Epidemiology of Dyslipidemia

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Learning Objectives of the lecture :

- Defining dyslipidemia
- Explain why it is an important public health problem
- Global burden of dyslipidemia
- Identify the risk factors of dyslipidemia
- Discuss therapeutic life style changes (TLC)
- List down prevention strategies

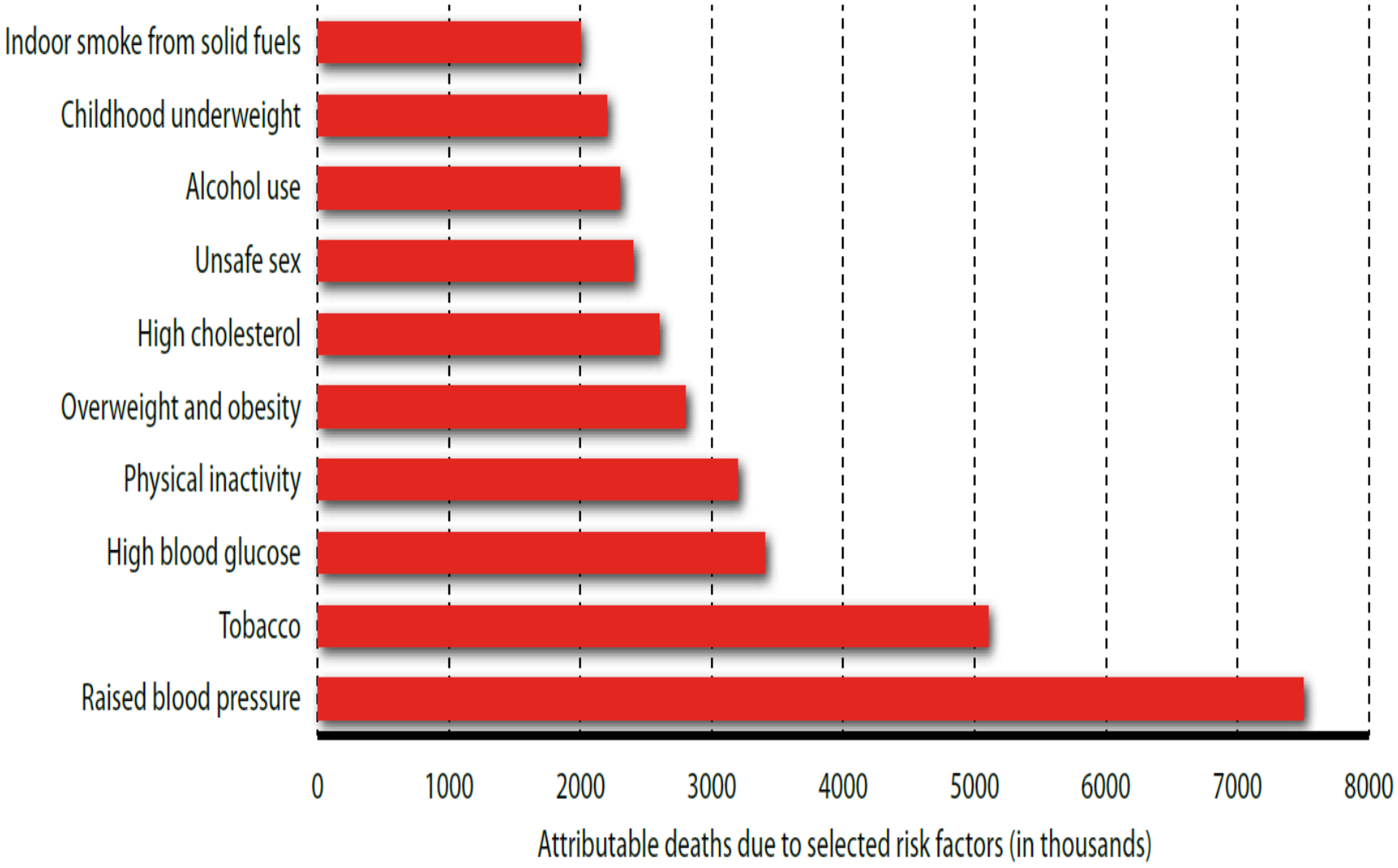
Introduction

- **Dyslipidemia** is a significant risk factor for cardiovascular diseases (CVD), increases the risks of heart disease and stroke.
- Globally, about **third** of ischemic heart disease is attributed to dyslipidemia.
- **Dyslipidemia is** clinically important because it is a major **modifiable** risk factors for cardiovascular disease

Definition

- Dyslipidemias are abnormalities of lipoprotein metabolism and include elevations of total cholesterol, LDL cholesterol, or triglycerides; or deficiency of HDL cholesterol.

