3.8.2. Ulbaka (Meconium aspiration syndrome)

Unit 3 · Topic 8.2 Ulbaka (Meconium Aspiration Syndrome)

Learning goals

By the end of this lesson you will be able to:

- define **Ulbaka** and correlate it with **Meconium Aspiration Syndrome (MAS)**;
- list **etiology/risk factors** and explain **pathophysiology** (mechanical obstruction, chemical pneumonitis, surfactant inactivation, PPHN);
- recognise **clinical features**, frame **differentials**, and choose **investigations** appropriately;
- write a **stepwise, exam-safe management** integrating modern neonatal care with Ayurvedic rationale (warm chain, KMC, stanya-prioritisation, ojas-preservation);
- present a concise **case algorithm** and answer viva queries confidently.

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1) Definition

Ulbaka in *Kaumārabhṛtya* denotes a **newborn respiratory disorder occurring at or soon after birth due to aspiration/ accumulation of intrauterine fluids (garbhodaka/ulva) and meconium**, producing **dyspnoea (śvāsa), cough (kāsa), cyanosis, feeding intolerance and sometimes convulsions**. Clinically, this corresponds to **Meconium Aspiration Syndrome (MAS)—respiratory distress in a neonate born through meconium-stained amniotic fluid (MSAF)** with compatible signs and radiology.

MAS triad (remember):

1. MSAF exposure; 2) respiratory distress ± hypoxemia; 3) typical chest X-ray (patchy infiltrates/ hyperinflation/ atelectasis) with exclusion of other primary causes.

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2) Etiology & risk factors

A. Maternal–fetal contributors

- **Post-term** pregnancy, **intrapartum fetal hypoxia/distress** (vagal-mediated meconium passage + gasping), **IUGR/SGA**, **hypertensive disease**, **chorioamnionitis**, **maternal tobacco**.
- **Oligohydramnios** (thick, viscous meconium), **prolonged/obstructed labour**, lack of skilled intrapartum monitoring.

B. Immediate birth context

- **Thick MSAF**, **non-vigorous infant** (poor tone/respiration/HR), **no labour** or precipitate labour.
- **Resuscitation delays** or high inflating pressures → air-leak risk.

Ayurvedic rationale: the navajāta has **tender agni and ojas**; **kapha-kleda** predominates. **Āvaraṇa/saṅga** of **prāṇavaha-srotas** by **ulva/meconium** and reactive **kapha** precipitates **śvāsa** with **udāna-vāta** dysregulation.

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3) Pathophysiology

Intrauterine hypoxia → vagal stimulation → meconium passage → aspiration (in utero or with first breaths) → the lungs suffer by **four interacting mechanisms**:

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1. **Mechanical obstruction** (large particles): **ball-valve** air-trapping → **over-distension**, **air-leak syndromes** (pneumothorax/pneumomediastinum).
2. **Chemical pneumonitis** (bile salts, pancreatic enzymes) → alveolitis, oedema, **shunt**.
3. **Surfactant inactivation/dysfunction** → **atelectasis**, ↓ compliance, ↑ work of breathing.
4. **Pulmonary vasoconstriction/PPHN** (endothelial dysfunction, impaired NO pathway) → **refractory hypoxemia**; can coexist with normal lung fields.

Ayurvedic mapping: kapha-āvaraṇa + **vāta-vaigunya** in **prāṇavaha-srotas**; cold stress/handling aggravates **ojas-kṣaya** → worsening śvāsa.

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4) Clinical features

- **Onset:** at birth or within hours in MSAF-exposed neonate.
- **Respiratory:** tachypnoea (>60/min), nasal flaring, grunting, subcostal/intercostal retractions, **cyanosis**.
- **Auscultation: coarse crackles**, **diminished breath sounds** in hyperinflated areas; asymmetric findings if patchy aspiration; **barrel chest** look.
- **Systemic:** poor feeding, lethargy; **pre-/post-ductal SpO_2 gap** if PPHN; hypotension in severe cases.
- **External clues: meconium staining** of skin, nails, umbilical cord.

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5) Differential diagnosis

Condition	Pearls that separate from MAS
TTN	Elective LSCS/no labour, tachypnoea > retractions, CXR: fissure fluid, **no** coarse crackles; resolves in 24–72 h.
RDS (surfactant deficiency)	Prematurity; CXR **ground-glass + air-bronchograms**; develops immediately, needs CPAP/surfactant.
Pneumonia/Sepsis	Maternal fever/PROM; CXR infiltrates; systemic instability; positive sepsis screen.
PPHN (primary/secondary)	Refractory hypoxemia with **pre/post-ductal SpO_2 difference**; echo shows elevated PVR ± shunts.
Pneumothorax	Sudden deterioration, unilateral decreased air entry, transillumination positive; CXR free air.

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6) Investigations (do not delay stabilisation)

- **Pulse oximetry:** right-hand (preductal) and foot (postductal).
- **ABG:** hypoxemia ± hypercarbia; metabolic acidosis in severe cases.
- **Chest X-ray: patchy alveolar infiltrates**, **hyperinflation**, **flattened diaphragms**; **atelectasis** in areas; **air-leak** if present.
- **Echocardiography:** assess **PPHN/CHD**.
- **Sepsis workup:** CBC/CRP/blood culture when indicated.
- **Bedside glucose, calcium, lactate**.

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7) Management — stepwise (delivery room → NICU)

7.1 Delivery room (first minutes)

1. **Call a skilled team** when MSAF is noted; prepare warmer, PPV device, oxygen blender, and intubation equipment. **Routine intrapartum suctioning is not recommended** (vigorous or non-vigorous). Resuscitation algorithm is

the same as with clear liquor; **start PPV if apnoeic or HR <100/min**.

2. **No routine endotracheal suction** for non-vigorous infants; consider tracheal suction **only if PPV is ineffective due to suspected airway obstruction by meconium**.
3. **Warm–dry–position** (neutral head), fast **SpO_2 probe (preductal)**, titrate **O_2** to targets.

Remember for viva: The shift since 2015–2020 guidelines is **away from routine tracheal suction** towards **effective ventilation**; suction is **selective** for **obstruction**.

7.2 Early nursery/NICU care

- **Thermal care:** axillary **36.5–37.5 °C**; minimal handling (ojas-preservation logic).
- **Respiratory support:**
  - **Oxygen/CPAP** for moderate distress; avoid excessive pressures.
  - **Mechanical ventilation** (AC/SIMV) when CPAP fails or in significant hypercarbia/apnea; **HFOV** for severe disease/air-leaks/PPHN.
- **Surfactant therapy:** in **moderate-to-severe MAS** (surfactant inactivation), consider **bolus surfactant**; emerging data support **less-invasive surfactant administration (LISA/INSURE)** in selected infants. **Surfactant lavage** may be considered in refractory severe cases in centres with expertise.
- **PPHN management:** minimal stimulation, maintain normothermia, correct acidosis/hypoglycaemia; **inhaled nitric oxide (iNO)** for oxygenation failure due to PPHN; escalate to **ECMO** when refractory and available.
- **Fluids & feeds:** restrict to avoid pulmonary oedema in early severe disease; commence **EBM** (expressed breast milk) by OG/NG once stable; advance cautiously to direct breastfeeding as RR and work of breathing improve.
- **Antibiotics:** if pneumonia/sepsis suspected (risk factors/abnormal labs); **de-escalate** with negative cultures and clinical improvement.
- **Monitoring:** serial ABGs, SpO_2 (pre/post-ductal), urine output, CXR as indicated.

7.3 Ayurveda-aligned supportive care (safe, unit-friendly)

- **Warm chain** and **Kangaroo Mother Care (KMC)** as soon as the baby is cardio-respiratorily stable—**preserves prāṇa/ojas**, reduces oxygen need and promotes restful sleep.
- **Stanya-prioritisation:** mother's milk as primary nutrition; support the mother's **diet–rest–hydration** (avoid very cold/heavy/incompatible foods).
- **Snehana/abhyanga:** only **after** respiratory stability; **lukewarm gentle oiling**, **no vigorous massage**, avoid in oxygen-dependent/air-leak states.
- **Avoid oral herbal decoctions** in unstable neonates; do not improvise medicinals in MAS.

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8) Complications & prognosis

- **Air-leak syndromes** (pneumothorax/pneumomediastinum).
- **PPHN** with risk of hypoxic injury.
- **Pulmonary haemorrhage** in severe cases.
- **Neurodevelopmental sequelae** if significant hypoxia/acidosis occurred.
- **Prognosis:** with timely respiratory support, surfactant/iNO where indicated, and meticulous nursing, most infants recover; outcome is driven by **thickness of meconium**, **timeliness of effective ventilation**, and **severity of PPHN**.

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9) Prevention & counselling

- **Antenatal/intrapartum:** avoid **post-term** gestation; good fetal surveillance; timely induction if needed; **alert, skilled team** when MSAF is present.
- **At birth:** no routine suction; prioritise effective PPV and oxygen targets; **early escalation** if PPHN suspected.

- **Parental communication:** explain cause, expected course (may need CPAP/ventilation a few days), warning signs (worsening distress, cyanosis, poor feeding), and the plan for **KMC** and **EBM** progression.

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10) Case algorithm

MSAF present → team ready.

- **At birth:** Assess tone/respiration/HR. If apnoeic or HR <100 → **PPV**. If PPV ineffective and **obstruction suspected**, **intubate and clear**; otherwise continue ventilation.
- **Stabilise:** Warm chain, SpO_2 (preductal), titrated O_2.
- **If ongoing distress: CPAP** → if failing/air-leak risk: **HFOV**; consider **surfactant (bolus/LISA)**.
- **If refractory hypoxemia + pre/post-ductal gap:** treat **PPHN** (iNO; correct acidosis/hypoglycaemia; consider ECMO where available).
- **Feeds:** OG/NG EBM when stable; advance to breast.
- **Review daily:** wean support; teach KMC; plan follow-up.

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11) How to write Ayurvedic correlation in 4 lines (viva)

> "Ulbaka of navajāta arises from **kapha-kleda/ulva** obstructing **prāṇavaha-srotas** with **udāna-vāta** derangement. Management is to **remove āvaraṇa** (airway recruitment/CPAP), **preserve ojas** (warm chain, KMC, stanya), and **avoid kapha-aggravating exposures**—thereby aligning classical śvāsa-chikitsā with modern neonatal care."

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12) Quick tables for revision

A. MAS severity pointers and likely support

Pointer	Mild	Moderate	Severe
SpO_2 in air	≥92%	88–92%	<88%
Work of breathing	Mild retractions	Marked + grunting	Exhaustion/apnea
CXR	Patchy, mild hyperinflation	Diffuse opacities + hyperinflation	Dense opacities ± atelectasis/air-leak
Likely support	O_2 / close obs	**CPAP**, possible surfactant	**Ventilation/HFOV**, surfactant ± **iNO**

B. MAS vs TTN (fast recall)

Feature	MAS	TTN
Liquor	Meconium-stained	Clear
Onset	At birth/early hours	Within 2 h
Sounds	**Coarse crackles** common	Often clear/soft crackles
CXR	Patchy + hyperinflation	Fissure fluid, perihilar streaking
Course	Variable, can be prolonged	Resolves 24–72 h

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13) Self-assessment

MCQs (one best answer)

1. A **non-vigorous** neonate with thick MSAF should **initially** receive:
   A. Routine tracheal suctioning before anything else
   B. **PPV with room air/oxygen titrated to targets; suction only if obstruction limits PPV**
   C. Deep gastric suction immediately
   D. Immediate surfactant instillation
2. **Hallmark CXR** pattern in MAS is:
   A. Ground-glass with air-bronchograms
   B. **Patchy alveolar infiltrates with hyperinflation ± atelectasis**
   C. Fissure fluid lines with cardiomegaly
   D. Normal film
3. **PPHN** in MAS is best detected early by:
   A. Capillary refill only
   B. **Pre- vs post-ductal SpO_2 difference and echocardiography**
   C. Routine CT chest
   D. Serum bilirubin
4. Which of the following is **true** today about delivery room management of MSAF?
   A. Routine endotracheal suctioning is recommended in all non-vigorous infants
   B. Routine oropharyngeal suction for all is mandatory
   C. **Resuscitation follows the standard algorithm; suction only for airway obstruction**
   D. Babies should be bathed early to remove meconium
5. A stable MAS infant on CPAP with rising oxygen need and hyperinflation most likely benefits **next** from:
   A. Early bath and massage
   B. **Surfactant therapy (bolus/LISA) in appropriate setting**
   C. Routine diuretics
   D. Immediate feeding to calm

Answer key: 1-B, 2-B, 3-B, 4-C, 5-B.

Short-answer (3–5 lines)

1. Outline **four mechanisms** by which aspirated meconium causes respiratory failure.
2. Write a **safe feeding plan** in moderate MAS on CPAP.
3. List **three situations** in which you will consider **iNO**.
4. Write a **four-step parental counselling script** for MAS.
5. Differentiate **MAS vs TTN** in four points.

Long-answer (10–12 marks)

1. Discuss **Ulbaka (MAS)** under definition, etiology, pathophysiology, clinical features, investigations, and **stepwise management** including CPAP, surfactant, iNO, and KMC.
2. “Modern neonatal priorities (effective ventilation, oxygen targeting, selective suction) align with **āvaraṇa-nigraha** and **ojas-rakṣaṇa** in Ayurveda.” Justify with a reasoned plan for **mild, moderate, severe** MAS.

60-second recap

Ulbaka (MAS) = MSAF exposure + respiratory distress + typical CXR. Mechanisms: **obstruction + chemical pneumonitis + surfactant inactivation + PPHN**. **Do not** waste time on routine suction—**ventilate effectively**; use **CPAP/ventilation**, **surfactant** when indicated, and **iNO** for PPHN. Keep the **warm chain**, start **EBM** as soon as safe, and counsel parents clearly. Classical rationale: **remove āvaraṇa, protect prāṇa/ojas, avoid kapha-aggravation**—perfectly aligned with modern neonatal practice.