### Mini Review

# Hypertension

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**Received:** July 12, 2018; **Accepted:** September 04, 2018; **Published:** September 11, 2018

# **Keywords**

Renovascular Hypertension; Pheochromocytoma; Hyperaldosteronism

## **Abbreviations**

HTN: Hypertension; ABI: Ankle-Brachial Index; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; BUN: Blood Urea Nitrogen; CHD: Chronic Heart Disease.

## **Definition**

Hypertension - Defined as any one of the following: Hypertension is defined as SBP or DBP  $\geq 95^{th}$  percentile for age, sex and weight persist continuously.

Systolic blood pressure > 140mmHg and/or Diastolic blood pressure >90mmHg, Patient taking antihypertensive medications.

Essential HTN: When the cause is not known (90 to 95 % cases).

**Secondary HTN:** Specific organ dysfunction is detected (5 to 10 % cases).

## **Blood Pressure**

Lateral Pressure exerted by column of blood on wall of artery called as blood pressure (Figure 1).

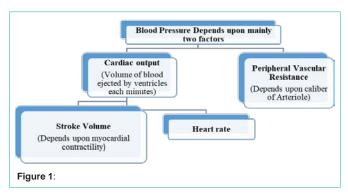
## **Risk factor for Hypertension**

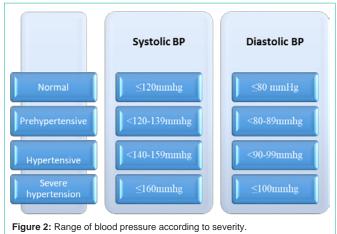
#### [A] Non-Modifiable risk factors:

- i) Age: As age increases BP increases (Figure 2).
- ii) Gender: Up to 60 years of age BP in Male > Female. But after > 60 years of age BP in Female > Male.
  - iii) Genetic factor
- iv) Ethnicity/Race: Black African race of same age and sex have more BP in comparison to others.

# [B] Non-Modifiable risk factors:

- i) Physical activity: At least 30 minutes of activity daily for 5 to 7 days/week will prevent HTN.
  - ii) Salt intake: Daily salt intake should be less than 5mg /day.
  - iii) Stress





- iv) Smoking
- v) Alcohol
- vi) Obesity: As body weight increases, risk of hypertension and other cardiovascular disease increase. Saturate fat increase blood cholesterol level so, increase risk of hypertension.

## Most common cause of HTN in Children

- 1. Intrinsic Renal disease
- a) Chronic glomerulonephritis.
- b) Chronic pyelonephritis
- 2. Obstructive uropathy
- a) Urolithiasis
- b) Urethral stricture

Most common cause of HTN in Adult or adolescent (13 to 18 year):

# **Secondary Hypertension**

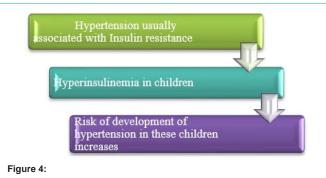
#### Renal artery stenosis (Renovascular hypertension)

Due to either atherosclerosis (older men) or fibromuscular

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dysplasia (young women). Presents with recent onset of hypertension, refractory to usual antihypertensive therapy. Abdominal bruit is present in 50% of cases; hypokalemia due to activation of the reninangiotensin-aldosterone system may be present.

# Renal parenchymal disease

Elevated serum creatinine and/or abnormal urinalysis, containing protein, cells, or casts.

## Coarctation of aorta

Presents in children or young adults (including 35% of pts with Turner syndrome); constriction is usually present in aorta at origin of left subclavian artery. Examination shows diminished, delayed femoral pulsations; late systolic murmur loudest over the midback. CXR shows indentation of the aorta at the level of the coarctation and rib notching (due to development of collateral arterial flow).

#### Pheochromocytoma

A catecholamine-secreting tumor, typically of the adrenal medulla or extra adrenal paraganglion tissue, that presents as paroxysmal or sustained hypertension in young to middle-aged pts. Sudden episodes of headache, palpitations, and profuse diaphoresis are common.

# Hyperaldosteronism

Usually due to aldosterone-secreting adenoma or bilateral adrenal hyperplasia.

Should be suspected when hypokalemia is present in a hypertensive pt off diuretics.

# Effects of Hypertension on different organs

I. Heart: Increase Systolic Blood Pressure leads to Left



Ventricular Hypertrophy. Increase Diastolic Blood Pressure may lead to risk of Myocardial Infarction increase. Increase risk of Coronary Artery Disease.

- **II. Brain:** Increase Blood Pressure leads to increase resistance in blood vessels of brain due to auto-regulation. So, Increase risk of ischemic stroke or CVA (Cerebro-vascular accident).
- **III. Kidney:** Increased Blood Pressure to renal tubular damage (Nephron).

**First developed:** MICROALBUMINURIA (less than 30mg albumin/gm of creatnine in urine).

**Later developed:** MACROALBUMINURIA (Greater than 300mg albumin/gm of creatnine in urine).

**IV. Eye:** On long increased BP earliest change is constriction of retinal arteriole. Arteriosclerotic changes (Thickening of retinal arteriole). Due to hypoxia vascular permeability increase. Plasma exudate from soft tissue changes in retina.

## V. Peripheral Blood Vessels:

**Ankle-Brachial Index (ABI):** Ratio of Systolic Blood Pressure in lower limb and Systolic Blood Pressure in Upper limb. Normally ABI  $\geq 1$ . On chronic Hypertension; Peripheral Vascular disease developed i.e.; ABI < 0.9. Clinically, Intermittent claudication i.e. No pain at rest but pain in calf muscles on motion.

### **Clinical Features**

- 1) Paroxysms of headache, sweating, or tachycardia (pheochromocytoma);
- 2) History of renal disease or abdominal trauma (renal hypertension)
  - 3) Daytime somnolence and snoring (sleep apnea).
  - 4) Dizziness, or blurred vision

#### Physical investigation

Wash hands; gown & drape appropriately Inspect precordium Palpation of RV and LV; Determination PMI Auscultation - patient @ 30 degrees S1 and S2 in 4 valvular areas w/diaphragm try to identify physiologic splitting S2? Murmurs Assess for extra heart sounds (S3,

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S4) w/bell over LV Carotid artery palpation, auscultation Jugular venous pressure assessment general lower extremity observation Assess femoral area (palpation for nodes, pulse); auscultation over fem art Knees - color, swelling; popliteal pulse Assess ankles/feet (color, temperature, pulses, edema, cap refill) Wash hands.

## Laboratory investigation

Screening tests for secondary hypertension:

Should be carried out on all patients with documented hypertension:

- (1) Serum creatinine, BUN, and urinalysis (renal parenchymal disease);
- (2) Serum K+ measured off diuretics (hypokalemia prompts workup for hyperaldosteronism or renal artery stenosis);
- (3) CXR (rib notching or indentation of distal aortic arch in coarctation of the aorta);
  - (4) ECG (LV hypertrophy suggests chronicity of hypertension);

- (5) Other useful screening blood tests including CBC, glucose, lipid levels, calcium, uric acid;
  - (6) Thyroid-stimulating hormone if thyroid disease suspected.

## Tracking of hypertension

Identification of children in which risk of development of Hypertension greater in adulthood.

**Benefit:** Risk may be reduced by life style modification.

## Metabolic syndrome

Usually HTN and Dislipidemia present together with insulin resistance i.e. resistance to uptake of glucose in tissue by insulin also present. In such cases higher risk of CHD stroke, Diabetes and other cardiovascular disease mortality increase. If family history of Hypertension in parents; then risk of Hypertension in children can be predicted (Figure 3-5).