Epidemiology and prevention of Hypertension, CVD (IHD, Stroke), Rheumatic fever and RHD

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Hypertension or raised blood pressure

- **Raised blood pressure (BP)** is the leading cause of mortality worldwide and the **main risk factor for cardiovascular disease** (CVD).
- Most people with raised BP have **no symptoms** and are only **diagnosed through screening**, through a health check or when they have a CVD event, such as a stroke, a heart attack or heart failure.
- Reducing the prevalence of raised BP is **one of the nine targets** of the WHO Global NCD Action Plan.
- A number of cost-effective interventions at the population and individual levels are available to **prevent and control raised BP**.

Definition of hypertension

Category	Systolic Blood pressure (mmHg)		Diastolic Blood pressure (mmHg)
Optimal	<120	and	<80
Normal	<130	and/or	<85
High normal	130-139	and/or	85-89
Grade 1 Hypertension	140-159	and/or	90-99
Grade 2 Hypertension	≥160	and/or	≥100
Hypertensive crisis	≥180	and/or	≥110
Isolated systolic HTN	≥140	and	<90

Classification of hypertension

- Hypertension is classified into **primary (essential) and secondary**.
- Hypertension is called **essential** when the causes are generally **unknown**.
- Almost **90% of all cases** of hypertension are **essential** hypertension.
- Hypertension is called **secondary** when it is caused by some **other disease process** i.e. chronic kidney disease, tumor of the adrenal glands, congenital narrowing of the aorta and toxemias of pregnancy.

Prevalence and disease burden of high BP

- The global number of persons with high BP has **doubled** over the past 30 years, affecting around **1.3 billion people in 2019**.
- High BP caused **10.9 million deaths** worldwide (19.2% of all deaths) in 2019, of which **92% were attributable to CVD** (mainly heart attack, heart failure, and stroke) and **8% were attributable to kidney disease** (IHME).

Risk factors of high BP

Behavioural
- Unhealthy diet
- Tobacco use
- Physical inactivity
- Harmful use of alcohol

Physiologic/metabolic
- High blood cholesterol
- High blood glucose
- Overweight and obesity

Other risk factors
- Poverty and low educational level
- Advanced age
- Gender
- Genetics
- Stress
- Excess homocysteine

Risk factors of high BP

The **non-modifiable risk factors** of hypertension are:

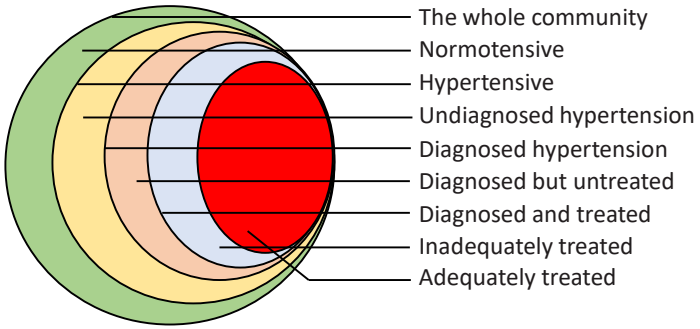
- **Age**
- **Sex**
- **Genetic factors**
- **Ethnicity: More in black communities.**

Risk factors of high BP

The main **modifiable risk** factors of hypertension are:

- **Overweight/obesity**
- **High salt intake**
- **High saturated fat intake**
- **Low intake of dietary fiber (fruits and vegetables)**
- **Harmful use of alcohol**
- **Physical inactivity**
- **Environmental stress**
- **Low socioeconomic status**
- **Others factors: The commonest cause of secondary HTN is OCP**

Rule of halves in hyperytension



Prevention of hypertension

- WHO recommended the following approaches in the prevention of hypertension:
  - ❑ **Primary prevention**
    - ✓ Population strategy
    - ✓ High-risk strategy
  - ❑ **Secondary prevention**

Population level strategy

- The population approach is directed at the **whole population**, irrespective of individuals risk levels.
- It mainly aims at **lifestyle modification** of whole population. These include:
  - ✓ **Weight reduction**
  - ✓ **Adopt DASH eating plan**: Diet rich in fruits and vegetables and low-fat dairy products with a low saturated fat

Population level strategy

- ✓ **Reduction of dietary sodium/salt:** Salt not more than **5g/day** and sodium not more than 2gm/day
- ✓ **Promotion of physical activity: at least 30 minutes daily** moderate intensity physical activity.
- ✓ **Limit alcohol consumption**

Interventions at the individual level

- **Diagnosis of hypertension:** Measuring BP.
- **Reducing behavioural risk factors:** Lifestyle modification
- **Medication:** Drugs include single or combined.
- **Surgery:** Where individuals are morbidly obese, gastric surgery is performed in some settings.

