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.

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.

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.

3) Pathophysiology

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

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- 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.
- 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.

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 SpO2 gap if PPHN; hypotension in severe cases.
- External clues: meconium staining of skin, nails, umbilical cord.

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 SpO₂ difference ; echo shows elevated PVR ± shunts.
Pneumothorax	Sudden deterioration, unilateral decreased air entry, transillumination positive; CXR free

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; airleak if present.
- Echocardiography: assess PPHN/CHD.
- **Sepsis workup:** CBC/CRP/blood culture when indicated.
- Bedside glucose, calcium, lactate.

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

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- 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 SpO₂ probe (preductal), titrate O₂ 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, SpO₂ (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.

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.

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.

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• 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.

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, SpO₂ (preductal), titrated O₂.
- 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.

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."

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	s Coarse crackles common Often clear/soft crackles		
CXR	Patchy + hyperinflation	Fissure fluid, perihilar streaking	
Course	Variable, can be prolonged	Resolves 24-72 h	

13) Self-assessment

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अार्वेद्ध भारती

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 SpO₂ 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.
- "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 kaphaaggravation—perfectly aligned with modern neonatal practice.

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