Original Research Article

Estimation serum C - reactive protein estimation inacute meningitis in adults

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International Archives of Integrated Medicine, Vol. 8, Issue 4, April, 2021.
Available online at http://iaimjournal.com/
ISSN: 2394-0026 (P) **ISSN: 2394-0034 (O)**
Received on: 02-03-2021 **Accepted on:** 17-03-2021
Source of support: Nil **Conflict of interest:** None declared.
How to cite this article: Pazhamalai K. Estimation serum C - reactive protein estimation in acute meningitis in adults. IAIM, 2021; 8(4): 18-23.

Abstract

Background: The evolution of clinical signs and symptoms produced by meningitis or encephalitis varies greatly. Few conditions in medicine require a rapid and accurate therapeutic intervention as acute pyogenic meningitis and viral meningitis, yet meningitis can also occur in chronic and recurrent forms. The major problem presented by patients with meningitis is the rapid determination of its etiology, the specific basis on which selection of potentially effective antimicrobial therapy is predicted.

Aim of the study: To evaluate the efficacy of serum C- reactive protein in differentiating bacterial meningitis from viral meningitis.

Materials and methods: Patients who attended the General Medicine Department of Government Headquarters Hospital, Kallakurichi, Tamil Nadu from December 2019 to September 2020 were taken up for the study. All the selected cases were investigated for serum C-reactive protein levels which were done by Rapid latex test. CSF study was done in all cases, to confirm the S-CRP findings. The results were correlated with the results of S-CRP levels and the cases were differentiated into bacterial meningitis or meningitis due to other causes.

Results: The incidence of seizure was observed in 42% (21) of cases, 40% (20) had neurological deficits and 10% (5) had abdominal pain and diarrhea. Four cases were found to have unilateral VII cranial nerve palsy of which three belonged to the viral meningitis group, two of them presented with papilledema, hemiparesis and aphasia. In 25 cases, S-CRP levels were less that 12 mg/l. of these, 16 cases had SCRP <6 mg/l and 9 cases had SCRP 6-12 mg/l. All these 25 cases were having clinical signs in favor of meningitis or meningoencephalitis and CSF formula in favor of viral infection.

Conclusion: Estimation of C-reactive protein in serum is the cheapest, sensitive and specific test to differentiate bacterial from viral infections. It is a simple qualitative as well as quantitative test and can be done as a bed side investigation. With serum C-reactive protein, a definite etiological diagnosis can be made rapidly at the time of admission itself. A serum CRP level of less than 6 mg/l with clinical signs of meningeal infection is a definite indicator of viral meningitis.

Key words

Meningitis, Serum CRP level, VII cranial nerve palsy, Immunoelectrophoretic (CIE).

Introduction

The evolution of clinical signs and symptoms produced by meningitis or encephalitis varies greatly. Few conditions in medicine require a rapid and accurate therapeutic intervention as acute pyogenic meningitis and viral meningitis, yet meningitis can also occur in chronic and recurrent forms [1]. The major problem presented by patients with meningitis is the rapid determination of its etiology, the specific basis on which the selection of potentially effective antimicrobial therapy is predicted. Thus, the clinician must sort out the form of clinical presentation, assess the rapidity of its evolution, and make a specific etiological diagnosis [2]. The examination of cerebrospinal fluid is an essential and often critical tool in the evaluation and management of patients with meningitis. If interpreted carefully, the cerebrospinal fluid (CSF) analysis, can be very helpful in guiding the diagnostic evaluation and management of patients [3]. Although examination of a Gram's stain of spinal fluid often defines the causative agent, this is not always the case. Cultures have the drawback of the time required, 24 to 48 hours or more to become positive, an unacceptable delay in initiating the treatment [4]. Because of the easy availability of the kit and simplicity of the procedure, serum C-reactive protein (CRP) was selected to differentiate viral meningitis and bacterial meningitis, which is elevated in the latter, were observed in the selection of cases [5]. Further, CRP was used only to differentiate bacterial meningitis from other meningitis, but not for the diagnosis of meningitis which was done only by routineclinical methods.

Materials and methods

Patients who attended the General Medicine Department of Government Headquarters Hospital, Kallakurichi, Tamil Nadu from December 2019 to September 2020 were taken up for the study. All the selected cases were investigated for serum C-reactive protein levels which were done by Rapid latex test. CSF study was done in all cases, to confirm the S-CRP findings. The results were correlated with the results of S-CRP levels and the cases were differentiated into bacterial meningitis or meningitis due to other causes.

Inclusion criteria: Above 12 years of age, History suggestive of meningitis, Neck Rigidity.

