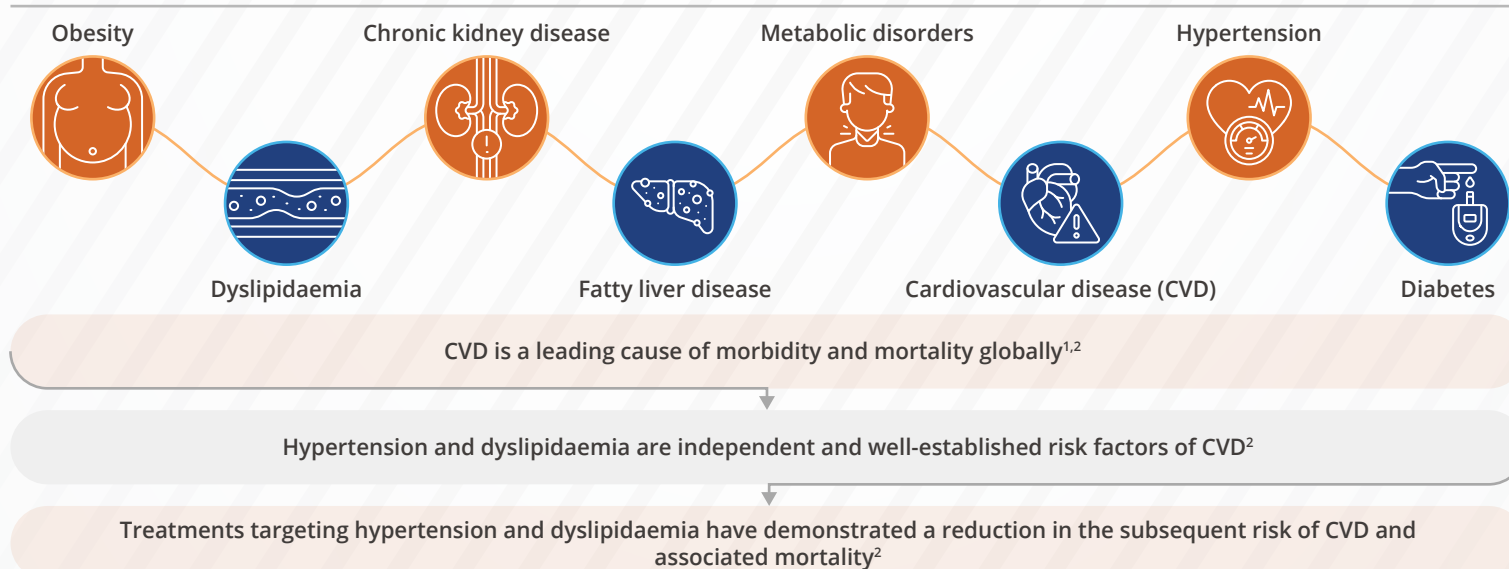


# Hypertension, Dyslipidaemia, and Cardiometabolic Disease – Insights on Pathophysiology, Interplay, and Therapeutic Management

Understanding the association between hypertension, dyslipidaemia, and cardiometabolic disease in the Asia Pacific region

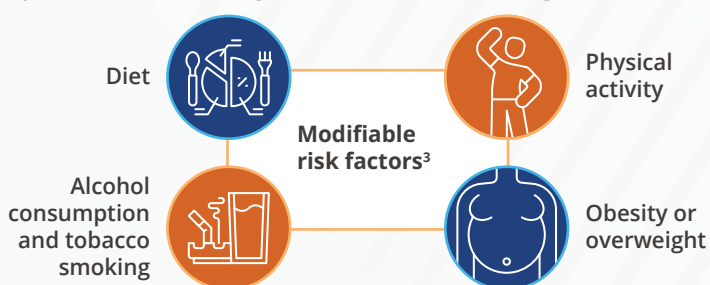
**Lifestyle-related diseases are tightly interlinked through complex and synergistic mechanisms, ultimately leading to cardiovascular complications<sup>1</sup>**