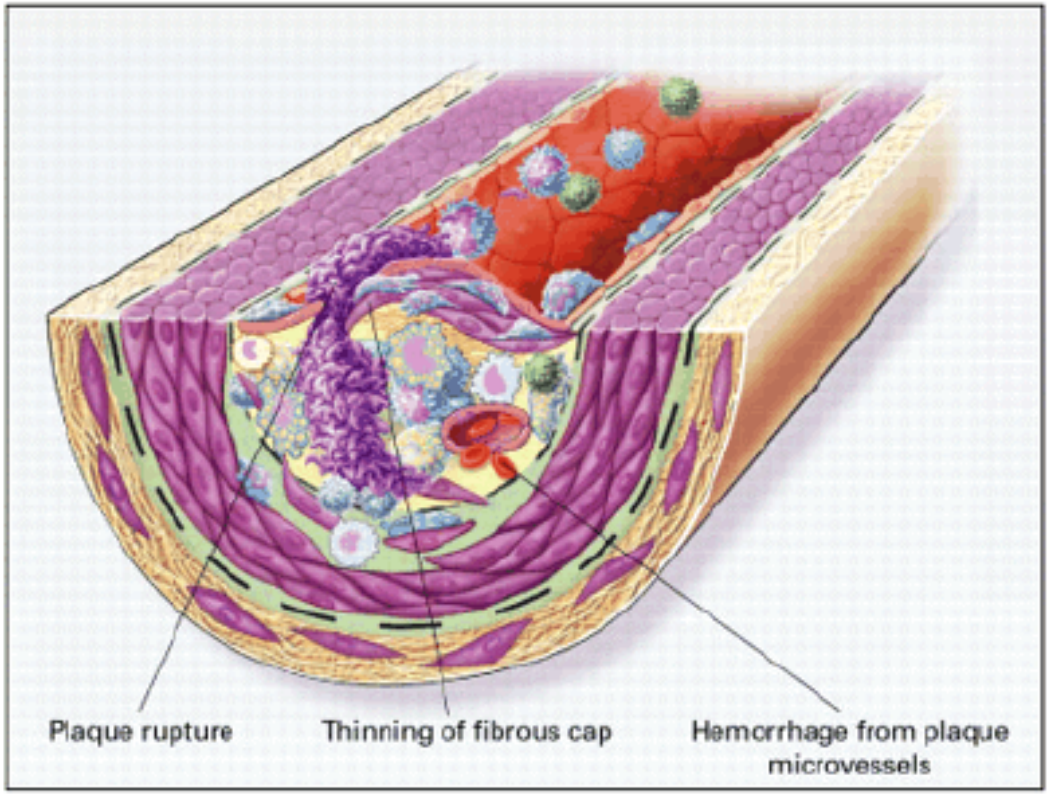
Figure 29 Ranking of 10 selected risk factors of cause of death (2).



- Dyslipidemia is a complex disorder caused by the interplay of **genetic**, **dietary** and **physiological** factors.

- Studies found a graded relationship between the total **cholesterol concentration and coronary risk**.

Atherosclerosis



EPIDEMIOLOGY

- According to the World Health Organization (WHO), **39%** of the world adult population has been affected by elevated blood cholesterol
- (**37%** for males and **40%** for females).

EPIDEMIOLOGY

- The prevalence of elevated total cholesterol was highest in the WHO Region of **Europe** (**54%** for both genders)
- The WHO **African** Region and the WHO **South East Asian** Region showed the lowest percentages (**23 %** and **30 %** respectively).

EPIDEMIOLOGY

- **71 million American adults (33.5%)** have high low-density lipoprotein (LDL), or “bad,” cholesterol.
- **Less than half** of adults with high LDL cholesterol get treatment.
- Only **1 out of every 3** adults with high LDL cholesterol has the condition under control.

Why it is an important public health problem ???

- Dyslipidemia is a **major cause of disease burden** in both the developed and developing world as a risk factor for **Ischemic heart disease and stroke.**
- It was reported that **4.32** million **fatalities** in **2017** were caused by raised low-density lipoprotein (LDL) cholesterol, accounting for **7.7%** of deaths worldwide that year.

Why it is an important to control hyperlipidemia???

- A **10%** reduction in serum cholesterol in men aged **40** has been reported to result in a **50% reduction in heart disease** within the next **5** years.

- The same serum cholesterol reduction for men aged **70** years can result in an average **20% reduction in heart disease** occurrence in the next **5** years.

Why it is an important to control hyperlipidemia???

- In Ireland, a **30%** reduction in the **heart disease death rate** has been attributed to **5 %** reduction of the population mean for total cholesterol.
- In Finland, **50%** of the **decline in IHD mortality** has been explained by the reduction of population blood cholesterol level.

Types of dyslipidemia:

1. Hypertriglycredemia
2. Hypercholesterolemia
3. Combined hyperlipidemia
4. lipoprotein disorders

Classification of Hyperlipidemia

- This classification tackles more on the reason why the condition has happened.
- The reasons may include **(primary) hereditary** or **secondary** to another conditions.

