Myocarditis in Pediatrics

Concise, exam-oriented notes for MBBS Final Year

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1. Introduction

Inflammation of the myocardium causing myocyte injury/necrosis → acute or chronic cardiac dysfunction, arrhythmias, and (rarely) sudden death.

Typical story	Viral prodrome → chest pain, tachycardia out of proportion to fever, dyspnea; elevated troponin.
ECG	Sinus tachycardia, diffuse ST-T changes, low voltages; may mimic MI or pericarditis.
Imaging	Echo: ↓ function ± dilation; MRI: edema & late gadolinium enhancement (LGE).

2. Etiology

- Infectious: Viral—Coxsackie B, adenovirus, parvovirus B19, enteroviruses, influenza, coronaviruses (incl. SARS-CoV-2); Bacterial—S. pyogenes, diphtheria, S. aureus, Borrelia (Lyme); Parasitic—Trypanosoma cruzi; Fungal/protozoal—immunocompromised.
- Non-infectious: Immune-mediated—Kawasaki disease, SLE, MIS-C; Toxins—anthracyclines, alcohol, cocaine; Hypersensitivity (drugs); Idiopathic.
- Vaccine-associated: Rare, usually mild (e.g., post mRNA vaccines), with good recovery; manage supportively.

3. Pathophysiology

- Initial injury: Direct pathogen toxicity to myocytes.
- Immune response: Cell-mediated & humoral inflammation → further injury/necrosis.
- Chronic phase: Fibrosis, remodeling → dilated cardiomyopathy & chronic HF.

4. Clinical Features

Symptoms:

- General: Fever, lethargy, irritability; infants—poor feeding.
- Cardiac: Chest pain, palpitations, dyspnea, exercise intolerance, syncope.
- GI: Abdominal pain, nausea/vomiting—often misdiagnosed as GI illness.

Signs:

- Tachycardia disproportionate to fever; gallop (S3/S4); displaced apex.
- Signs of HF—hepatomegaly, crackles/wheeze, cool extremities, weak pulses.
- Arrhythmias—PVCs, VT/VF, heart block.

Red Flags (Fulminant Myocarditis)

- Syncope, sustained VT/VF, complete heart block.
- Refractory tachycardia, hypotension, shock, rising lactate.
- Rapidly escalating oxygen/ventilation/inotrope needs.

5. Diagnosis

- Clinical: Recent viral illness + chest pain/dyspnea + ↑ troponin.
- Labs: Troponin/CK-MB ↑; BNP/NT-proBNP ↑; CBC; CRP/ESR; viral PCR/serology where indicated.
- CXR: Cardiomegaly; pulmonary edema.
- ECG: Sinus tachycardia, ST-T changes, AV block, arrhythmias, low voltages.
- Echocardiography: LV dysfunction, regional wall motion abnormalities, pericardial effusion.
- Cardiac MRI: Supports diagnosis—myocardial edema (T2), hyperemia (T1), LGE (necrosis/fibrosis).
- Endomyocardial biopsy: Reserved for refractory/atypical cases or when results change management.

Key Differentials & Clues

Condition	Clues vs Myocarditis
Pericarditis	Pleuritic chest pain ↑ with inspiration, pericardial rub, diffuse ST elevation with PR depression; preserved LV function.
MIS-C	Recent SARS-CoV-2, fever, shock, multisystem involvement, high inflammation; often needs IVIG + steroids.
AMI / Coronary anomaly	Ischemic ECG changes localized; coronary imaging abnormal; severe chest pain.
Sepsis/Asthma/Pneumonia	Respiratory focus; troponin normal or mildly ↑; echo normal LV function.

6. Management

Stabilize: ABCs, oxygen, IV access, monitor rhythm; cautious fluids; early PICU transfer if shock/arrhythmia.
Heart failure therapy: Loop diuretics; consider vasodilators/inodilators (milrinone) if low output; avoid digoxin in acute fulminant myocarditis due to arrhythmia risk.
Etiology-directed: Antivirals/antibiotics as indicated; treat diphtheria/Lyme specifically if diagnosed.
Immunomodulation: IVIG and/or corticosteroids in immune-mediated disease, MIS-C, or persistent inflammation as per specialist guidance.
Arrhythmias: Follow pediatric ACLS; temporary pacing for high-grade block; consider antiarrhythmics with expert input.
Mechanical support: ECMO/VAD for refractory cardiogenic shock; discuss with cardiac center early.
Activity: Strict rest in acute phase; no competitive sports for at least 3–6 months and until LV function, biomarkers, and rhythm normalize.

Disposition – When to Admit / PICU

Ward	Mild symptoms, stable vitals, modest biomarker rise, preserved or mildly ↓ LV function.

PICU	Hypotension/shock, significant LV dysfunction, sustained arrhythmias/heart block, rapidly rising troponin/BNP, escalating oxygen/inotrope needs.

7. Prognosis

Variable: many recover fully within weeks–months; some progress to dilated cardiomyopathy or require transplant. Early recognition and supportive care improve outcomes.

8. Complications

- Heart failure; cardiogenic shock.
- Arrhythmias (VT/VF, heart block); sudden cardiac death.
- Dilated cardiomyopathy; intracardiac thrombus/embolism.

9. Prevention

Vaccination (influenza, COVID-19) & hygiene reduce viral myocarditis risk; monitor for cardiotoxic drugs (e.g., anthracyclines) with baseline and periodic echo; treat systemic diseases (Kawasaki/MIS-C) promptly.

10. Summary & Exam Triggers

Exam Triggers	Post-viral chest pain + tachycardia out of proportion • ↑ Troponin/BNP • ECG ST-T changes/arrhythmia • Echo ↓ LV function • MRI edema/LGE • Avoid sports 3–6 months