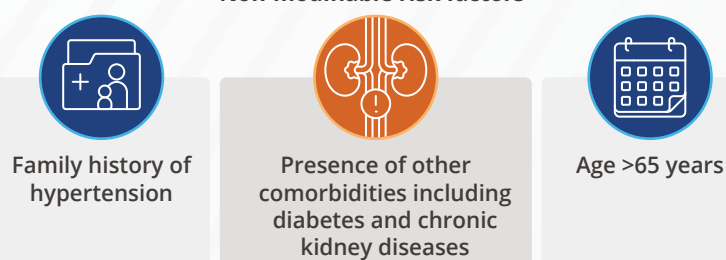
**However, the mortality rate continues to remain high, underscoring the need for comprehensive risk assessment and treatments that address multiple risk factors**  
**Understanding the interplay between hypertension, dyslipidaemia, and metabolic dysfunction in the development of CVD can aid improved therapeutic management**

**Uncontrolled hypertension is characterised by excessively high blood pressure (BP) levels<sup>2,3</sup>**

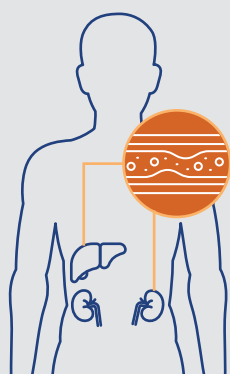
Systolic BP  $\geq 140$  mmHg or diastolic BP  $\geq 90$  mmHg



Non-modifiable risk factors<sup>3</sup>



**Pathophysiology<sup>4</sup>**



## Altered renal function

- Higher sodium retention
- Increased release of renin (an enzyme that activates the renin-angiotensin system)
- Altered pressure diuresis and natriuresis
- Modulation of systemic sympathetic tone and enhanced renal afferent nerve traffic
- Immune activation

## Vascular perturbations

- Systemic vascular resistance
- Increase in angiotensin II, catecholamines, and vasopressin  $\rightarrow$  enhanced vasoconstriction and diminished vasodilation
- Endothelial dysfunction and impaired vasodilation
- Reduced nitric oxide (vasodilator) bioavailability
- Vascular stiffening
- Immune activation and thrombosis

## Central nervous system alterations

- Sympathetic neural activation
- Enhanced renal sodium resorption and inflammation
- Altered vagal activity and defective immune reflex

## Insulin resistance and type 2 diabetes-induced hypertension<sup>5,6,7</sup>

Inappropriate activation of the renin-angiotensin-aldosterone system and sympathetic nervous system

Oxidative stress

Diabetic nephropathy

Arterial stiffness

Inflammation

Modulation of gut microbiota

Mitochondrial dysfunction

Enhanced renal and endothelial sodium channel activation

Abnormal release of extracellular vesicles and related microRNAs

## Obesity-induced hypertension<sup>4,5</sup>



Afferent nerve stimulation in the adipose tissue triggered by a high-fat diet increases BP and insulin resistance

## Dyslipidaemia and hypertension<sup>2,4,5</sup>

Dyslipidaemia is characterised by alterations in the plasma lipid profile



Total cholesterol



Triglycerides



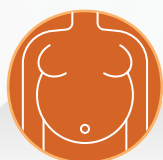
Low-density lipoprotein cholesterol (LDL-C)



High-density lipoprotein cholesterol (HDL-C)

- Endothelial dysfunction
- Arterial stiffening
- Increased lipid oxidation and generation of reactive oxygen species
- Increase in atherosclerosis
- Enhanced vasoconstriction
- Heightened risk of ischaemic heart disease and stroke

## Cardiometabolic syndrome represents a group of metabolic abnormalities associated with an elevated CVD risk<sup>5,6,7</sup>



Abdominal obesity  
(high body mass index  
and/or large waist  
circumference)



Insulin-resistant glucose  
metabolism  
(hyperinsulinaemia,  
impaired fasting glucose,  
impaired glucose tolerance,  
type 2 diabetes)