All cases which had the following history were excluded from the study to avoid false-positive S-CRP results: Recent injury of any kind, Recent surgery, Patients in the immediate post-partum period, Known case of Rheumatic Heart Disease (according to modified Jones Criteria), Known case of Rheumatoid arthritis (according to ARA Diagnostic Criteria), Known case of acute or chronic glomerular nephritis and all cases of Genito- Urinary tract infection, Focal infections like pneumonic consolidation, infections of the skin, etc.

Results

It was observed in the study that, 16 cases belong to the age group of 13-20 years (32%), another 14 cases (28%) in 21-40 years group, 16 cases (32%) were from 41-60 years group and 4 cases (8%) were above 60 years of age (**Table – 1**).

Table – 1: Sex incidence in the study.

Sex	No. of patients	Percentage %
Male	28	56%
Female	22	44%

The sequence of symptoms observed from the study was as follows. 98% (49) of cases presented with a fever while 48% (24) presented with vomiting. The incidence of seizure was observed in 42% (21) of cases, 40% (20) had neurological deficits and 10% (5) had abdominal pain and diarrhea. Neck stiffness was seen in all the fifty cases, as it was considered as the prime sign for the selection of cases. Thirty-eight

cases (76%) were found to have positive Kernig's sign whereas Brudzinski's sign was positive in thirty cases (60%). Papilledema was present in seven out of fifty cases. Among them, five belong to the bacterial meningitis group, of which three expired. The other two who belong to the nonbacterial group had recovered and were alive (**Table – 2**).

Table – 2: Symptoms.

Symptoms & Sign	Number of patients	Percentage %
Fever	49	98%
Altered Sensorium	41	82%
Headache	30	60%
Vomiting	24	48%
Neck rigidity	50	100%
Seizures	21	42%
Neurological deficits	20	40%
Abdominal pain & Diarrhea	5	10%

Table – 3: Neurological deficits.

Neurological Deficits	Number of patients	Percentage %
Abducent nerve palsy	5(3B, 1V, 1TB)	10 %
Facial Nerve Palsy	4(1B, 3V)	8 %
Another Cranial Nerve palsy	0	0
Aphasia	4(1B, 2V, 1TB)	8 %
Hemiparesis	6 (1B, 5V)	12 %
Quadriparesis	1(V)	2 %

Table – 4: CRP-level and morality.

S-CRP (mg/l)	S-CRP Qualitative	No. of patients	Death	Percentage %
<6	**-**	16	9	18%
6 – 12	**+**	9	2	4%
12 – 24	**++**	8	0	0%
24 – 48	**+++**	9	1	2%
>48	**++++**	8	2	4%

Of the fifty cases, five cases developed VI cranial nerve palsy. Among the five, the VI Cranial nerve palsy was unilateral in four and bilateral in one who has papilledema also. Three cases belonged to the bacterial meningitis group, of which two were having papilledema. One case belonged to the viral meningitis group, and once belonged to the tuberculous meningitis group. Of the five, two expired. Four cases were found to have unilateral VII cranial nerve palsy of which three belonged to the viral meningitis group, two of them presented with papilledema, hemiparesis, and aphasia. All of them survived. Hemiparesis was observed in six cases. One belonged to the bacterial meningitis group, who had papilledema and VI cranial palsy expired. Five cases belonged to the viral meningitis group. Two had associated papilledema, VII cranial nerve palsy, and aphasia. Four cases developed aphasia during illness. Two had associated papilledema, VII cranial nerve palsy, and hemiparesis. Of these, one was bacterial, one tubercular, and two of viral origin. One case belonged to the viral meningitis group, which developed spasticity in all four limbs (**Table – 3**). S-CRP levels were analyzed in all fifty cases. Sixteen cases (32%) showed negative results for S-CRP indicating a possibility of viral infection.

Of these nine cases (18%) expired. Nine cases (18%) were having S-CRP of 6 mg/L levels, of which 2 cases (4%) expired. Eight cases (16%) had S-CRP levels 12-18 mg/L level of which there was no mortality. Nine cases (18%) had S-CRP levels 24-48 mg/L, of which one died (2%) and eight cases (16%) were having strongly positive levels of > 48 mgms / L indicating a definite bacterial infection, of which two cases (4%) expired (**Table – 4**).

