

# An Overview on Pediatric Meningitis Diagnosis and Management Approach Pediatric Meningitis

Mr. Aadil Ahmad Gojry

## ABSTRACT

Pediatric meningitis is a life- hanging infection and one of the Pediatric extremities. It has a high mortality rate ranging from 5 to 30, with a high frequency of central nervous system morbidity affecting up to 50 of Pediatric meningitis cases. For that, the early discovery of Pediatric meningitis and early foreword of the applicable Antibiotics can drop mortality and morbidity. The ideal of this review is to club Pediatric Meningitis pathogenesis, clinical features, etiologies, opinion, and operation in clinical practice. PubMed database was used for papers selection, and the following keys were used in the mesh ((“meningitis” (Mesh)) AND (“assessment” (Mesh)) OR (“operation”(Mesh)). Meningitis is considered as one of the most serious infections that can affect the Paediatric population with high morbidity and mortality. Ultimate of the cases affected by meningitis present originally to the exigency department, and a comprehensive approach to these cases is vital if one wants to lower the serious consequences of the complaint.

**Crucial words:** Pediatric meningitis, Neonatal meningitis, Lumbar perforation, Hydrocephalus

## 1 Introduction

Pediatric meningitis is a life- hanging infection, and one of the Pediatric extremities is acute Pediatric meningitis. It has a high mortality rate ranging from 5 to 30, with a high frequency of central nervous system morbidity affecting up to 50 of Pediatric meningitis cases. For that, the early discovery of Pediatric meningitis and early preface of the applicable Antibiotics can drop the prevalence of mortality and morbidity [1]. Despite the inventions in vaccination, opinion, treatment, in 2015, there were 8.7 million cases of meningitis reported worldwide, with 379,000 deaths as a result of it [2, 3].

## 2 Materials and Methods

PubMed database was used for papers selection, and the following keys were used in the mesh ((“meningitis”(Mesh)) AND (“assessment” (Mesh)) OR (“operation”(Mesh)). In respects to the addition criteria, the papers were named grounded on the addition of one of the following motifs meningitis, non-invasive assessment. Rejection criteria were all other papers, which didn't have one of these motifs as their primary endpoint. Around 90 publications were chosen as the most clinically applicable out of 1,202 papers listed in the former two decades, and their full textbooks were estimated. A aggregate of 31 of the 90 were included after a thorough examination.

Fresh exploration and publications were set up using reference lists from the honored and linked studies. Expert agreement recommendations and commentary were added where applicable to help rehearsing croakers assess meningitis most simply and virtually possible

## 3 Results and Discussion

Meningitis is considered to be one of the life-hanging diseases that are most frequently caused by bacteria or contagions. The condition was widely fatal before the period of antibiotics (3). Overall, the rate of meningitis cases has been declining since the inauguration of the three vaccines against the most common meningeal pathogens (Streptococcus pneumoniae, Haemophilus influenza type b, and Neisseria meningitides) [4]. Each around the world, bacterial meningitis is still considered to be a neurological exigency associated with high morbidity and mortality rates taking critical evaluation and operation. Seizures, hail loss, hydrocephalus, motor problems, and internal deceleration, as well as further inferred issues, including cognitive, behavioural, and academic difficulties, are observed after the recovery from meningitis in children [4].

### Etiology by age group

Meningitis is a condition known as inflammation of the meninges. The meninges are the three membranes that cover the brain (the pia mammy, arachnoid mammy, and dura mammy) that cover the enclosed conduit and cranium line the brain and spinal cord. On the other hand, Encephalitis is a condition where the brain parenchyma itself becomes lit [5]. Meningitis is caused by contagious

