



## Original Research Article

# A study of clinical profile of cranial nerve palsy in meningitis and its significance from a tertiary care centre in South India

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## ABSTRACT

**Introduction:** Cranial nerve involvement in meningitis is not uncommon and readily treatable if addressed at the earliest. Hospital admissions due to meningitis is quite common in developing countries like India. Here we present a study about clinical profile of meningitis patients with cranial nerve involvement and its significance in day to day practice. This study is conducted from a tertiary care centre of South India. The present study can aid in differentiation of types of meningitis and arrive at proper diagnosis especially in resource limited settings.

**Materials and Methods:** The study was conducted for a period of three consecutive years with a sample size of 150 patients. It is a cross sectional descriptive study where in data was collected and analysed among various variables necessary. Patients with symptoms of meningitis and involvement of either of twelve cranial nerves were taken into consideration. Necessary investigations and examinations were done.

**Results:** Cranial nerve involvement was most commonly seen in tubercular meningitis as compared to other types of meningitis. 6<sup>th</sup> cranial nerve was most commonly involved followed by 3<sup>rd</sup>, 2<sup>nd</sup>, 8<sup>th</sup> and 7<sup>th</sup> respectively. Fever and neck stiffness were seen in considerable number of patients of meningitis with cranial nerve palsy and especially in less than 45 years of age.

**Conclusion:** Tubercular meningitis should be the first differential diagnosis in a patient presenting with symptoms of meningitis (or fever) with cranial nerve palsy. Presence of only papilledema without cranial nerve palsy warrants to exclude other causes.

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## 1. Introduction

Meningitis is defined as inflammation of the meninges of brain and spinal cord that can be either secondary to an infection or a non-infectious cause. CNS tuberculosis is one of the most common infections of central nervous system (CNS) especially in the developing world.<sup>1,2</sup> Viral meningitis is more common than bacterial meningitis and is less severe often with better recovery. Fungal meningitis is rare but, poses a significant challenge, spanning a wide array of hosts, including both immunocompetent and immunosuppressed individuals and mortality rate ranges from 10 to 30%.<sup>3,4</sup>

Significant morbidity and mortality is seen in meningitis patients if left untreated.<sup>1</sup> Involvement of cranial nerve in meningitis patients is not uncommon. Presence of cranial nerve palsy in meningitis aids in arriving at a relatively appropriate diagnosis when in a diagnostic dilemma. This in turn helps in initiation of appropriate treatment at the earliest for a better improvement avoiding complications of meningitis.

Diagnosing with recent advances is easier in well-equipped centres. But clinical findings, minimal investigations like CSF profile and correlation of the same remains first aid in diagnosing patients especially in resource limited settings and developing countries like India. The symptom onset, duration, associated findings like cranial nerve palsy and papilledema, also helps in diagnosing and differentiating various types of meningitis.

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Here, in our study, we are presenting the clinical profile of patients with meningitis along with cranial nerve involvement and significance of determining the same.

## 2. Aim

To study the clinical profile of patients presenting with cranial nerve involvement in meningitis and determining its significance in day to day practice.

## 3. Materials and Methods

Study was conducted for period of three years in a tertiary care hospital of South India. The study included a sample size of 150 patients which satisfied the case definitions of tubercular meningitis (Thwaites et al), viral meningitis (CDC) and bacterial meningitis (WHO practical guidelines) along with involvement of either of twelve cranial nerves.<sup>1,5</sup> Descriptive statistics was used in present study. Continuous variable is expressed as mean +SD or median (Range) if non- normally distributed. Categorical data is expressed in proportions.

### 3.1. Study Population

All cases presenting to our hospital diagnosed with meningitis with either of cranial nerve involvement were included in the study. A complete clinical examination was done and clinical findings like fever, headache, vomiting, neck stiffness, papilledema, blurring of vision or any other cranial nerve involvement or focal deficits and CSF profile where noted and analysed. Ophthalmologist help was taken for fundus examination for papilledema and choroid tubercles or cysticercal lesions. Neuroimaging either MRI or CT was done. Majority of the patients where followed up on a OPD basis and assessed for improvement.

### 3.2. Study Design

Cross – sectional descriptive study.

### 3.3. Inclusion criteria

Patients diagnosed with meningitis after taking clinical and CSF picture into consideration along with either of twelve cranial nerve involvement.

Patients more than more 18 years of age.

### 3.4. Exclusion criteria

Patients less than 18 years of age

Patients not fitting into criteria of meningitis based on clinical and CSF picture.

Patients with meningitis but without involvement of cranial nerve.

## 3.5. CSF Study

CSF study was done following a lumbar puncture, which was done in all patients after ruling out contraindications for lumbar puncture. CSF was analysed for cell count, cell type, protein, glucose, AFB stain and culture sensitivity, fungal stain and culture sensitivity, malignant cells. PCR testing was done to differentiate bacterial, viral, tubercular or fungal and correlated with clinical findings. Indian Ink preparation, Cryptococcal antigen testing also was done in suspected cryptococcal meningitis patients.

## 4. Results

Our study included 150 patients diagnosed with meningitis. Tuberculous meningitis was the most common type and accounted for 68 % of the patients. Viral, pyogenic and others (inflammatory, sarcoid, chemical etc) where next in order of presentation respectively.

Sixth cranial nerve was most commonly involved (53%), followed by third (22%), second (14%) and eighth (14%) and seventh (7%) respectively. Seven patients had bilateral sixth cranial nerve palsy out of 19 patients. 1 patient had bilateral third cranial nerve palsy and 2 had bilateral sensorineural hearing loss. Cranial nerve involvement was often seen in Tuberculosis (67%) and in age group of less than 45 years of age as compared to older patients. 15 of 150 patients had generalised tonic clonic convulsions (12%). Cranial palsy was often associated with fever 95 patients out of 150 and only 28 patients of cranial nerve palsy had associated neck stiffness. Headache was seen in around 91 patients out of 150 to be associated with cranial nerve palsy in meningitis patients. Generalised tonic clonic convulsions was noted in 15 out of 150 patients.

Papilledema was observed commonly in TB meningitis accounting for 18 patients out of 19. Only one patient with viral meningitis had papilledema In 145 patients out of 150 either of symptoms were present for more than 20 days and not lesser than that. There was a slight preponderance among males i.e 64 %. About 95 patients out of 150 patients had fever at presentation. TB, viral and pyogenic meningitis group of patients had fever as compared to others like pachymeningitis, or NCC or Mollaret or granulomatous.

Fever, Neck stiffness, vomiting, cranial nerve palsy and seizures were slightly more common among males compared to females. Females had increased incidence of headache at presentation compared to males. 91 patients (73 %) out of 150 had headache at presentation, with, 67 patients symptomatic over a period of days to weeks and remaining 24 patients over a period of months. Vomiting was often seen associated with TB (36%) and viral (54%) type of meningitis compared to other types and in age group less than 45 years. Only 7 patients had vomiting without headache.

Patients with third, sixth and seventh cranial nerve palsy were noted to have recovered completely than others. It was noticed that patient presenting at late stages like optic atrophy had lesser chance of improvement. Patients with bilateral sensorineural hearing loss had partial to no recovery and facial nerve involvement showed to have a delayed recovery.

**Table 1:** CSF Profile

CSF	TB	Pyogenic	Viral
Protein	40-460	47-259	37-266
Total cells	10-900	35-480	10-600
Lymphocytes	9-150	11-57	9-100
Glucose	15-73	9-50	50-92
Neutrophils	5-19	60-90	1-60
Chloride	89-125	80-122	82-120

**Table 2:** Common Cranial Nerve Palsy

CN Palsy	No. of patients (19)
Abducens	9
Oculomotor	4
B/L SNHL	2
Optic	2
Facial	1
Ext ophthalmoplegia	1

## 5. Discussion

In the present study we have included all patients presenting with meningitis and involvement of cranial nerve palsy. Most of the patients were in the age group of less than 45 years of age similar to study by Aparna et al.<sup>6</sup> Tuberculous meningitis was the most common type of meningitis observed in our study, which is in par with study by Borade et al.<sup>7</sup> Fever headache, vomiting and neck stiffness are classical symptoms of meningitis described so far. But all the symptoms were not uniformly present in all the patients, as classically described. Study by Aparna et al and Sarvapalli et al also demonstrated the same observations.<sup>6,8</sup>

Papilledema was commonly seen in tuberculous meningitis as compared to other types of meningitis and was thought to be due to raised intracranial pressure secondary to impaired CSF circulation. Neck stiffness was seen most commonly with tuberculous and viral meningitis and was noticed to be common in patients less than 45 years of age.

