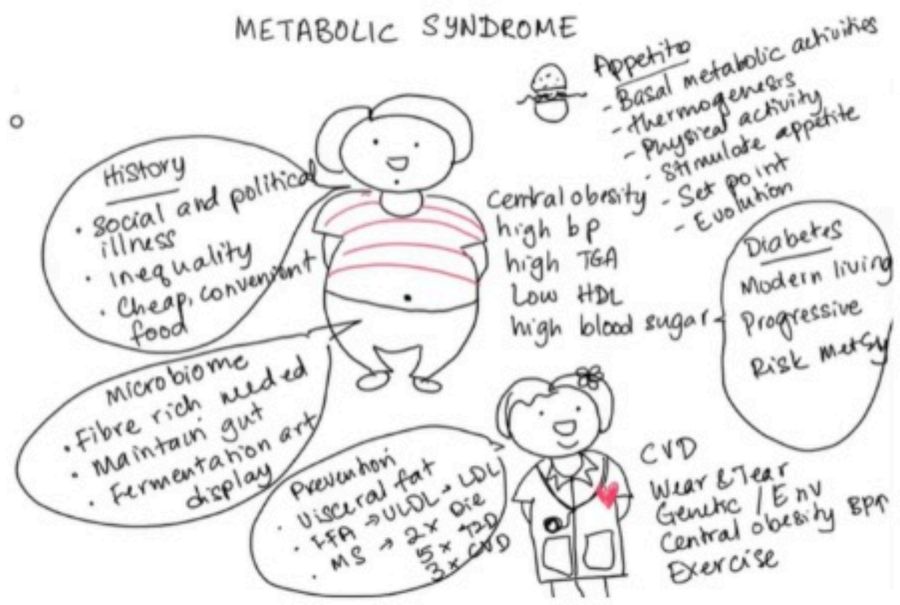
Metabolic Syndrome - Introduction



Learning Outcomes

- Describe what is meant by the term ‘Metabolic Syndrome’
- Explain the significance of the overall features of Metabolic Syndrome
- Recognize the clinical criteria used to define Metabolic Syndrome and the factors that make this complicated
- Describe the different roles of plasma lipoproteins in lipid transport
- Compare and contrast the roles of plasma lipoproteins in lipid transport, in the endogenous, exogenous and reverse cholesterol transport pathways
- Integrate the process of the formation of atherosclerotic plaques with lipoprotein and lipid transport
- Rationalise the ‘good’ and ‘bad’ labels applied to cholesterol in terms of lipid transport pathways and the specific roles of lipoprotein complexes

Definition of a Syndrome

A syndrome is a of signs and symptoms that occur together, indicating a particular condition or risk. The term originates from Greek, where "sin" means together and "drome" means to run, implying signs and symptoms that "run together." In medical terms, it refers to a set of concomitant symptoms characteristic of a specific disease or disorder. Wikipedia describes it as a group of correlated medical signs and symptoms associated with a disease or disorder.

Metabolic Syndrome as a Cluster of Risk Factors

Metabolic syndrome is best defined as a cluster of risk factors that predispose individuals to type 2 diabetes and cardiovascular disease. The comprehensive definition by Alberti et al. (2009), endorsed by the International Diabetes Federation (IDF) and other health organizations, emphasizes the interconnected nature of these risk factors. The syndrome involves a combination of clinical and biochemical features that increase disease risk.

Key Risk Factors Contributing to Metabolic Syndrome

- Raised blood pressure (hypertension)
- Abnormal lipid levels, including high triglycerides and low HDL cholesterol
- Raised fasting blood glucose levels
- Central obesity (excess fat around the abdomen)

These factors often occur together, creating a high-risk profile for metabolic and cardiovascular diseases.

Alternative Names and Cultural Variations

Metabolic syndrome is known by various names depending on the literature, such as "deadly quartet," despite involving five signs and symptoms. Different definitions and criteria exist across organizations, reflecting population-specific considerations and ethnic differences.

Measurement and Diagnosis Criteria

Metabolic syndrome is increasingly common in Australia and overseas. With an annual incidence of MetSy thought to be 3% and more than 35% of Australian adults have metabolic syndrome (BHC).