<sup>1</sup>Nursing tutor, Department of Obstetrics and Gynecological Nursing, Faculty of Nursing, Rama University, Mandhana, Kanpur, Uttar Pradesh, India

and non-infectious processes (medicine responses, autoimmune conditions, para-neoplastic runs). The contagious organisms of meningitis may include bacteria, contagions (known as Aseptic meningitis), fungi, or spongers. The most common contagions causing aseptic meningitis are enteroviruses, substantially coxsackie viruses. Other causes of viral meningitis include echo viruses, Herpesviridae contagions, mortal immunodeficiency contagion (HIV), Mumps, Measles, and Polio-virus [2, 5]. Numerous bacterial pathogens can beget bacterial meningitis in children, including *Listeria monocytogenes*, *Hemophilus influenzae* type b (Hib), group B streptococcus, *Escherichia coli*, *S. pneumoniae*, and *Neisseria meningitis* [2]. In a recent meta-analysis that was done to collect the available data on the organisms causing bacterial meningitis that was published encyclopaedically in the last five times, the seven bacterial organisms most generally causing meningitis are *Streptococcus pneumoniae*, *Escherichia coli*, Group B *Streptococcus*, *Haemophilus influenzae*, *Staphylococcus aureus*, *Neisseria meningitidis*, and *Listeria monocytogenes* were analysed, and the results were stratified into the six geographical regions and seven age groups as determined by the WHO [6]. *Coccidioides* is an illustration of fungal meningitis. Exemplifications of parasitic meningitis include *Strongyloides stercoralis*, *Angiostrongylus cantonensis*, *Baylis Ascaris procyonis*, and *Naegleria fowleri*; *Acanthamoeba*. Also, meningitis can be due to non-infectious etiologies similar as specifics. Sulpha medicines and NSAIDs are exemplifications of similar medicines [1].

### Neonates and infants

Babies, unseasonable babies, babes, and babies youngish than two months of age are at the loftiest threat for bacterial meningitis in the Pediatric population [6]. The threat of developing bacterial meningitis is analogous to the threat of sepsis in these cases and can be attributed to the lack of immunoglobulins that cross the placenta after 32-week gravidity in the mama and conceivably the disabled phagocytic capability of neutrophils and monocytes and the immature vulnerable system in this youthful population [6]. Organisms that generally beget neonatal meningitis are the same as the organisms that beget sepsis in this age group [7]. Threat factors in developing meningitis in babes include motherly rectovaginal colonization with GBS, punctuality, veritably low birth weight (18 hours, and dragged hospitalization [7]. Despite the perpetration of intrapartum prophylaxis, GBS remains the leading cause of early-onset neonatal meningitis, counting for roughly 40 of cases [8]. *Escherichia coli* (*E. coli*) is considered to be the alternate most common etiology account for around 17.7 in Africa and 30 of cases in the USA

and is the main cause of sepsis and early-onset meningitis in new-born with veritably low birth weight [9]

### Children older than one year

In spite of the major reduction that happened to the incidence of meningitis in this age group that was attributed to the introduction of vaccines to the three most common meningeal pathogens, including: *S. pneumoniae* and *N. meningitidis* remain the most common organisms causing community-acquired bacterial meningitis, then followed by GBS and gram-negative bacilli organisms [10].

### Pathogenesis

Three layers are girding the brain called the meninges. The inmost subcaste is a thin impermeable subcaste called the Pia matter, which is tightly attached to the brain. Bitty blood vessels will pierce the Pia matter to give nutrition to the brain. The intermediate subcaste is called the Arachnoid matter. Dura matter is the thick remotest sub-caste that's attached to the cranium [3].

### Clinical manifestation

Children with meningitis generally manifest with the classical trio that includes fever, neck severity, and headache [11]. Other donations include nausea, puking, photophobia, agitation, distraction, palsy of the cranial jitters, and seizures. Children may have a positive Kernig sign that's knee pain and resistance that happens after extending the knee while the hipsterism is flexed, or Brudzinski sign, which is flexion of the knees and hips that happens after forced unresistant flexion of the neck [3]. On the other hand, babes present without the classical trio but rather present with non-specific signs and symptoms similar as hyperthermia or hypothermia, languor, feeding dogmatism, puking, and hypotonia. Bulging of the fontanelles is another sign that's present recently in babes and is caused by the increase in the internal cranial pressure (ICP) [6]. The fundoscopic examination may show papilledema in children who have high intracranial pressure. Enterovirus meningitis children can have Maculopapular rash. On the other hand, paediatrics that is affected by meningococcal meningitis can have nonblanching purpuric rash or petechia. Also, they may present with circulated intravascular coagulation, acute adrenal insufficiency, hypotension, and shock, which are the features of Waterhouse-Friedrichsen pattern. Flu-suchlike symptoms and Upper respiratory tract symptoms similar as sore throat can give an indication of viral meningitis [11]. Children may also present with seizures and focal neurological poverties, and that can give an indication of meningoencephalitis [11].

