Hypertension: Comprehensive Overview

1 Definition

Hypertension, or high blood pressure, is defined as a sustained elevation of blood pressure above normal levels. According to the World Health Organization (WHO) and American Heart Association (AHA), hypertension is diagnosed when systolic blood pressure (SBP) is $\geq$140 mmHg or diastolic blood pressure (DBP) is $\geq$90 mmHg, measured on two or more occasions.

2 Etiopathogenesis

Hypertension is classified into primary (essential) and secondary hypertension:

- **Primary Hypertension**: Accounts for 90–95% of cases. It results from a complex interplay of genetic, environmental, and lifestyle factors. Key contributors include:
  - Genetic predisposition (family history).
  - Increased sympathetic nervous system activity.
  - Renin-angiotensin-aldosterone system (RAAS) dysregulation.
  - Endothelial dysfunction and vascular remodeling.
  - Lifestyle factors: high salt intake, obesity, physical inactivity, and stress.
- **Secondary Hypertension**: Accounts for 5–10% of cases, caused by identifiable underlying conditions such as:
  - Renal artery stenosis.
  - Hyperaldosteronism (Conns syndrome).
  - Pheochromocytoma.
  - Coarctation of the aorta.
  - Thyroid disorders.
  - Medications (e.g., oral contraceptives, NSAIDs).

3 Clinical Manifestations

Hypertension is often asymptomatic, earning it the name "silent killer." However, severe or long-standing hypertension may present with:

- Headache, particularly occipital, often in the morning.
- Dizziness or vertigo.
- Blurred vision or visual disturbances (hypertensive retinopathy).
- Chest pain or angina (due to cardiovascular strain).
- Shortness of breath (heart failure).
- Epistaxis (nosebleeds, less common).

Complications include stroke, myocardial infarction, heart failure, renal failure, and aortic dissection.

4 Pathophysiology

Hypertension involves complex mechanisms leading to increased vascular resistance and blood pressure. The flowchart below illustrates the key pathways.

5 Symptoms

Most patients with hypertension are asymptomatic. When symptoms occur, they may include:

- Morning occipital headaches.
- Dizziness or lightheadedness.
- Visual changes (e.g., double vision, scotoma).
- Chest discomfort or palpitations.
- Fatigue or shortness of breath.
- Confusion or neurological symptoms in hypertensive crises.

6 Diagnosis

Diagnosis involves:

- **Blood Pressure Measurement**: Using a validated sphygmomanometer, measure BP on at least two separate occasions. Ambulatory or home BP monitoring may confirm diagnosis.
- **Physical Examination**: Check for signs of target organ damage (e.g., fundoscopy for retinopathy, heart auscultation for murmurs).
- **Laboratory Tests**: Urinalysis, blood glucose, lipid profile, serum creatinine, and electrolytes to assess secondary causes and complications.
- **Imaging**: ECG, echocardiography, or renal ultrasound if indicated.
- **Classification**:
  - Normal: SBP $<$120 mmHg and DBP $<$80 mmHg.

