Cardiovascular Disease

Objectives:
- Definition and public health significance of Cardiovascular Diseases (CVDs).
- