



Original Article

Usefulness of CSF C-Reactive Protein in Differentiating Pyogenic and Aseptic Meningitis

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Abstract

A cross sectional study was done about usefulness of CSF- C reactive protein determining the sensitivity, specificity and predictive value of CSF C-reactive protein estimation. The study was conducted in all the Pediatric unit of Rajshahi Medical College Hospital from March 2008 to July 2009. A total of 130 suspected case of meningitis patients were included in the study. Cerebrospinal fluid culture and C-reactive protein were done for all the patients. Among them 102 were diagnosed as meningitis and 28 were other than meningitis. They were diagnosed as febrile convulsion, seizure disorder, IVH, Among these diagnosed as meningitis, CSF culture were positive in 66 patient and CSF C-reactive protein were positive in 59 patients. Sensitivity and specificity of CSF C-reactive protein were 89.39% and 100% respectively. Predictive value of positive and negative test for CSF-CRP was 100% and 83.72%.

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Introduction

Meningitis is one of the most potentially serious infections occurring in infant and older children and important cause of morbidity and mortality in children world wide.¹In the developing countries, acute bacterial meningitis (ABM) is one of the major cause of morbidity and mortality²

Rapid and accurate diagnosis coupled with early appropriate therapy is the utmost importance in reducing morbidity and mortality of the patient³. Biochemistry, Cytology, Gram stain, Culture sensitivity of Cerebrospinal fluid usually being done to diagnose and differentiate pyogenic from aseptic meningitis. In such circumstances the detection of C-reactive protein in CSF appears to provide a new dimension to the diagnosis of meningitis.⁴

Carrol et al detected CSF C-reactive protein by latex slide agglutination test which is 100% sensitive in differentiating bacterial meningitis from aseptic meningitis⁵.

Bangladesh is a developing country. We have limited resources, manpower, and skill, particularly in peripheral setup. We need to think about an easy and comprehensive test by which we can diagnose ABM. Routine use of detection of CSF CRP, could be a reliable and easy to do test and can be done for rapid diagnosis of meningitis

Objective

General Objective: The study is aimed at establishing estimation of CSF-C-reactive protein for differentiating pyogenic and aseptic meningitis

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Methodology

Study design: The estimation of CSF-CRP among children of meningitis is a hospital based descriptive cross sectional study among the admitted children.

Place of study: All aspect of this study have been accomplished in the department of Pediatrics, Pathology and microbiology in RMC.

Period Of Study: The study was done from march 2008 to July 2009.

Sample Size: Total patients were 130.

Inclusion Criteria: Age 0 month to 12 yrs. Clinically diagnosed case of meningitis, who has undergone CSF study.

Exclusion criteria:

- Previously treated patient as meningitis.
- Patient with congenital CNS abnormality.
- Conditions in which lumber puncture (LP) is contraindicated
- Immunocompromised patient.
- Unwilling of guardian to included in the study.

Data analysis:

Data were collected entered and analyzed by SPSS program, version 11.5 according to standard procedure. The descriptive analysis included frequency distribution, mean, median and standard deviation as required. Univariate analysis was carried out to describe the characteristics of the study population while internal comparisons were done by using bivariate analysis or multivariate analysis. To examine the relationship between variable statistical significant test, chi-square test were done and estimate the correlation between variables in appropriate section (result).

Results

One hundred thirty patients with suspected meningitis who met the inclusion criteria according to case definition were enrolled. The study population consists of 66 children with

pyogenic meningitis, 36 children with aseptic meningitis and 28 children without meningitis were taken as non meningitis group. Results were presented by the help of appropriate tables, charts, diagrams and figures.

The findings of this study clearly indicated that the protein level rise in both pyogenic (100-572 mg/dl) and aseptic (62-268 mg/dl) meningitis but more markedly rise in pyogenic meningitis.

Sugar level decrease in pyogenic meningitis (16-34 mg/dl) but normal or increase in aseptic meningitis (46-72 mg/dl).

Culture of CSF was done for all suspected case of meningitis (130 patients). Among them culture positive in 66 (50.76%) cases were diagnosed as pyogenic meningitis. Culture is negative in 64 (49.24%) patients. The findings of this study clearly indicated that TLC (16-8000) and PMN (60%-92%) had remarkably increased in pyogenic meningitis and lymphocyte count had increased (8%-100%) more markedly in aseptic meningitis.

Study revealed that *S. pneumoniae* is the leading pathogen 30 (44.45%) of pyogenic meningitis followed by *H. influenzae* 26 (39.39%) *N.meningitidis* 7(9.60%), and *E.coli* 3(6.56%).

Fig. I: CSF C-reactive protein for suspected case of meningitis

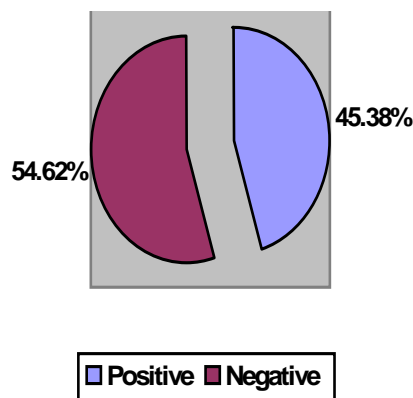


Figure I showed that latex agglutination test for CSF C-reactive protein was positive in 59 patients (45.38%) and was negative in 71 (54.62%). Among them 28 cases were diagnosed other than meningitis.