- Elevated waist circumference (population-specific thresholds)
- Elevated triglyceride levels (>1.7 mmol/L)
- Reduced HDL cholesterol (<1.0 mmol/L for men, <1.3 mmol/L for women)
- Elevated blood pressure (elevated if above certain thresholds)
- Elevated fasting glucose (>5.6 mmol/L)

Diagnosis requires meeting at least three out of these five criteria. Exact cutoff values vary slightly among different health organizations, such as the Mayo Clinic, American Heart Association, RACGP (Australian), and IDF, especially considering ethnic differences.

	Mayo clinic	**American Heart Association & NHLBI**	**RACGP**	**New IDF definition**
Large waist	> 102cm in men > 89cm in women	> 102cm in men > 89cm in women	> 90-102cm in men > 80cm in women	Ethnic specific values
High triglyceride levels (or drug treatment)	> 1.7 mmol/L	> 1.7 mmol/L	> 1.7 mmol/L	> 1.7 mmol/L
Reduced HDL (or drug treatment)	< 1.04 mmol/L in men < 1.3 mmol/L in women	< 1.05 mmol/L in men < 1.3 mmol/L in women	< 1.0 mmol/L in men < 1.3 mmol/L in women	< 1.03 mmol/L in men < 1.29 mmol/L in women
Elevated blood pressure (or drug treatment)	> 130 systolic > 85 diastolic	> 130 systolic > 85 diastolic	> 130 systolic > 85 diastolic	> 130 systolic > 85 diastolic
Elevated fasting glucose (or drug treatment)	> 5.6 mmol/L	> 5.6 mmol/L	> 5.6 mmol/L	> 5.6 mmol/L

Population-Specific and Ethnic Considerations

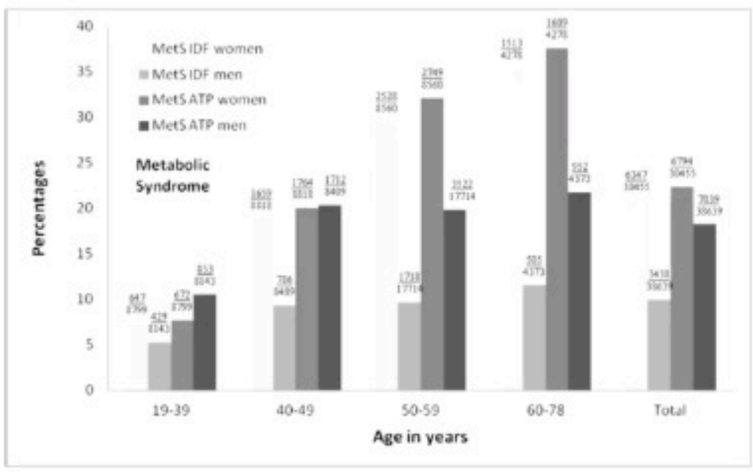
Definitions of risk thresholds differ based on ethnicity. For example, South Asians and Southeast Asians tend to have higher visceral fat at lower waist measurements, leading to lower cutoff points for central obesity. The RACGP considers waist circumference above 92 cm for men and 89 cm for women as risk factors, while the IDF uses ethnic-specific values to account for these differences.

Table 2. Waist circumference thresholds for abdominal obesity[4]

	Recommended threshold in waist circumference for abdominal obesity (high risk)	
Population	**Men**	**Women**
European/North American	≥102 cm	≥88 cm
Asian	≥90 cm	≥80 cm
Central and South American	≥90 cm	≥80 cm
Middle Eastern/Mediterranean	≥94 cm	≥80 cm
Sub-Saharan African	≥94 cm	≥80 cm

Gender and Age Variations in Prevalence

Studies show that more women than men in the same age groups tend to meet the criteria for metabolic syndrome, with prevalence increasing with age. Women aged 60-78 have a particularly high prevalence, with over a third affected. The risk increases as individuals grow older, especially among females.



Risk Factors and Their Impact

- Elevated blood pressure, high triglycerides, and low HDL are individually associated with cardiovascular disease
- Elevated fasting glucose and insulin resistance significantly increases risk of T2D
    - Although 25% of insulin resistant patients have normal glucose tolerance
- Large waist circumference indicates central obesity, increasing risks for cardiovascular disease and type 2 diabetes.

Additional Considerations

It is important to recognize that some risk factors are modifiable through lifestyle changes, while others are unmodifiable, such as genetic predisposition. Early detection and intervention are crucial for preventing progression to more serious conditions.