to do comparative evaluation of Gram stain, culture and Antigen detection in CSF.A total of 100 patients, clinically suspected cases of pyogenic meningitis in children below 5 years of age admitted in Paediatrics department of Dhaka Shishu (Children) Hospital Dhaka, from December, 2012 to May, 2013, were included in this study. Children with history of fever, bulged fontanelle, convulsion, neck stiffness, altered sensorium and meningeal sings were enrolled in this study. Pyogenic meningitis occurs in all ages but it is commonest during infancy. In this study it was observed that majority (70.0%) patients belong to ≤12 months, in this study all patients had fever their median duration was 2days. Ninety six patients had convulsion with median duration 1day. Thirty eight patients had vomiting and median duration 1day.In present study CSF culture, Gram stain and Latex agglutination test was done.CSF culture is the "Gold standard" and these positive cases could be identified by other tests too, as being found here. Latex agglutination test has been introduced for this purpose because it can detect comparatively very small quantity of antigen present in CSF. The antigen is common meningeal pathogen eg. H. influenzae type b, S. pneumonae, E. coli, Group B. Strep. and N. meningitidis are detected by LAT. The LAT can diagnose these specific bacterial pathogens and specific antibiotic therapy can be given to reduce the emergence of bacterial resistance [7]. Particularly when antibiotic

treatment is already started and it has been suggested that such diagnostic techniques may be more sensitive than Gram staining or standard bacterial culture [8]. Latex agglutination test is very useful in the diagnosis of bacterial meningitis with sensitivity and specificity ranging from 95-100% [7]. Seizures occur more commonly with S. pneumonae and H. influenzae infection. Signs of fulminant sepsis such as shock, DIC, purpuric rash and coma may present and are more common in meningococcal meningitis [5]. Incidence rates of N. meningitidis meningitis are generally highest in children <5 years of age and adolescents. N. meningitidis can also cause a severe bacteremia called meningococcaemia [9]. In young children; the case-fatality rate for meningitis due to H. influenzae is generally higher than that for meningitis due to N. meningitidis. The case fatality rate for meningitis due to S. pneumonae in children less than five years of age exceeds 73% in some parts of the world.[10]The mortality of untreated bacterial meningitis approaches 100% and even with optimum treatment mortality and morbidity might happen. Neurological sequel is relatively common in survivors of meningitis [11]. Sensorineural hearing loss, seizures, motor problems, hydrocephalus and mental retardation, as well as more subtle problems are observed in post meningitis children [12]. Early clinical suspicion supplemented with CSF study to confirm meningeal inflammation and identification of organism helps in timely intervention and optimum outcome. Meningitis in children constitutes a formidable illness worldwide due to as its high morbidity and mortality [13]. One hundred and fifty patients with a clinical diagnosis of pyogenic meningitis were studied by Awari and Nighute[14]. The sensitivity of Gram stain and latex agglutination test was 98% and 92% respectively. Sensitivity of CRP was 70%. Hence Gram stain and latex agglutination test were found to be most reliable tests for diagnosis of pyogenic meningitis.

Limitations of the study

The study population was selected from one selected hospital in Dhaka city. So, the results of the study may not reflect the exact scenerios of the whole country. The present study was conducted at a very short period of time .Small sample size was also a limitation of the study as it was conducted at a very short period of time. Although culture is the 'Gold Standard" for diagnosis but it has limited value in case of low bacterial load in CSF.

CONCLUSION AND RECOMMENDATIONS

This study was undertaken to document laboratory findings of pyogenic meningitis in children under 5 years. Pyogenic meningitis is more common during infancy and in males. Fever, Convulsion, Vomiting, and Lethargy were the commonest symptoms. Only culture could identify the agent in 38.9% cases. Latex could identify 36.0% cases. S. Pneumoniae was the most common identified organism in this study. A collaboration of methods may help to diagnose bacterial meningitis. However, Majority of the cases are diagnosed on clinical ground. Proper documentation and findings can help to treat diseases properly. Multicentre study should be conducted with large sample size.

REFERENCES

1. McIntyre PB, O'Brien KL, Greenwood B, Van De Beek D. Effect of vaccines on bacterial meningitis worldwide. The Lancet. 2012 Nov 10;380(9854):1703-11.
2. Adriani KS, Brouwer MC, van de Beek D. Risk factors for community-acquired bacterial meningitis in adults. Neth J Med. 2015 Feb 1;73(2):53-60.
3. Prober CG, Dyner L. Acute Bacterial Meningitis Beyond the Neonatal Period. In: Kliegman RM, Stanton BF, St Geme JW, Schor NF, Behrman RE (Editors). Nelson Textbook of Paediatrics (19th Edition). Philladelphia: WB Saunders Company. 2011:2087-95.
4. Alam MR, Saha SK,Nasreen T, Latif F, Rahman SR ,Gomez DJ ,Deection, Antimicrobial Susceptibility and Serotyping of Streptococcus pneumonia From Cerebrospinal Fluid Specimen for Suspected Meningitis Patients. Bangladesh J Microbiol.2007;24(1): 24-29.
5. Rasul KH, Muhammad F, Hossain MJ, Ahmed KU ,Rahman M, Acute Meningoencephalitis in Hospitalized Children of Southern Bangladesh. Malaysian j Med Sci,2012;19(20):67-73.
6. Khan MR, Rahman ME. Meningitis. In: Lhan MR, Rahman ME. Essence of Paeditris 94th Edition. New Delhi: Elsevier, 2001: 264-66.
7. Tacon CL, Flower O, Diagnosis and Management of Bacterial Meningitis in the Paediatric Population: A Review, Emergency Medicine International. 2012; Article ID 320309: 1-8.
8. Klein NJ. Suspected Meningitis.In: Mclntosh N, Helms PJ, Smyth RL, Logan S (Editors). Forfar and Arneil's Texbook of Pediatrics (7th Edition). China: Elsevier Limited. 2008: 1194-7.
9. Begum N, Ahmed I, Salam MA, Begum S, Alam KMF, Role of Latex particele Agglutination Test in the Diagnosis of Meningitis. Bangladesh J Med Microbiol. 2007;01: 10-12.
10. Finlay FO, Witherow H, Rudd PT, Latex agglutination testing in bacterial meningitis. Arch Dis Child. 1995; 73-:160-1.
11. Harrison LH, Trotter CL, Ramasy ME. Global epidemiology of meningococcal disease. Vaccine 2009: 27: B51- B63.
12. Kim Ks.Actue Bacterial Meningitis in infant and children. Lancet Infect Dis 2010; 10: 32-42.
13. Jonge Rc, Furth Am, Wassenaar M, Gemke R JBJ, Terwer CB. Predicting sequelae and death after bacterial meningitis in childhood: A systematic review of prognostic studies. BMC Infectious Diseases 2010;10 :232.

14. Joardar S, Joardar GK, Mandal PK, Mani S. Meningitis in children: A Study in Medical College & Hospital, Kolkata. Bangladesh J Child Health 2012; 36 (1): 20-25
15. Awari A,Nighute S. Incidence of Bacterial meningitis with special reference to latex agglutination test JRAAS 2012:27:65-68
16. Maxson S, Lewno MJ, Schutze GE. Clinical usefulness of cerebrospinal fluid bacterial antigen studies. Journal of Paediatrics 1994;125: 235-8.