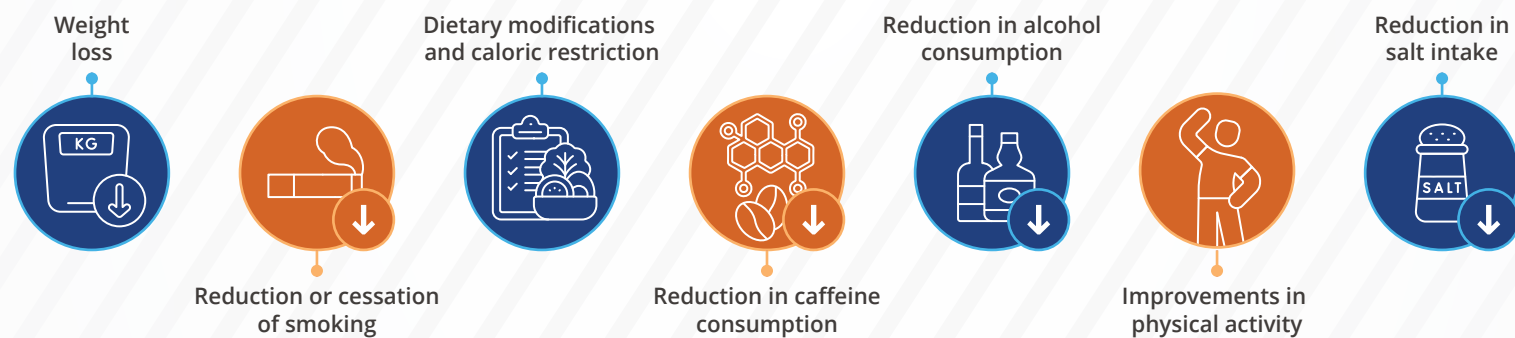
Dyslipidaemia (high serum  
triglyceride and low serum  
HDL-C concentrations)










Increased BP

## Guidelines for hypertension and dyslipidaemia management<sup>8</sup>

### Non-pharmacological interventions










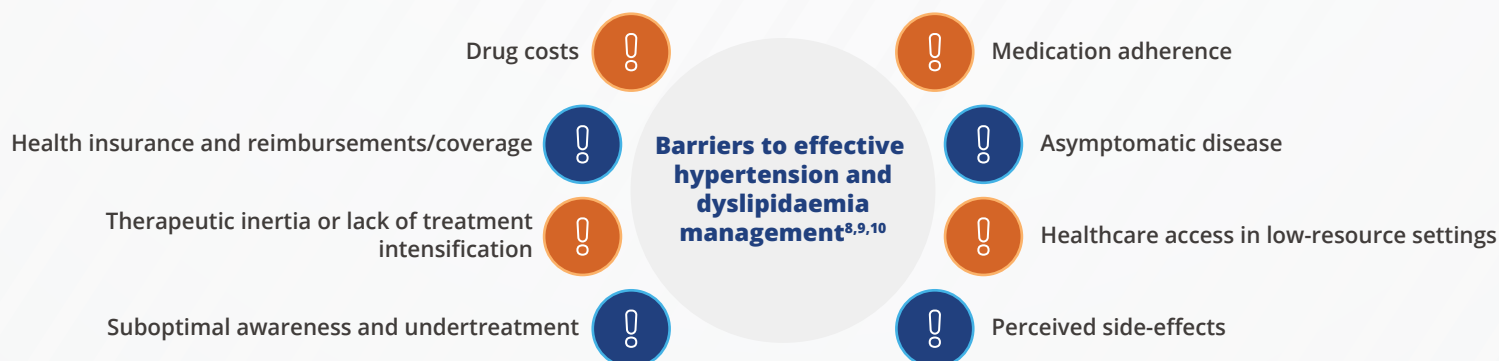
### Pharmacological interventions for hypertension

-  Angiotensin-converting enzyme inhibitors – captopril, enalapril, lisinopril, perindopril, ramipril
-  Angiotensin receptor blockers – candesartan, losartan, olmesartan, telmisartan, valsartan
-  Beta blockers – atenolol, bisoprolol, carvedilol, metoprolol, nebivolol, propranolol
-  Alpha blockers – doxazosin, prazosin
-  Calcium channel blockers – amlodipine, cilnidipine, lercanidipine, nifedipine
-  Diuretics – bendroflumethiazide, chlorthalidone, chlorothiazide, hydrochlorothiazide, indapamide
-  Mineralocorticoid receptor antagonists – eplerenone, spironolactone

**A combination of two or more drugs may be used in individuals with high initial BP or a high CVD risk**

### Lipid-lowering agents

-  Statins
-  Ezetimibe
-  Fibrates
-  Proprotein convertase subtilisin/kexin type 9 inhibitors
-  Cholesteryl ester transfer protein inhibitors
-  Fish oils
-  Nicotinic acid



