



ပြည်ထောင်စုမြန်မာနိုင်ငံ၊ အထူးဒေသ(၁) ကျန်းမာရေးဌာန
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Meningitis (bacterial and tuberculous)

Standard Operating Procedure (SOP)



Union of Myanmar Special region - 1
Pediatric (SOP)

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Union of Myanmar Special region - 1
Pediatric (SOP)

Meningitis (bacterial and tuberculous)

BACTERIAL MENINGITIS

- *Bacterial meningitis (BM) is a serious illness that carries high mortality and morbidity*
- *Early diagnosis and effective antibiotic treatment remains the cornerstone of successful management*

Diagnosis

BM should be suspected in any febrile infant or child presenting with:

- *Neurological manifestations like convulsion, altered consciousness*
- *Projectile or repeated vomiting*
- *Headache or irritability or excessive cry*
- *Signs of meningism*
- *Signs of raised intracranial pressure*
- *Neurological deficits like focal paralysis or cranial nerve palsy*
- *Signs of underlying cause like a petechial rash or purpura (meningococemia), ear discharge*

Immediate assessment

- *Airway, breathing and circulation including blood pressure*
- *Shock and hydration status*
- *Glasgow Coma Scale for children (Refer Page-497 Appendices)*
- *Ongoing seizures*
- *Raised ICP*

Approach to Children with Suspected Bacterial Meningitis (BM)

Table 5.5 CNF findings in various CNF infections

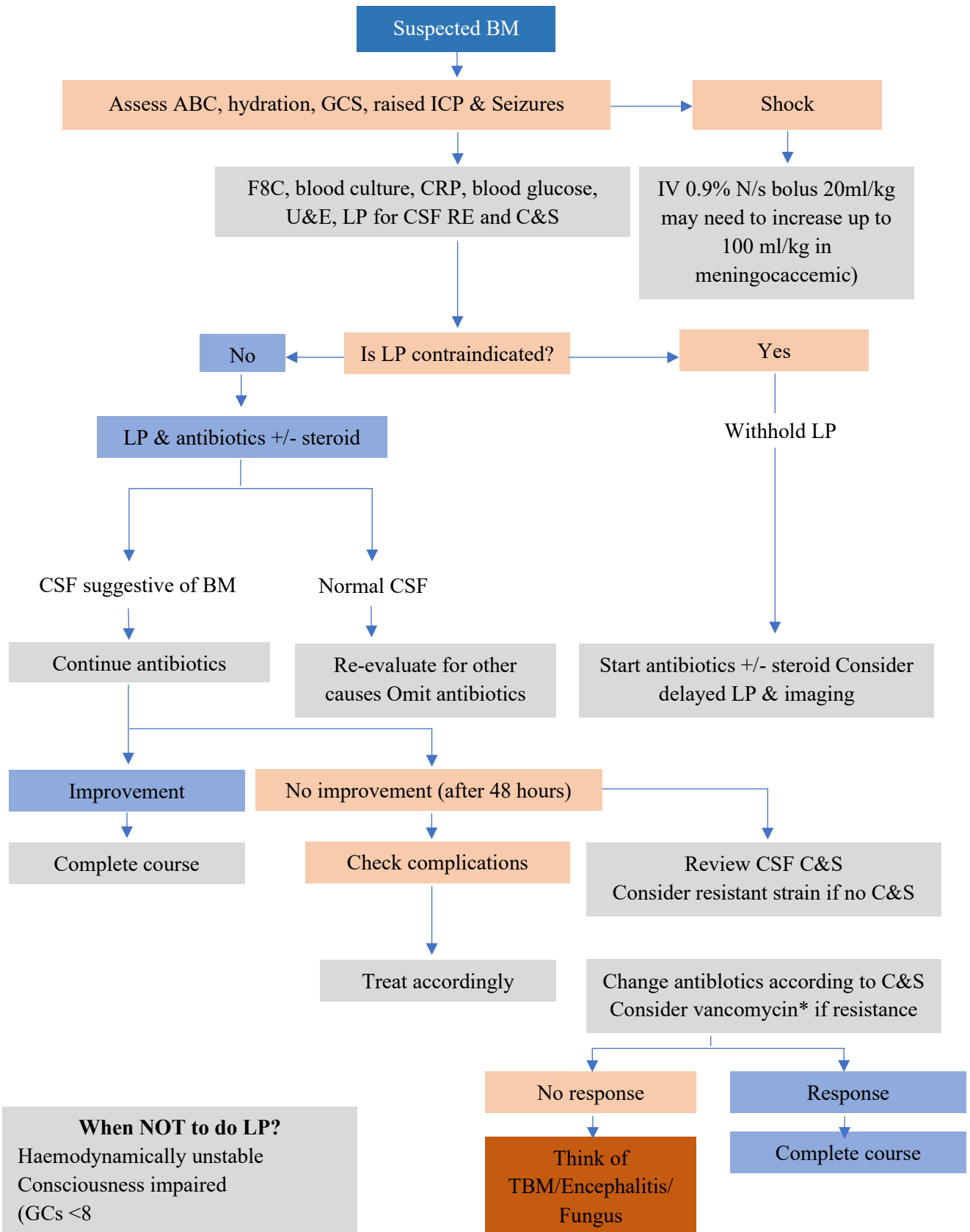
Condition	WBC	Protein (mg%)	Glucose (mg%)	Pressure	Comments
BM	100- >50,000 Mainly PMN	>40	Reduced	Increased	Gram stain may be positive
Partially treated BM	1-10,000 May have more lymphocytes	>100	Reduced	N/increased	Gram stain may be Negative Culture maybe sterile
TB meningitis	10-500 Early PMN, later lymphocytes	100-500	Reduced	Increased or may below due to block	AFB may be positive in CSF
Fungal meningitis	50-500 Lymphocytes	50-200	N/reduced	N/slightly increased	
Viral Encephalitis	10-1000	N/slightly increased	Normal	N/slightly increased	CSF virology
Viral meningitis	<100	N	N	N	CSF virology
Encephalopathy	<10 lymphocytes	N	N		May not be febrile