Secondary prevention of hypertension

- **Early case detection**
- **Treatment**
- **Patient compliance**

Lifestyle modification practice

- **Stop all form of tobacco use**
- **Avoid second hand tobacco smoke**
- **Stop taking alcohol**
- **Increase physical activity to equivalent of brisk walk at least 150 minutes per week**
- **If overweight, lose weight**
- **Eat heart-healthy diet**

Heart healthy diet for hypertensive patients

- **Reduce dietary salt intake to <5gm/day**
- **Eat ≥ 5 servings of fruits and vegetables per day**
- **Use healthy oils, such as soyabean, sunflower, olive, sesame**
- **Eats nuts, peas, whole grains and foods rich in potassium like spinach, watermelon, yogurt and banana**
- **Limit red meat to once or twice a week at most**
- **Eat fish or other food rich in omega 3 fatty acid at least twice a week**
- **Avoid added sugar from sweets, cakes, fruit juice and sugar sweetened beverages**

Cardiovascular disease (CVD)

- CVD is the **leading noncommunicable disease**.
- CVDs are the **leading causes of death and disability** in the world.
- **CVD** is a term for conditions affecting the **heart and blood vessels**.
- The **two main sites** for CVD are **ischaemic heart disease (IHD)** and **cerebrovascular disease** (such as ischaemic or haemorrhagic stroke).

Cardiovascular disease: Types

CVDs due to atherosclerosis

- Ischaemic heart disease or coronary artery disease (e.g. heart attack)
- Cerebrovascular disease (e.g. stroke)
- Diseases of the aorta and arteries, including hypertension
- Peripheral vascular disease

Other CVDs

- Congenital heart disease
- Rheumatic heart disease
- Cardiomyopathies
- Cardiac arrhythmias

Epidemiology of CVD

- Based on data from **IHME 2019**,
  - There were **523 million** people living with a CVD of which **197 million** were **IHD** and **101 million** were **stroke**.
  - **CVD** (including IHD and stroke) accounted for **32.8% (18.6 million)** of all deaths globally of which **IHD** for **16.2% (9.1 million)** and **stroke** for **11.2% (6.6 million)**

Risk factors of CVD

Behavioural

- Unhealthy diet
- Tobacco use
- Physical inactivity
- Harmful use of alcohol

Physiologic/metabolic

- High blood pressure
- High blood cholesterol
- High blood glucose
- Overweight and obesity

Other risk factors

- Poverty and low educational level
- Advanced age
- Gender
- Genetics
- Stress
- Globalization
- Urbanization

Primary prevention of CVD

- **Population-wide intervention:**
  - Tobacco control policies
  - Taxation to reduce the intake of foods that are high in fat, sugar and salt
  - Building walking and cycle paths to increase physical activity
  - Strategies to reduce harmful use of alcohol
  - Provide healthy school meals to children

Primary prevention of CVD

- **Individual level intervention:**
  - To prevent first heart attacks and stroke, health care interventions need to be targeted to high-risk individuals i.e. who have high blood pressure or high blood glucose or high blood cholesterol

Secondary prevention of CVD

- **Medication:**
  - Aspirin
  - Beta blockers
  - ACE inhibitors
  - Statins
- **Lifestyle modification**

Health care packages for CVD

- WHO has developed the **HEARTS package** to support countries to strengthen primary health CVD management.
- HEARTS includes **six modules**:
  i. **Healthy-lifestyle** counselling
  ii. **Evidence-based** treatment protocols
  iii. **Access** to essential medicines and technology
  iv. **Risk-based** CVD management
  v. **Team-based** care
  vi. **Systems** for monitoring

Coronary/Ischemic Heart Disease

- Coronary heart disease is defined as impairment of heart function due to inadequate blood flow to the compared to its needs, caused by obstructive changes in the coronary circulation to the heart.
- CHD may manifest itself in many presentations:
  - **Angina pectoris**
  - **Myocardial infarction**
  - **Irregularities of the heart**
  - **Cardiac failure**
  - **Sudden death**

Risk factors for CHD/IHD

Non-modifiable

- Age
- Sex
- Family history
- Genetic factors
- Personality

Modifiable

- Tobacco smoking
- High blood pressure
- Elevated serum cholesterol
- Diabetes
- Obesity
- Sedentary habits
- Stress

Prevention of CHD/IHD

- WHO expert committee recommends the following strategy for the prevention of CHD:
  - **Population strategy**
    - Prevention in whole population
    - Primordial prevention in whole population
  - **High risk strategy**
  - **Secondary prevention**

Population strategy to prevent CHD/IHD

- **Dietary changes:**
  - Reduction of **fat intake to 20-30%** of total energy intake
  - **Saturated fat** intake to **less than 10%** of total energy intake
  - **Dietary cholesterol** to less than **100mg/1000kcal/day**
  - **Salt intake** to less than **5gm/day**
  - **Increase in complex carbohydrate** consumption i.e. fruits and vegetables, whole grains and legumes
  - **Avoid alcohol** consumption

Population strategy to prevent CHD/IHD

- **Avoid smoking** and smokeless tobacco use
- **Control blood pressure**
- Promotion of **physical activity**
- Maintain an **ideal body weight**

High risk strategy to prevent CHD/IHD

- **Identifying risk**
  - WHO CVD (laboratory-based) risk charts
  - WHO CVD (non-laboratory-based) risk charts
- **Specific advice**
  - Having identified those at high risk, the next step will be to brong them under preventive care and motivate them to take positive action against all the identified risk factors.

CHD/IHD risk factors intervention trial

- Since 1951, one of the best known large prospective studies, the **Framingham Study**, has played a major role in establishing the nature of CHD risk factors.
- The widely reported intervention trials are:
  - **The Stanford Heart Disease Prevention Programme in California**
  - **The North Kereia Project in Finland**
  - **The Multiple Risk Factor Intervention Trial (MRFIT) in USA**
  - **The Lipid Research Clinics Study**

Stroke

- Stroke is a **highly preventable and treatable NCD** that occurs when the blood supply to the brain is disrupted or when a blood vessel in the brain bursts and blood leaks into the brain, causing oxygen starvation, brain damage, and loss of function.
- Strokes can result in lasting damage, including partial or complete paralysis, difficulties with speech, comprehension, and memory/cognition.
- The extent and location of the damage determines the severity of the stroke, which can range from minimal to catastrophic.

Classification of stroke

- **Ischemic stroke (85%)**
  - Total anterior circulation stroke (**TACS**)
  - Partial anterior circulation stroke (**PACS**)
  - Lacunar stroke (**LACS**)
  - Posterior circulation stroke (**POCS**)
- **Haemorrhagic stroke (15%)**
  - Intracerebral haemorrhage
  - Subarachnoid haemorrhage

Top 10 global risk factors for stroke

1. **Elevated systolic blood pressure**
2. **High body mass index**
3. **High fasting glucose**
4. **Air pollution**
5. **Smoking**
6. **Poor diet**
7. **High LDL cholesterol**
8. **Kidney dysfunction**
9. **Alcohol use**
10. **Low physical activity**

Epidemiology of stroke

- There are over **12.2 million new strokes** each year (**1 in every 3 seconds!**).
- Globally, there are **over 101 million people currently living** who have experienced stroke (**This number has almost doubled over the last 30 years!**).
- **Six and a half-million people die** from stroke annually.
- Over **143 million years of healthy life is lost** each year due to stroke-related death and disability.
- A crude **prevalence of stroke** is **11.39 per thousand** population in **Bangladesh**.