Visit <https://diabetes.apac.knowledgehub.wiley.com/> for additional resources

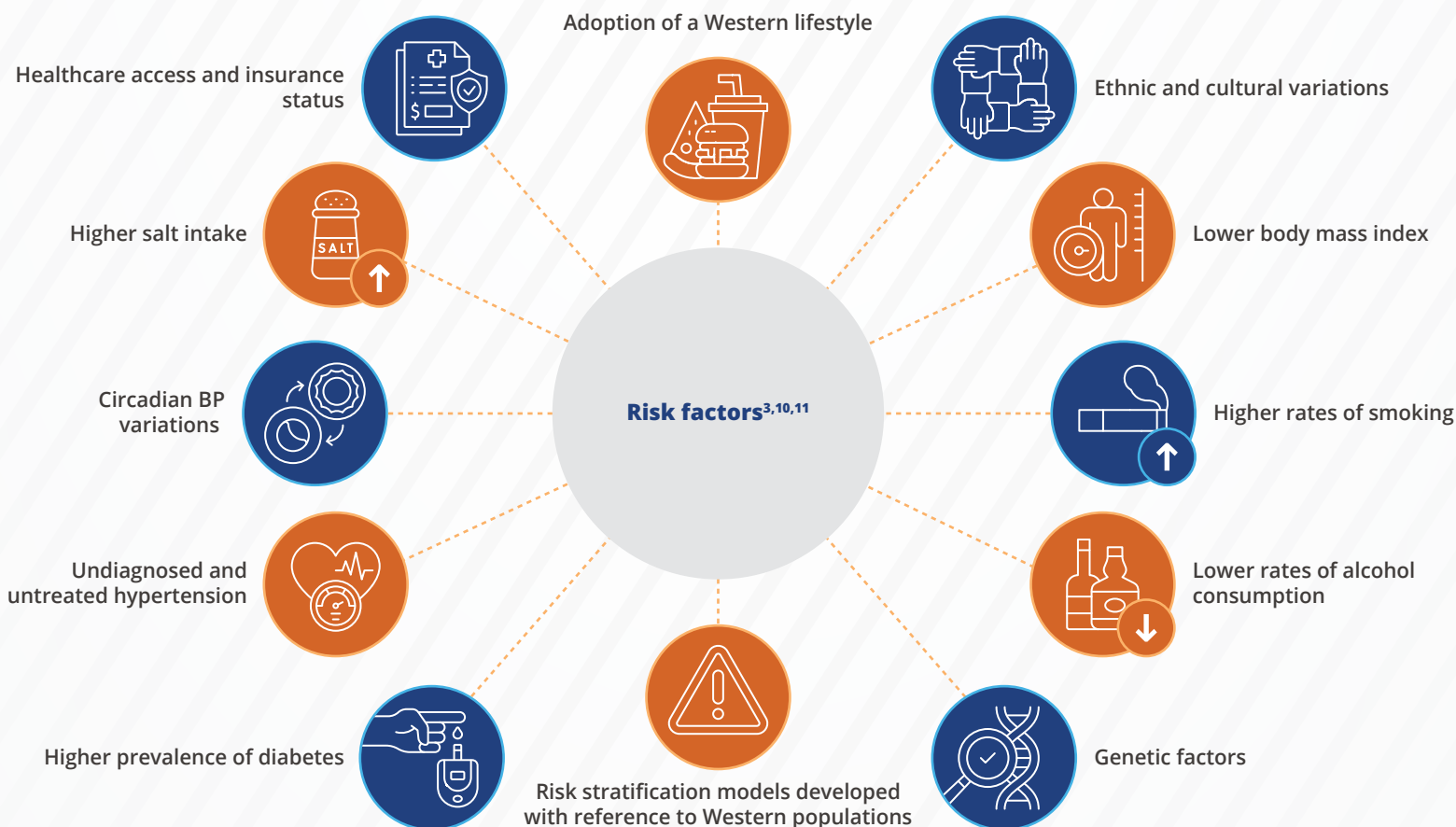


APAC countries account for a major proportion of the global population<sup>10</sup>



However, treatment guidelines for the management of hypertension and dyslipidaemia are largely based on data derived from non-Asian populations<sup>10,11</sup>

## CVD risk varies considerably for individuals from APAC countries compared to their Western counterparts



## Guidelines for the treatment of hypertension vary across different APAC regions with respect to<sup>11</sup>:



Threshold for diagnosis

Threshold for treatment

Target BP

## A unified pan-Asian guideline can help streamline patient care and optimise the management of hypertension

### Key message

Regular monitoring of BP and blood glucose, risk assessment, lifestyle modifications, and comprehensive therapeutic management can help reduce cardiovascular complications and associated mortality

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