N-Normal

Table 5.6 Normal CSF value

	Neonate	Infant	Older child
Cells	<30	<10	<5
Glucose mg%	20-60	70-90	50-80
Protein mg%	20-150	15-45	20-40
Pressure mmH ₂ O	50-100	50-100	70-200

Algorithm to Children with Suspected Bacterial Meningitis (BM)



Treatment

Antibiotics for bacterial meningitis with unknown organism

- Give antibiotic treatment as soon as possible.
 - For those older than 3 months
 - Third-generation cephalosporin such as: ceftriaxone: 50 mg/kg IV every 12 hours or 100 mg/kg IV once daily or cefotaxime: 50 mg/kg IV every 6 hours for 10-14 days depending on symptoms and signs and course of the illness
 - For the age: 1-3 months
 - Ampicillin (50 mg/kg IV 6 hourly) plus cefotaxime or ceftriaxone for at least 14 days should be the antibiotics of choice.

NB: Ceftriaxone should not be used in premature babies or in babies with jaundice, hypoalbuminaemia or acidosis as it may exacerbate hyperbilirubingemia

- When penicillin or cephalosporin resistance is suspected,
 - Vancomycin combined with a third-generation cephalosporin
 - Vancomycin dose
 - Child 1 month-18 years-IV infusion 15 mg/kg every 8 hours (maximum daily dose 2 g)

Antibiotics for bacterial meningitis with known organism

- Children aged 3 months or older
 - *H. influenzae* type B meningitis - IV Ceftriaxone/Cefotaxime for 10 days
 - *S. pneumoniae* meningitis - IV Ceftriaxone/Cefotaxime for 14 days
 - *N. meningitides* - IV Ceftriaxone/Cefotaxime for 7 days
- Children younger than 3 months
 - Group B streptococcal meningitis - IV Cefotaxime for at least 14 days. If the clinical course is complicated, consider extending the duration of treatment.
 - *Listeria monocytogenes*-IV Amoxicillin or Ampicillin for 21 days in total plus gentamicin for at least the first 7 days
 - Gram-negative bacilli - IV Cefotaxime for at least 21 days. If the clinical course is complicated, consider extending the duration of treatment.

Steroid treatment

- Dexamethasone 0.15 mg/kg IV 6 hourly for 4 days just before or with the first antibiotic dose
- Do not use steroids:
 - Children younger than 3 months
 - In meningococcal meningitis

- *If IV antibiotics already given*
- *Dexamethasone should be promptly withdrawn if CSF is normal*

NB. if dexamethasone was not given before or with the first dose of antibiotics, try to administer the first dose within 4 hours of starting antibiotics, but do not start dexamethasone more than 12 hours after starting antibiotics.

Supportive care

- *Convulsions*
 - *Diazepam for acute seizure control*
 - *Treat hyperpyrexia and hypoglycaemia*
- *General management of an unconscious child*

Fluid, electrolyte and nutritional management

- *Monitor IV fluids very carefully and examine frequently for signs of fluid overload*
- *$\frac{3}{4}$ maintenance is only necessary if SIADH is present*
- *Give attention to nutritional support and nutritional rehabilitation. Feed the child as soon as it is safe*

Management of increased intracranial pressure

- *30° head elevation*
- *Avoid frequent and vigorous tracheal suction*
- *Correction of hyponatraemia/SIADH*
- *Use IV 20% Mannitol 2.5-7.5 ml/kg judiciously*