Discussion

Meningeal infection remains a significant health problem, although the overall incidence had decreased. The diagnosis and treatment of acute meningitis is a challenge for the primary care physician. The earlier the recognition of bacterial meningitis and the more rapid the institution of antimicrobial therapy, the better the chance of a favorable outcome. Since the modality of treatment for bacterial and viral meningitis are different, it is very important to differentiate meningitis on an etiological basis from the bacterial and viral origin [6]. It is generally held that the confirmation of viral meningitis using a positive culture is of academic interest since no specific antiviral therapy exists to change the clinical outcome. The CSF examination is most critical in distinguishing bacterial from viral meningitis [7]. When a definite diagnosis of viral meningitis is made, anti-microbial therapy could be discontinued and the hospital stay might be significantly shortened. Not all medical centers have viral diagnostic laboratories at their disposal. Moreover, the serologic confirmation of a viral infection is usually of academic interest, since by the time its result is available, the patient has recovered and it never determines specific therapy. Therefore, several different techniques to discriminate rapidly between viral and bacterial meningitis have been evaluated [8]. These include counter immunoelectrophoresis (CIE) of the cerebrospinal fluid (CSF) for the detection of viral antigens and examination of the CSF for immunoglobulins, Lactic acid dehydrogenase, creatine phosphokinase isoenzyme, and C-reactive protein (CRP). The sine qua non of establishing viral meningitis based on culture is very expensive and it is not available in most places in our country and unfortunately, no simple and easily performed procedure to distinguish viral from bacterial meningitis is available which has 100 percent predictive positive and negative values [9]. For this reason, the C reactive protein (CRP) was chosen to differentiate bacterial from viral infections of the central nervous system. Gajanana A, et al. studied the use of C-reactive protein for differentiating meningitis and have pointed out that the C-reactive protein may be the single best nonspecific indicator of bacterial infection with sensitivity and specificity rates of 100 and 98 percent, respectively [10]. Further, the serum C-reactive protein measured by rapid latex test can be done as a bedside procedure which costs only thirty rupees and two minutes. If the result is viral, unnecessary antibiotics administration for a prolonged period can be avoided, and only supportive measures are sufficient for all cases of viral meningitis. Even if the virus is isolated, at present no specific antiviral drug therapy is available. Therefore, the serum C-reactive protein estimation is most useful in differentiating bacterial from a viral infection of the central nervous system, especially for developing countries like ours, even in peripheral medical centers [11]. Altered sensorium was found in 82 percent of cases in the study as compared to 69% in the study. Further, the altered sensorium was more commonly associated with viral meningoencephalitis. Neck stiffness was present in all cases as it was considered as the prime sign for the selection of cases. The Kernig's sign was present in 76% of cases and the Brudzinski's sign in 60% of cases whereas have noticed only 50 percent of cases were having these meningeal signs. It is observed in the study that, hemiplegia with facial nerve involvement, was the commonest neurological deficit with an incidence of 12 percent isolated abducent nerve palsy unilateral or bilateral having an incidence of 10% tops the cranial nerve deficits whereas isolated facial nerve palsy and isolated aphasia were found in 8% of cases each and Quadriparesis in one case [12]. The

ability of serum C-reactive protein (S-SRP) to differentiate between acute bacterial and non-bacterial meningitis was evaluated in fifty cases, of the adult population. The patients underwent lumbar puncture for suspected central nervous system (CNS) infections. Of the fifty cases, 17 cases were diagnosed as bacterial meningitis, another 33 cases as meningitis due to non-bacterial causes. In patients with bacterial meningitis, eight cases were having S-CRP levels of more than 48 mg/L. From the study, in adults, an S-CRP level of less than 6 mg/l. with clinical signs of meningitis, is a definite indicator of viral meningitis [13]. Kabilan L, et al. reported 97% sensitivity and 98% specificity to differentiate bacterial from viral meningitis using CRP testing. The S-CRP level of more than 48 mg./L was taken as the cut-off point for pyogenic meningitis. In distinguishing partially treated pyogenic meningitis from tuberculous meningitis, CRP had a positive predictive value of 90% [14]. The mortality rate also shows a male predominance of 18 percent whereas the incidence in females is 10 percent. Bacterial meningitis consists of 6% mortality whereas viral meningitis has a mortality rate of 22% [15].

Conclusion

A serum CRP level of less than 6 mg/l with clinical signs of meningeal infection is a definite indicator of viral meningitis. A serum CRP level of more than 48 mg/l with clinical signs of meningeal infection is a definite indication of bacterial meningitis. Pre-admission treatment with steroids causes a fall in CRP levels in bacterial meningitis. Serum CRP has a 68% predictive value in adults. The rapid differentiation facilitates an early, accurate, and appropriate therapy thereby reducing the mortality and morbidity rates, the overall cost of the treatment, and the duration of hospitalization.

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