Hyperlipidemia Causes

Primary Causes. (Hereditary)

- **Over production** and **defective clearance** of the cholesterols TG and LDL which is the result of the **mutations of single or multiple genes.**

Hereditary Causes of Hyperlipidemia

- Familial Hypercholesterolemia
- Familial Combined Hyperlipidemia:
- Dysbetalipoproteinemia

- **Familial combined hyperlipidemia** is an autosomal dominant disorder characterized by **patients and their first-degree relatives** who may have either isolated triglyceride or low-density lipoprotein (LDL) cholesterol elevations or both.

- **Dysbetalipoproteinemia:** is a **rare familial** dyslipidemia characterized by approximately equally **elevated serum cholesterol and triglyceride levels**.
- It is associated with an increased risk for **premature cardiovascular disease**.

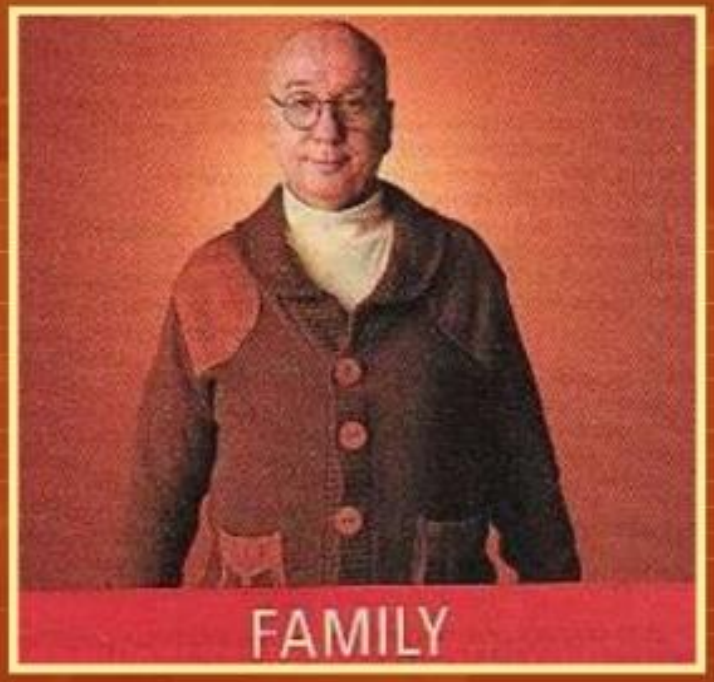
Causes of Secondary Hyperlipidemia

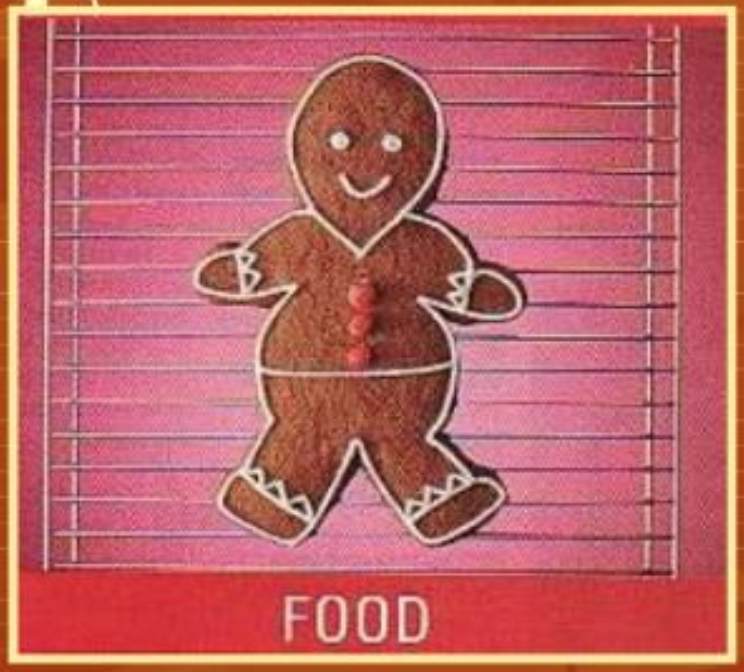
- DM
- Hypothyroidism
- Obstructive liver disease
- Chronic renal failure
- Drugs that raise LDL cholesterol and lower HDL cholesterol
- Alcohol raises triglycerides

Risk Factors for Dyslipidemia

- **Alcohol intake**
- **Cigarette smoking**
- **Diabetes mellitus**
- **Hypertension**
- **Liver disease**
- **Drugs** like thiazides, retinoids, anabolic steroids and glucocorticoids .

Risk Factors





Risk Factors for Dyslipidemia

- **Age** and **Gender (Men >45y, Women >55y)**
- **Family history**
- **Obesity**—BMI > 30 Obesity increases LDL by decreasing LDL receptor activity, also lowers HDL.
- **Physical inactivity**
- **Atherogenic diet**—high saturated fats & trans fat.