Monitoring

- *Daily CNS assessment e.g. Neuro-observation chart and twice daily if necessary*
- *Head circumference (Ultrasound $\pm$ CT scan if effusion or hydrocephalus is suspected)*
- *If there is a poor response to treatment*
 - *Consider the presence of common complications, such as*
 - *Subdural effusion (persistent fever plus focal neurological signs, tense AF, reduced level of consciousness)*
 - *Cerebral abscess*
 - *Hydrocephalus*
- *Persistent fever*
 - *Look for other sites of infection*
 - *Thrombophlebitis and injection sites e.g. intramuscular abscess*
 - *Intercurrent infection e.g. pneumonia, UTI, bed sores or nosocomial infection*
 - *Resistant organisms, inappropriate antibiotics or inadequate dosage*

Indications for CT Scan (Head)

- *Deterioration of conscious level*
- *Prolonged focal or late seizures*
- *Focal neurological abnormalities*
- *Enlarging head circumference*
- *Suspicious of subdural effusion or empyema or hydrocephalus*

Indication to Treat Subdural Effusion (Most do not need treatment)

- *Rapid $\uparrow$ in OFC with no hydrocephalus*
- *Focal CNS sign or $\uparrow$ ICP*
- *Suspected subdural empyema*

Discharge

- *When*
 - *If stable for 24 hours after stopping antibiotic therapy*
 - *If feeding orally*
- *Assess on discharge*
 - *OFC*
 - *Other neurological deficits*

Follow Up (Long term follow up is essential)

- *Assess*
 - *Development*
 - *Head circumference*
 - *Fits or any behavioural abnormalities*
 - *Hearing*
- *Follow-up until the child can speak normally or intelligible to others (usually need to follow-up until 4 years old)*

Prophylaxis

Meningococcal prophylaxis

- *Household or close contacts*
 - *Rifampicin by mouth*
 - *Neonate - 5 mg/kg every 12 hours for 2 days*
 - *Child 1 month-1 year - 5 mg/kg every 12 hours for 2 days*
 - *Child 1-12 years - 10 mg/kg (max. 600 mg) every 12 hours for 2 days (OR)*

- Ciprofloxacin by mouth
 - Child 2-5 years - 125 mg as a single dose
 - Child 5-12 years - 250 mg as a single dose
- Timing of chemoprophylaxis
 - As soon as possible/within 2 weeks after onset of illness
- Health-care workers
 - Chemoprophylaxis rarely indicated
 - Only recommended in situations where there has been mouth to mouth contact or direct exposure to infectious droplets

Haemophilus prophylaxis

- Eligible contacts
 - Household contacts
 - Pre-school or primary school contacts
- Timing of chemoprophylaxis
 - As soon as possible/ within 4 weeks after onset of illness
- Choice of antibiotic for chemoprophylaxis
 - Rifampicin by mouth
 - Child under 3 months - 10 mg/kg once a day for 4 days
 - Child 3 months-12 years - 20 mg/kg (max. 600 mg) once a day for 4 days
 - Intravenous or intramuscular Ceftriaxone 50 mg/kg in children younger than twelve years once a day for 2 days (an alternative agent in an individual who is unable to tolerate or develops an adverse reaction to rifampicin)

TUBERCULOUS MENINGITIS (TBM)

central nervous system infections due to *Mycobacterium tuberculosis* take a variety of forms including acute fulminant meningoencephalitis, meningitis, tuberculoma and tuberculous encephalopathy.

Diagnosis

Consider tuberculous meningitis in a child with suspected meningitis if

- Fever more than 7 days
- Previous constitutional symptoms suggestive of tuberculosis
- An adult family member with tuberculosis or history of strong TB contact
- Underlying HIV infection
- Chest X-ray suggestive of tuberculosis

Investigations

- Lumbar puncture
- Definitive diagnosis
 - Only by the demonstration of mycobacterium bacillus in CSF
 - AFB smear of CSF positive in less than 20% of cases
- Computerized tomography (CT) brain scan
 - supporting diagnosis (e.g. basal meningeal enhancement)
 - detecting complications (e.g. hydrocephalus, infarct)
- Chest radiograph
 - 50% of patients with TBM have active or previous tuberculosis infection in chest radiograph

Treatment

Table 5.7 Recommended regimen for treatment of TBM in children

Regimen	intensive phase 2HRZE(S)	Continuation phase 10HR
Drug	Daily dose (mg/kg)	
Isoniazid	10	
Rifampicin	15	
Pyrazinamide	35	
Ethambutol	20	
Streptomycin	15	

Corticosteroids

- Corticosteroids (usually prednisolone) are recommended in a dosage of 2mg/kg/day for 4 weeks
- The dose should then be gradually reduced (tapered) over 2-4 weeks before stopping
- The dosage of prednisolone can be increased to 4 mg/kg daily (maximum 60mg/day) in the case of seriously ill children
- IV Dexamethasone can be given initially if the child cannot take/tolerate oral prednisolone (Dose-0.3-0.4 mg/kg/day in divided doses up to maximum 0.6 mg/kg/day)