Sixth cranial nerve was commonly involved followed by third, second, eighth and seventh respectively. Cranial nerve involvement was more common in tuberculous meningitis compared to other type of meningitis. Early initiation of treatment was found to be beneficial and helped in significant improvement of cranial nerve palsy and had better prognosis. Fever and neck stiffness were often.

Patients with third, sixth and seventh cranial nerve palsy were noted to have recovered completely than others. It was noticed that patient presenting at late stages like optic atrophy had lesser chance of improvement. Patients with bilateral sensorineural hearing loss had partial to no recovery and facial nerve involvement showed to have a delayed recovery. Fever, Neck stiffness, vomiting, cranial nerve palsy and seizures were slightly more common among males compared to females. Patients with cranial nerve palsy often had associated fever and headache as compared to other symptoms.

In the present study CSF analysis was not repeated in all the patients and was considered in cases with diagnostic dilemma to assess the treatment response. Overall clinical improvement of symptoms and signs was considered as an indicator of response to treatment. The varying CSF profile as described in the results, suggests that lymphocytic predominance and elevated protein are more classically seen in tubercular meningitis. Though an elevated protein can still be seen in viral meningitis occasionally, duration of symptoms and other associated factors like papilledema, cranial nerve palsy etc help arriving at a proper diagnosis. In present study presence of low glucose and neutrophilic predominance in CSF was considered as pyogenic meningitis. Patient's diagnosis was confirmed with PCR testing.

Treatment with dexamethasone helped in early and significant improvement in the deficits, like cranial nerve palsies and also reduced the incidence of the sequelae of meningitis. Similar observations were made in the European dexamethasone study.<sup>9</sup>

Prognosis of the patients that is duration for improvement was dependent on duration of symptoms and severity at presentation. Tuberculous meningitis typically improved over a period of 1-2 weeks to more than 3 weeks and pyogenic from 7 days to 32 days. Viral meningitis improved over a period 4 days to 16 days with an early recovery period compared to other type of meningitis with no sequelae.

## 6. Conclusion

Incidence of meningitis with cranial nerve involvement was higher in age group of less than 45 years. Cranial nerve palsy and Papilledema was observed most commonly among tuberculous meningitis. Sixth cranial nerve was more commonly involved, followed by 3<sup>rd</sup>, 2<sup>nd</sup>, 8<sup>th</sup> and 7<sup>th</sup>. Neck stiffness was frequently seen in tubercular type and viral as compared to other types of meningitis.

Lymphocytic predominance and elevated protein were more classically seen in tubercular meningitis. Though, elevated protein was observed in viral meningitis also, duration of symptoms, other associated factors like papilledema, cranial nerve palsy etc helps in arriving at proper diagnosis.

**Table 3:** Clinical Profile of Meningitis

No. of patients	Headache	Neck stiffness	Vomiting	Pappiloedema	Seizure	Fever	Cn palsy
<45 yrs.	66	26	36	14	13	71	18
>45 yrs.	25	2	12	4	2	24	1
Male	43	16	27	10	10	50	10
Female	48	12	21	8	5	45	9
TB	54	12	25	18	6	44 (no. of days)	14
Pyogenic	7	3	3		1	12	2
Pachymeningitis	4		2		1	2	
Viral	14	12	12	1	5	21	2
Others	10	1	4		1	14	

**Table 4:** Incidence of various meningitis

No. of patients	Tb	Viral	Pyogenic	Pachy Meningitis	Recurrent	Others
<45 yrs.	54	20	9	4	1	7
>45 yrs.	30	6	7	3	2	2
Male	43	9	14	3	1	3
Female	41	16	2	4	2	6

Use of dexamethasone 4 to 8 mg three times a day helped in early and significant recovery with prevention of complications and sequelae and improved the prognosis.

Prognosis and improvement was much better in younger age group that is less than 45 years.

With the above results and observations we conclude that presence of cranial nerve involvement in a suspected case of meningitis may warrant treating physician to consider Tubercular meningitis as first differential diagnosis. As patients may not present with all classical features of meningitis, in the presence of cranial nerve palsy with either of features like fever or headache or signs like pappiloedema, one might consider meningitis as their differential especially in resource limited settings.

Early institution of treatment helps in better recovery and prognosis.

## 7. Source of Funding

None.

## 8. Conflict of Interest

None.

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