Dyslipidemia signs & symptoms

- Dyslipidemia doesn't have symptoms at all, but it can cause other **symptomatic vascular** disease, like coronary artery disease.
- Eye lid xanthelasmas, arcus cornea and tendinous xanthomas at the elbow, knee and Achilles tendons are caused by high levels of LDL.
- Acute pancreatitis is caused by high levels of TGs.

Dyslipidemia signs & symptoms

- Patients with familial hypercholesterolemia can have the above findings with planar xanthomas.
- Patients that have elevation of TGs in severe condition expect to have **eruptive xanthomas** over their elbow, back, trunks, knees, buttocks, feet and hands.

Dyslipidemia signs & symptoms

- Retinal arteries and veins can have a creamy white appearance due to the severe hypertriglyceridemia.
- Symptoms like paresthesias, confusion and dypsnea my occure in case of high lipid levels.

Signs of Dyslipidemia

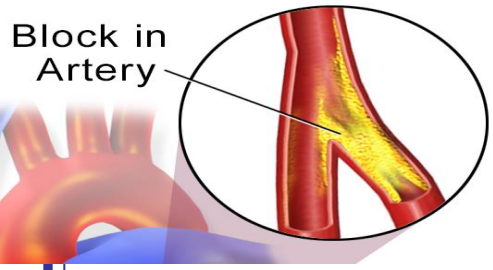
xanthelasma

↓

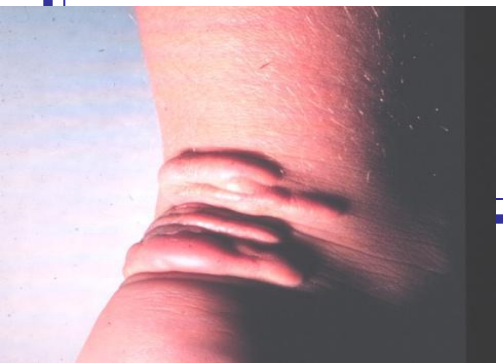
Not significant if in elderly

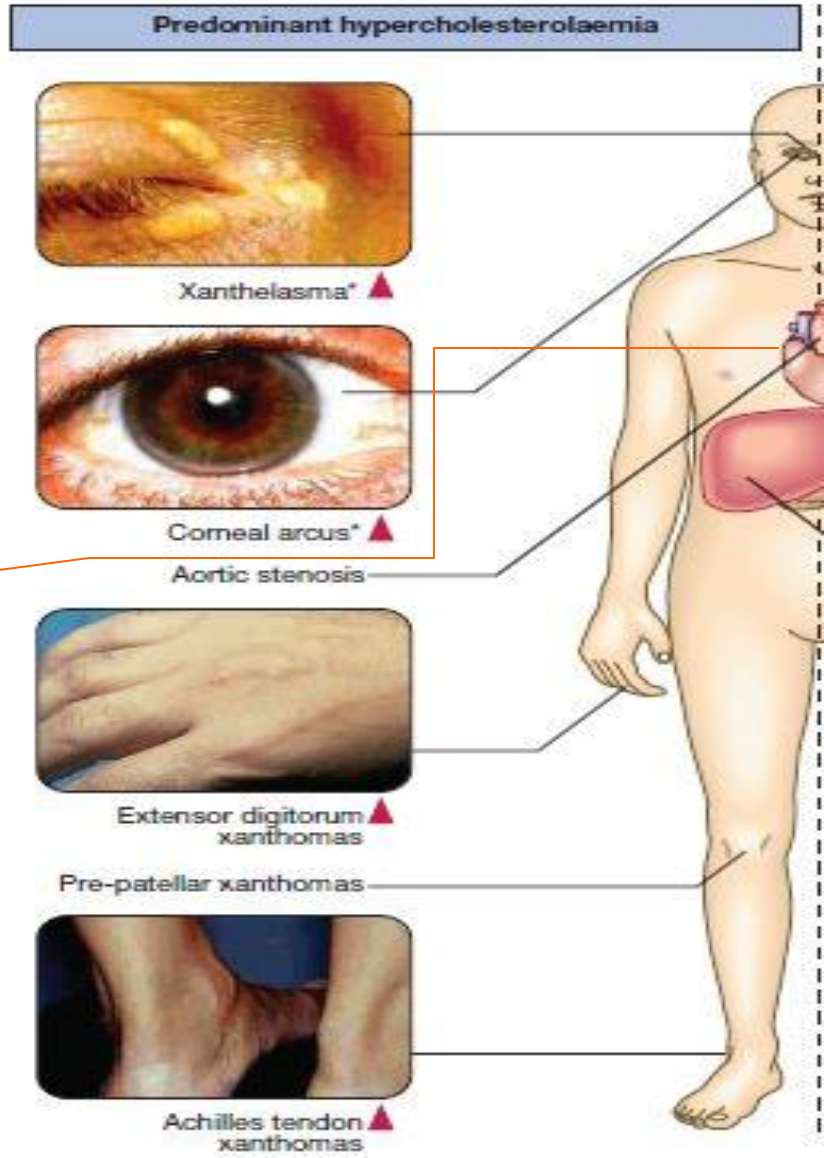
↑

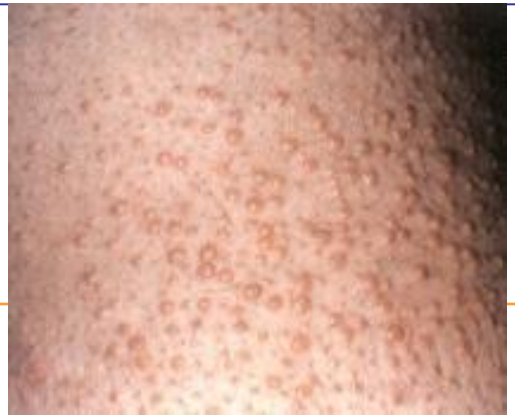
Corneal arcus

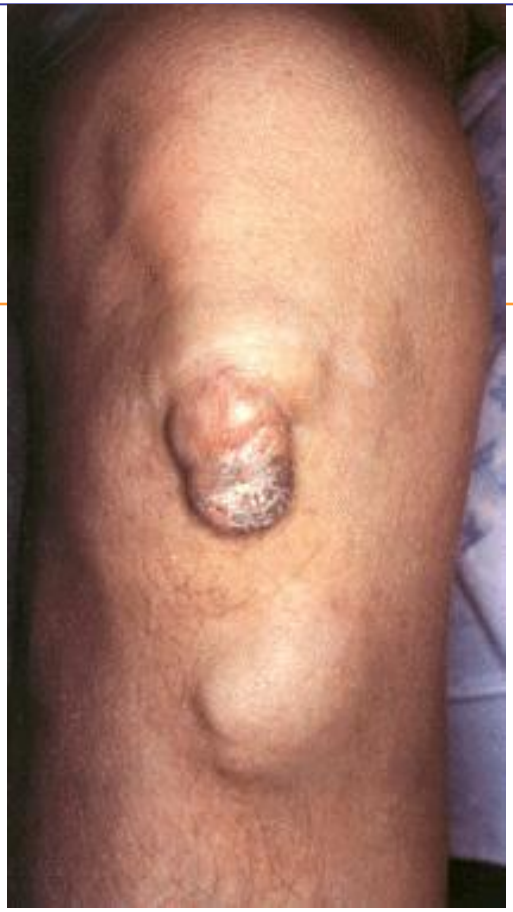


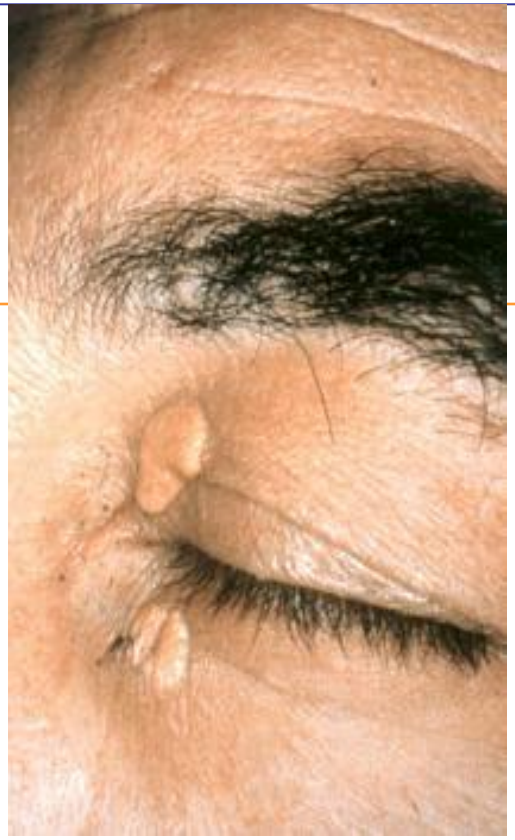
A major risk of CVD, including myocardial infarction and stroke , as well as total mortality

