

# TBH protocol for Initial Management of TBM

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## **Note:**

Always maintain a high index of suspicion about the possibility of TBM in children, as the disease often begins insidiously with non-specific symptoms and signs. If there is doubt about the cause of any meningitis it is safer to treat as for TBM until all the investigation results are available

## **Suggestive Clinical Findings:**

### **History**

- Often subacute onset with background persistent cough/respiratory complaints
- Recent growth faltering on RTHC
- Child not him/herself, drowsy, irritable
- Headache and vomiting
- Focal neurological fallout noticed by parent squint/facial asymmetry/hemiparesis
- Seizures
- Positive contact with a household adult TB source case

### **Examination:** take note of

- Weight, length: crossing of centiles/z-scores
- BCG scar, tuberculin skin test
- Meningism
- Level of consciousness- may be normal with irritability to comatose
- Careful neurological examination, document any cranial nerve palsies or other focal neurology like hemiparesis
- Features of raised intracranial pressure: depressed level of consciousness, bradycardia, hypertension, asymmetrical pupils, abnormal respiratory pattern, papilloedema(rarely present). Note: if signs of *severe raised ICP/imminent herniation* give Mannitol 0,25g/kg immediately (provided patient not shocked or dehydrated) and arrange urgent CT scan and neurosurgical opinion.
- Look for evidence of TB in other sites: pulmonary, spine, abdomen

After examination, the patient can be staged:

- **Stage I:** conscious but irritable, no focal neurological signs
- **Stage IIa:** Normal level of consciousness, may have meningeal irritation, focal neurological signs like squint or hemiparesis
- **Stage IIb:** GCS 11-14, may have meningeal irritation, focal neurological signs like squint or hemiparesis
- **Stage III:** Stupor/deeply comatose, GCS<11, may have abnormal posturing and focal neurological signs

**Keep your Differential Diagnosis in mind**, and treat for all the most likely causes if the diagnosis is in doubt or the presentation not classical

- **Bacterial meningitis** usually a more acute history, but often safer to cover for bacterial meningitis with Ceftriaxone 100mg/kg/day IVI daily or Cefotaxime 50mg/kg/dose 6 hourly until the CT and LP results are available
- **Herpes encephalitis** oral herpetic lesions(not always present), hallucinations/personality disturbance, high fever, focal signs, temporal changes on CT. If a confusing CSF picture then best to cover as well for herpes encephalitis with Acyclovir 20mg/kg/dose 8 hourly until CSF viral panel results are available.
- **Brain abscess** may also have focal signs and features of raised intracranial pressure, look for local trauma, sinusitis
- **Intracranial neoplasm** chronic history of headache and vomiting, focal signs, features raised intracranial pressure. Afebrile but may have neck stiffness

### Investigations:

1. Mantoux- document date and subsequent result
2. CXR
3. Bloods - FBC with diff, ESR; U&E; LFTs
4. HIV PCR or Elisa depending on age
5. Contrast CT brain
  - Arrange ASAP.
  - Must be done before a lumbar puncture in all patients with cranial nerve lesions, other focal neurological signs, features of raised intracranial pressure, depressed level of consciousness
  - If you have a suspicion of TBM then initiate treatment before the CT /whilst waiting for results. If the picture is less typical, also cover for bacterial meningitis(and consider herpes simplex 1 too)
5. Lumbar puncture
  - in all, unless deep coma (GCS<11), rapidly declining level of consciousness or signs impending herniation
  - measure and document the opening CSF pressure
  - If the CT scan has showed hydrocephalus then perform an **air encephalogram** - after collecting 8-10ml of CSF, inject 8-10ml of air into the CSF space, and perform a lateral skull X-ray. If air is seen in the lateral ventricle this confirms a communicating hydrocephalus which can be treated medically. If air is seen at the base of the skull (in the basal cistern) and not in the ventricles, this demonstrates non-communicating hydrocephalus and requires urgent neurosurgical referral for consideration for VP Shunt or if stable a third ventriculostomy
  - Request CSF colour and appearance, cell count, protein, glucose concentration, chloride, India Ink stain, Gram stain, bacterial culture, GeneXpert, TB culture.

- TBM is suggested by : clear CSF, if communicating hydrocephalus then raised ICP ( $> 20\text{cm H}_2\text{O}$ ), no organisms seen on gram stain, moderately raised leucocyte count (10-500 cells/L),  $>50\%$  lymphocyte predominance (occasionally polymorph predominance if early), raised protein typically  $>1\text{g/dL}$ , low CSF glucose concentration  $<2.2\text{mmol/L}$ , subsequent CSF bacterial culture negative
6. Gastric washings or induced sputum x2
  7. Other investigations depending on clinical picture e.g. blood gas if dehydrated or significant respiratory symptoms, urine electrolytes if hyponatraemic etc.

## Treatment:

- Initiate treatment in the ambulatory paediatrics ward (or referring hospital) and arrange transfer to a paediatric neurology bed
- If you suspect TBM clinically then start treatment immediately, before the CT or whilst waiting for CT or LP results. If the picture is less typical, also cover for bacterial meningitis (and consider herpes simplex 1 treatment too)
  1. Anti-tuberculous therapy with 4 drugs, give orally before breakfast. High doses and given for 6 months if HIV negative and 9 months if HIV positive (If MDR get advice from ID)
    - Rifampicin 20mg/kg/day
    - INH 20mg/kg/day
    - PZA 40mg/kg/day
    - Ethionamide 20mg/kg/day
  2. Prednisone 2mg/kg/day (to a maximum of 60mg) for one month followed by 2 weeks weaning
    - If it is difficult to distinguish between bacterial and TBM and you are awaiting CT/LP results, use Dexamethasone 0,15mg/kg/dose 6 hrly IVI initially then switch to oral prednisone if diagnosis confirmed
  3. Diuretics
    - Give in cases of communicating hydrocephalus, confirmed by air encephalogram
    - Acetazolamide 50mg/kg/day in 3 divided doses for 1 month
    - Furosemide 1mg/kg/day in 3 divided doses for 1 month
    - If signs of severe raised ICP/imminent herniation give Mannitol 0,25g/kg immediately (provided patient not shocked or dehydrated, oliguric or known with renal problems) and refer urgently to neurosurgery. As a note, this is while waiting to confirm a diagnosis- children with TBM do not typically present with cerebral oedema therefore Mannitol will not be effective.
  4. Urgent referral to neurosurgery if air encephalogram demonstrates non-communicating hydrocephalus

5. Fluids

- normal fluid volumes for age, with maintenance fluid preferably given as feeds which can be given by NGT if not feeding well
- Intravenous fluids can be used to correct dehydration or to give maintenance fluids if the child is severely ill, persistently vomiting, awaiting theatre for VPS etc.

6. If the child is hyponatraemic, do not restrict fluids- this is to preserve cerebral perfusion. Management is by very slow iv correction with hypertonic 3% saline solution over 12-24 hours

7. Analgesia - regular paracetamol +/- valaron or ibuprofen

8. Notification