Fig. II: CSF C-reactive protein for meningitis patient (n=102)

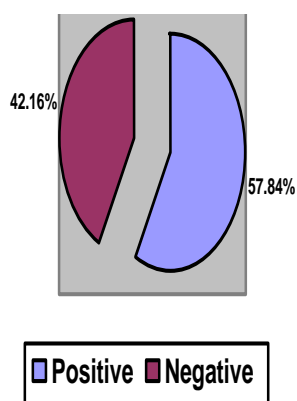


Figure II reveal of 102 case of meningitis, the result of latex agglutination test of CSF for C-reactive protein were positive in 59 case (57.84%) and were negative in 43 case (42.16%).

Table I: CSF C-reactive protein with pyogenic and aseptic meningitis.

CSF C-reactive protein	Results of culture of CSF		Total
	Positive	Negative	
Positive	59 (89.39%)	0 (0.0 %)	59
Negative	07 (10.61%)	36 (100%)	43
Total	66	36	102

chi-square (χ^2) value – 8.58 Tabulaed value -- 3.84 df = 1
 Calculated Value > Tabulated value (8.58 > 3.84) p =<0.05

Among pyogenic meningitis patient (culture positive), 89.39% case were CSF C-reactive protein positive and all patients were found to be negative in aseptic meningitis group. p value is significant.

Table II: Validity (accuracy) of CSF C-reactive protein estimation

Screening test	Percent
Sensitivity	89.39%
Specificity	100%
Predictive value of a positive test	100%
Predictive value of a negative test	83.72%

Sensitivity and specificity of CSF C-reactive protein was 89.39% and 100% Predictive value of positive and negative test was 100% and 83.72% respectively.

Discussion

Bacterial meningitis is a potentially devastating illness. So prompt recognition and early appropriate treatment is essential. The result of this hospital based prospective study showed that meningitis is most common in infancy (54.90%) . Males are more affected in both pyogenic (57.58%) and aseptic (66.67%) meningitis. The diagnostic findings in my study is matching with other study findings.¹³

The definitive diagnosis of pyogenic meningitis requires isolation of organism from CSF collected by LP. This is the gold standard method for diagnosis of bacterial meningitis.

Other test of CSF like Gram stain, Latex agglutination test, PCR, C-reactive protein (CRP) are used to diagnosis of bacterial meningitis. In this study it is tried to perform CSF culture to isolate the organism and CSF C-reactive protein for the diagnosis of pyogenic meningitis and differentiate pyogenic from aseptic meningitis. We also compare the result of CSF C-reactive protein estimation with the result of culture of CSF. One hundred thirty patient (130) were included in this study. Among them 66 (50.76%) was culture positive (pyogenic) meningitis and rest 64(49.24%) was aseptic meningitis and no meningitis group.

Among childhood meningitis, incidence of pyogenic meningitis (64.70%) is more than aseptic meningitis (35.30%). Pathogens isolated by CSF culture are S.Pneumoniae (44.45%), H, influenzae (39.39%), N. meningitidis (9.60%) and E.coli (6.56%). S. pneumoniae is the leading pathogens of childhood meningitis. The observation of present study was consistent with the previous study.¹⁴ CSF-C-reactive protein was detected in 89.39% cases of pyogenic meningitis. 59 patient out of 66 pyogenic meningitis cases showed agglutination (Table I). The C-reactive protein could not be detected in the CSF of aseptic meningitis.

In this study CSF-CRP was measured by semi quantitative latex agglutination method where cut off value was equal or more than 6 mg/L for observation of agglutination.⁵

In this study, the result revealed that the sensitivity and specificity of CSF-CRP estimation were 89.39% and 100%. The predictive value of the positive test was 100% and the predictive value of negative test was 83.72% (Table-II).

Abraham et al, corral CJ et al, S. Narinder et al found the sensitivity of CSF-CRP in 97%, 100%, 84% and specificity 86%, 94%, 100% respectively.

Similar findings have been reported by other workers.⁽⁶⁻¹⁰⁾ So this study is consistent with other studies. Negative CSF slide agglutination test for CRP could not exclude TBM nor exclude the pyogenic meningitis.

In this study, cross tabulation showing (Table-I) $X^2=8.58$; $df=1$. $P<0.05$. P value is significant. So CSF-C-reactive protein have a significant role in differentiating pyogenic and aseptic meningitis.

It was observed that 59 patient of pyogenic meningitis gave a positive result of CSF-C-reactive test giving a sensitivity 89.39%. The sensitivity of CSF-CRP have shown varying from 84% to 100%.

The determination of CSF-CRP does have significant role in differentiating bacterial meningitis from aseptic meningitis. Sensitivity 89.39% and specificity 100%. Its presence significantly favors the diagnosis of acute bacterial meningitis and predicts possibility of poor outcome.¹¹ A patient with clinical suspicion of meningitis having any degree of CSF pleocytosis with elevated CRP level should be treated for presumed bacterial meningitis.¹²

Conclusion

From the preceding study, from the result the author came to a conclusion that although culture of CSF is the gold standard fore diagnosis of pyogenic meningitis for direct evidence of the organism, it has some limitation particularly in peripheral set up. Routine use of detection of CSF-C-reactive protein could be a reliable, rapid and easy to do test for the diagnosis of bacterial meningitis and differentiate from aseptic meningitis. It is not an alternative of CSF culture.

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