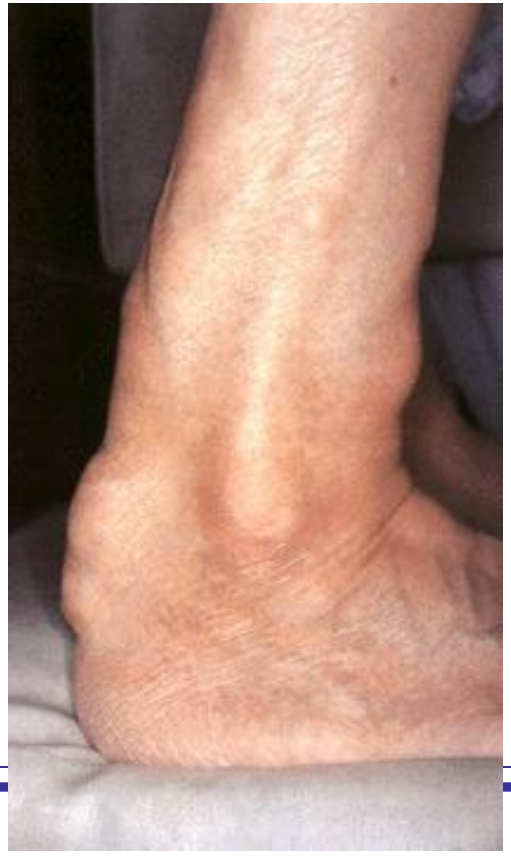


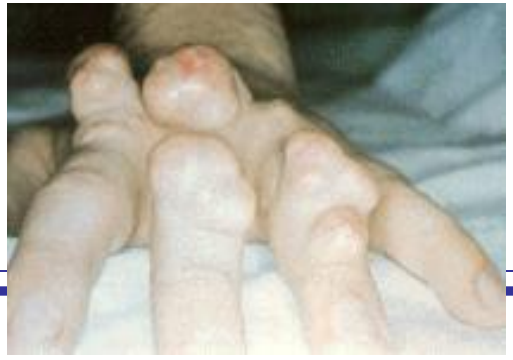


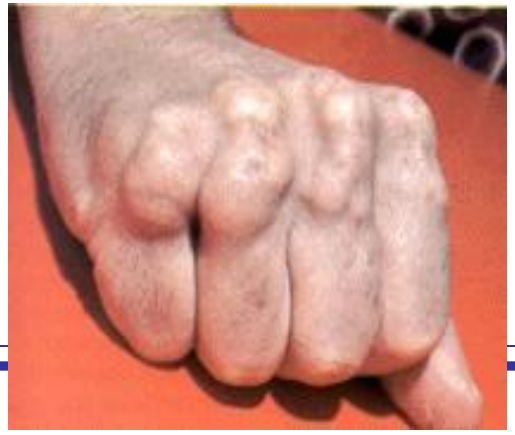












Diagnosis

- By using fasting lipoprotein profiles and measuring plasma levels (total cholesterol, TGs, Lipoproteins)

LIPID PROFILE

	DESIRABLE	BORDERLINE	HIGH RISK
Cholesterol	<200 mg/dl	200-239 mg/dl	240 mg/dl
Triglycerides	<150 mg/dl	150-199 mg/dl	200-499 mg/dl
HDL cholesterol	60 mg/dl	35-45 mg/dl	<35 mg/dl
LDL cholesterol	60-130 mg/dl	130-159 mg/dl	160-189 mg/dl
Cholesterol/ HDL ratio	4.0	5.0	6.0

The adult ranges for LDL cholesterol:

- Optimal: **100 to 129** mg/Dl
- Optimal: Less than **100 mg/dL** (This is the goal for people with **diabetes or heart disease.)**
- Borderline high: **130 to 159** mg/dL
- High: **160 to 189** mg/dL
- Very high: **190** mg/dL and higher

- **Practical WHO Approach (Primary Care)**
- Focus on overall cardiovascular risk, not lipids alone
- Combine with:
  - Blood pressure
  - Smoking status
  - Diabetes
- Use WHO risk charts (ISH charts)

Clinical Pearl

- WHO does not rely on a single lipid abnormality alone to define disease severity
- Management is risk-based, not just number-based

Determination of risk category:

- Establish LDL goal of therapy
- Determine need for therapeutic lifestyle changes (TLC)
- Determine level for drug consideration

Primary Prevention

Prevention of new onset.

Goal is to reduce risk factors:

- HT
- DM
- Smoking
- Obesity
- Physical inactivity

Primary prevention measures include:

- Reduce fat and cholesterol intake
- Increase physical activity
- Weight control

Secondary Prevention

By LDL-Lowering Therapy either by

1.Therapeutic Lifestyle Change-TLC ..or

2. Pharmacological therapy

Benefits:are reduction in the following:

- Total mortality
- Coronary mortality
- Major coronary events
- Coronary procedures
- Stroke

Dyslipidemia management:

Non-Pharmacologic Treatment

Therapeutic Lifestyle Change-TLC

- Smoking Cessation
- Physical Activity
- Weight Loss
- Dietary Modification

Therapeutic Lifestyle Change-TLC

Dietary Modification-TLC diet

- Reduce saturated and “trans” fats <**7%** of total calories from fat.
- Cholesterol <**200** mg/day
- Increase Fiber (**25g**/day) and complex carbohydrates intake.

Therapeutic Lifestyle Change-TLC

Dietary Modification-TLC diet

- Simple carbohydrates discouraged because insulin drives TG production in the liver
- Alcohol eliminate their intake.
- Dairy products and red meat are taken in moderation. In order to lower cholesterol level.

Dietary recommendations:

It is recommended that patients should

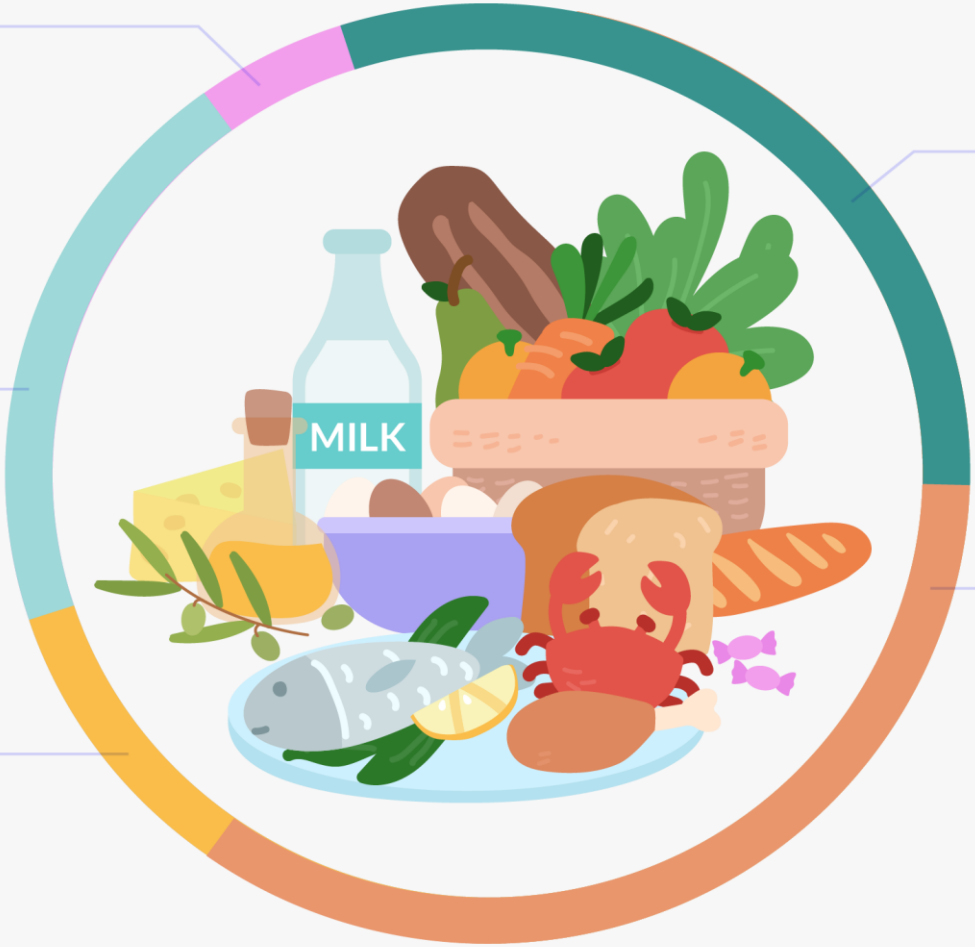
eat lean protein like fish, vegetables, nuts and fruits.

- eat in smaller portions.
- 3 months trial for all patients.

Mediterranean diet:

- Mediterranean diet is **a way of eating that's based on the traditional cuisines of Greece, Italy and other countries that border the Mediterranean Sea**.
- It is a heart-healthy, **well-balanced** way of eating that prioritizes vegetables, fruits, whole grains, legumes, lean proteins (particularly from fish), and healthy fats like extra virgin olive oil and nuts.