Prevention of stroke

- **Primary prevention**
  - Smoking cessation
  - Regular physical activity at least 30 min per day
  - Reduced intake of salt (30%
  - Antihypertensives for people with persistent blood pressure >140/90 mm Hg and 10-year risk of developing cardiovascular disease >20% who are unable to reduce blood pressure through lifestyle modifications

Prevention of stroke

- **Secondary prevention**
  - Tobacco cessation, healthy diet, and regular physical activity
  - Aspirin, anti-hypertensives (low dose thiazide, angiotensin-converting enzyme inhibitor), and statins
- **Tertiary prevention**
  - Treatment of complication
  - Palliative care

Rheumatic fever (RHD)

- **Rheumatic fever** is a febrile disease **affecting connective tissues** particularly in the **heart and joints** initiated by infection of the throat by **group A β-hemolytic streptococci**.
- Although **RF is not a communicable disease**, it results from a communicable disease (**streptococcus pharyngitis**).
- Rheumatic fever and rheumatic heart disease cannot be separated from an epidemiological point of view.

Rheumatic heart disease (RHD)

- RF often leads to RHD which is a crippling disease.
- The **consequences of RHD** include:
  - Continuing damage to the heart
  - Increasing disabilities
  - Repeated hospitalization
  - Premature death usually by the age of 35 years or even earlier
- RHD is the **most readily preventable** chronic disease.

Epidemiological factors of RF

- **Agent factors:** Streptococcal sore throat by group A β streptococci
- **Host and environmental factors:**
  - **Age:** Usually occurs in child and adolescence (5-15 years)
  - **Sex:** Prognosis is worse in female
  - **Immunity:** Type-II hypersensitivity reaction occurs
  - **Socio-economic status:** Poverty, overcrowding, poor housing condition, inadequate health services, inadequate health care expertise
  - **High-risk groups:** School aged children, slum dwellers

Modified Jones criteria for diagnosis of RF

- **Major criteria:**
  - Carditis
  - Polyarthritis
  - Chorea
  - Erythema marginatum
  - Subcutaneous nodule

Modified Jones criteria for diagnosis of RF

- **Minor criteria:**
  - Fever
  - Arthralgia
  - Previous history of RF or RHD
  - Raised ESR (≥ 60 mm/h)
  - Raised C-Reactive Protein (≥ 3 mg/dl)
  - Prolonged PR interval (ECG)
  - Leukocytosis

Prevention of RF

There are two ways of prevention of rheumatic fever.

- **General measures:**
  - Improvement of socioeconomic condition
  - Environmental sanitation
  - Health education to the parents of school going children
- **Drug prophylaxis:**
  - Primary prophylaxis/primary prevention
  - Secondary prophylaxis/secondary prevention

Primary prophylaxis for RF

Antibiotic	Dose
Benzathine penicillin (Intramuscular)	12 lac units for adults and children ≥30kg 6-9 lac units for children <30kg (single dose)
Phenoxymethyl penicillin (Oral)	250mg 4 times daily for 10 days for adults and children ≥20kg 125 mg 4 times daily for 10 days for children <20kg
Erythromycin (Oral)	250mg 4 times daily for 10 days for adults and children ≥25kg 40 mg/kg/day for 10 days for children <25kg

Secondary prophylaxis for RF

Patient	Treatment	Duration of treatment
Only RF	Intramuscular benzathine benzylpenicillin at an interval of 3 weeks (12 lac for adults and 6 lac for children)	At least 5 years or until the age of 21 years whichever is longer
RF with carditis	Intramuscular benzathine benzylpenicillin at an interval of 3 weeks (12 lac for adults and 6 lac for children)	At least 10 years or until the age of 40 years whichever is longer

References

- Bovet, Pascal & Banatvala, Nick & Khaw, Kay-Tee & Reddy, K. (2023). Cardiovascular disease. 10.4324/9781003306689-8.
- Park, K. (2023) Parks Textbook of Preventive and Social Medicine. 27th Edition, M/S Banarsidas Bhanot Publishers, Jabalpur.
- World Stroke Organization (2023). World stroke factsheet 2022. URL: https://www.world-stroke.org/assets/downloads/ WSO_Global _Stroke _Fact_Sheet.pdf

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