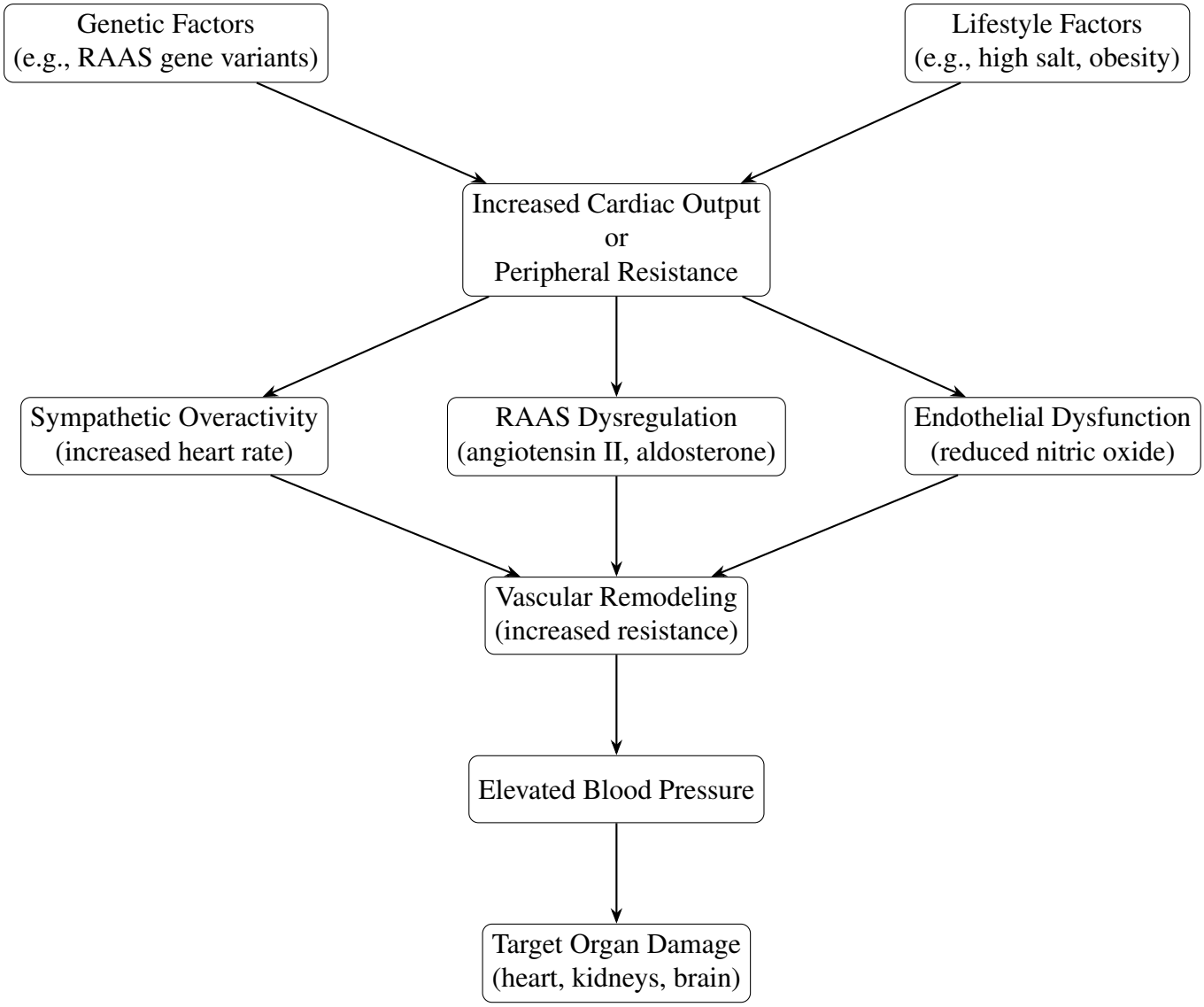

Figure 1: Pathophysiology of Hypertension

- Elevated: SBP 120–129 mmHg and DBP $<$80 mmHg.
- Stage 1 Hypertension: SBP 130–139 mmHg or DBP 80–89 mmHg.
- Stage 2 Hypertension: SBP $\geq$140 mmHg or DBP $\geq$90 mmHg.

7 Nonpharmacological Management

Lifestyle modifications are critical for managing hypertension and include:

- **Dietary Changes**: Adopt the DASH (Dietary Approaches to Stop Hypertension) diet, emphasizing fruits, vegetables, low-fat dairy, and reduced sodium ($<$2.3 g/day).
- **Weight Reduction**: Aim for a BMI of 18.5–24.9 kg/m^2.
- **Physical Activity**: Engage in 150 minutes/week of moderate aerobic exercise (e.g., brisk walking).

- **Sodium Restriction**: Limit salt intake to $<$5–6 g/day.
- **Alcohol Moderation**: Limit to $\leq$2 drinks/day for men and $\leq$1 drink/day for women.
- **Smoking Cessation**: Quit smoking to reduce cardiovascular risk.
- **Stress Management**: Practice relaxation techniques (e.g., meditation, yoga).

8 Pharmacological Management

Medications are used when lifestyle changes are insufficient or in high-risk patients. Common classes include:

- **Thiazide Diuretics**: E.g., hydrochlorothiazide (12.5–50 mg/day). Reduce blood volume.
- **ACE Inhibitors**: E.g., lisinopril (10–40 mg/day). Block RAAS, reduce vasoconstriction.
- **Angiotensin II Receptor Blockers (ARBs)**: E.g., losartan (25–100 mg/day). Similar to ACE inhibitors, fewer side effects.
- **Calcium Channel Blockers (CCBs)**: E.g., amlodipine (2.5–10 mg/day). Relax vascular smooth muscle.
- **Beta-Blockers**: E.g., metoprolol (25–200 mg/day). Reduce heart rate and cardiac output, typically used in specific cases (e.g., heart failure).
- **Others**: Alpha-blockers, mineralocorticoid receptor antagonists, or vasodilators for resistant hypertension.

Treatment is tailored based on patient comorbidities, age, and response. Combination therapy (e.g., thiazide + ACE inhibitor) is often required for stage 2 hypertension.