Mediterranean Diet



5%
Meats, Sweets

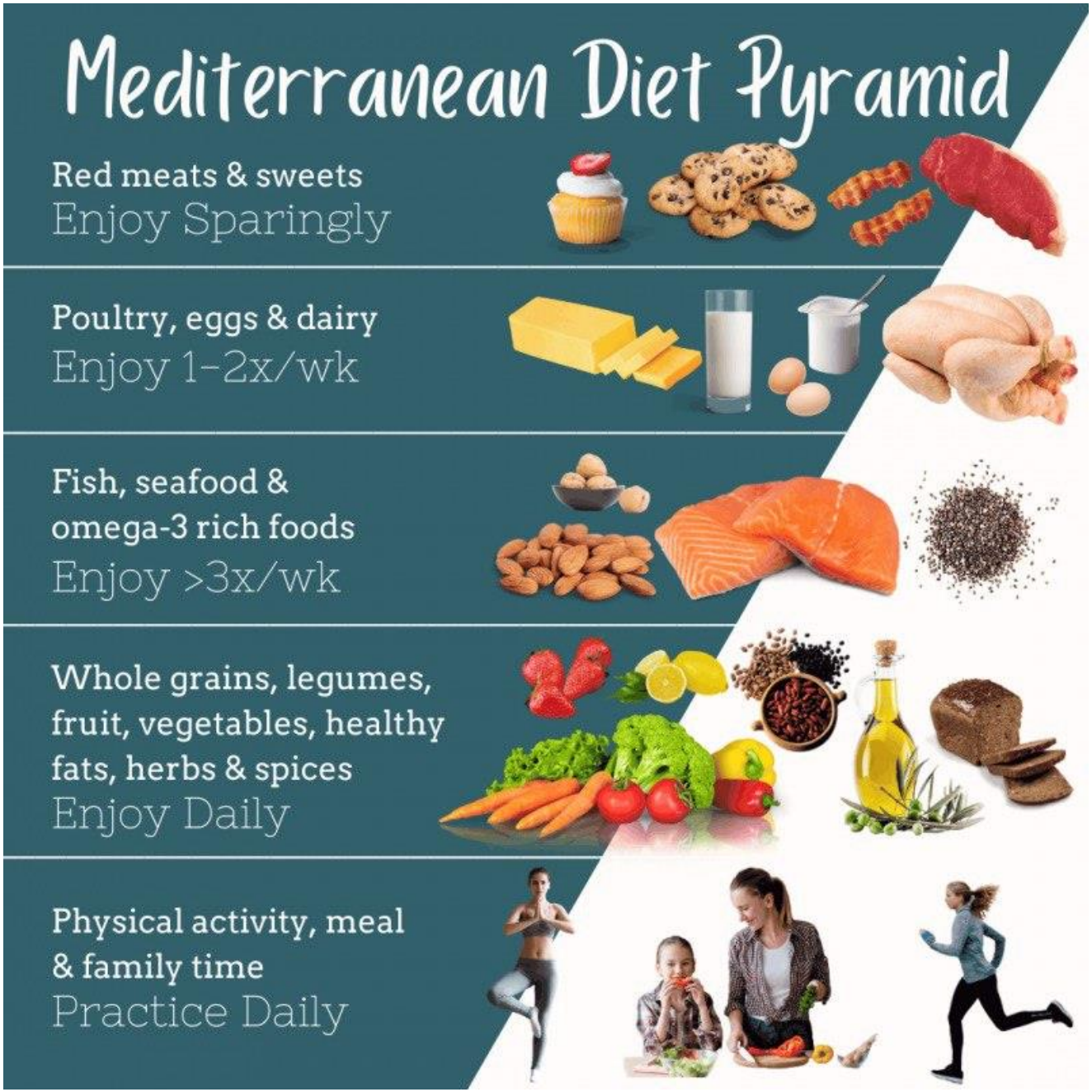
20%
Fish, Seafood, Poultry, Dairy Foods, Eggs

10%
Olive Oil

30%
Vegetables and Fruits

35%
Whole Grains, Pasta, Beans, Wholegrain Bread

Mediterranean Diet Pyramid



Food and additives

Certain foods and dietary additives are associated with modest reductions in plasma cholesterol levels. Plant stanol and sterol esters interfere with cholesterol absorption and reduce plasma LDL-C levels by 10% when taken regularly.

Dietary sources of Cholesterol

Type of Fat	Main Source	Effect on Cholesterol levels
Monounsaturated	Olives, olive oil, canola oil, peanut oil, cashews, almonds, peanuts and most other nuts; avocados	Lowers LDL, Raises HDL
Polyunsaturated	Corn, soybean, safflower and cottonseed oil; fish	Lowers LDL, Raises HDL
Saturated	Whole milk, butter, cheese, and ice cream; red meat; chocolate; coconuts, coconut milk, coconut oil , egg yolks, chicken skin	Raises both LDL and HDL
Trans	Most margarines; vegetable shortening; partially hydrogenated vegetable oil; deep-fried chips; many fast foods; most commercial baked goods	Raises LDL

Regular Exercise-

- Regular exercises help the patients in losing weight, improve the functions of their lungs and heart and to stabilize their blood pressure.
- Exercise to increase HDL

Cardioprotective affect

*

- If the patient is physically able, they are encouraged to take walk regularly and ride bicycles.
- Other activities like **Pilates**, **Yoga**, **Workout classes** and **weightlifting** are also suggested.
- **Exercise routines are adjusted to fit in the patient's ability level.**

- *If TLC are not effective or pts. are at high CV risk or extremely elevated LDL (>200mg/dl)

- Then TLC is applied **concurrently** with Pharmacological treatment.

PHARMACOLOGICAL INDICATION FOR DYSLIPIDEMIA

Indications:

1.Patients with CHD or risk factors even they have "average" LDL-C levels.

2.To reduce LDL-C to **<100** mg/dL in patients with established CHD

3.All patients with markedly elevated plasma levels of LDL-C levels **(>190 mg/dL)**

4.Plasma LDL-C levels between **130 and 190** mg/dL with The presence of other risk factors such as a low plasma level of HDL-C (**<40** mg/dL)


thank you!