The standard gold test for meningitis is through the lumbar perforation and cerebrospinal fluid (CSF) analysis (Table 1), which includes white blood cell count, culture, protein, glucose, and polymerase chain response (PCR) in some cases. CSF is attained by performing a lumbar perforation (L.P.), and the opening pressure can be measured (11). Fresh testing must be considered and acclimatized on suspected etiology (1, 12)

- Viral Specific PCRs and Multiplex test
- Fungal India essay stain for Cryptococcus and CSF fungal culture
- Mycobacterial Mycobacterium culture and CSF Acid-fast bacilli smear.
- Lyme complaint CSF burgdorferi antibody
- Syphilis VDRL

**Table 1: The CSF findings in bacterial, fungal, and viral meningitis**

	App eara nce	open in pressure mmHg	WB C (cell/ uL)	Prote in (mg/ dl)	Gluc se (mg/d l)
<b>Normal</b>	Clea r	90-180	<8	15-45	50-80
<b>Bacteri al Mening itis</b>	Turb id	Elevated	<100 0- 2000 <300, Lym phati c	<200	<40
<b>Viral Mening itis</b>	Clea r	Normal	Predo mina nce	<200	Norm al
<b>Fungal Mening itis</b>	Clea r	Normal- Elevated	<500	<200	Norm al Low

In ideal situations, the L.P. should be performed before starting antimicrobials. Nonetheless, when there is a high clinical suspicion for bacterial meningitis in severely ill cases, antibiotics should be administered before performing the lumbar perforation test (3). Suggestions for performing reckoned Tomography (C.T.) of the Head-before L.P. The current guidelines indicate the use of empiric antibiotics and supportive care without performing L.P. if an increase in the intracranial pressure or impending brain herniation is suspected (3). Signs and symptoms of increased intracranial pressure (12)

- languor
- New- onset seizures
- Focal neurologic insufficiency
- Glasgow coma scale (GCS) lower than 11
- Altered internal status It's vital to keep in mind that a normal head C.T. does not rule out an increase in the intracranial pressure. When the

clinical symptoms are harmonious with possible brain herniation, anyhow of the head C.T. is normal or not, L.P. must be avoided, and the applicable treatment should be started as soon as possible. Blood work- up, including serum electrolytes, blood culture, renal and liver function, serum glucose, and HIV testing (12).

## Treatment

Supportive care and antibiotics remedy are critical in all cases of bacterial meningitis (13- 16). The type of Medication depends on the organism causing meningitis. The croaker must take into account the formerly medical history of the case and the case's demographics to be suitable to make the swish choice of treatment with the topmost antimicrobial content (17- 19).

## Current empiric therapy

Neonates - Up to 1 month old [11]

- Ceftriaxone IV and Ampicillin IV
- Gentamicin IV and Acyclovir IV
- Older than one month old [17]
- Ceftriaxone IV and Ampicillin IV.
- Adults (18 to 49 years old) [17]
- Vancomycin IV and Ceftriaxone IV.
- Adults older than 50 years old or immunocompromised patients [17]
- Vancomycin IV and Ceftriaxone IV, and Ampicillin IV Meningitis in patients with penicillin allergy [17]
- Vancomycin IV and Moxifloxacin IV
- Fungal (Cryptococcal) meningitis [20]
- Flucystine Oral and Amphotericin- B IV

## 4 Conclusion

Meningitis is considered as one of the most serious infections that can affect the Pediatric population with high mortality and morbidity. ultimate of the cases affected by meningitis present firstly to the emergency department, and a comprehensive approach to these cases is vital if one wants to lower the serious consequences of the complaint. When bacterial meningitis is the main differential to the case, antibiotics treatment must be started indeed before having the routine laboratory examinations. preventing meningitis in children can be achieved by educating the public about the significance of vaccinations in the Pediatric population (21).

**ACKNOWLEDGMENTS:** None

**CONFLICT OF INTEREST:** None

**FINANCIAL SUPPORT:** None

**ETHICS STATEMENT:** None

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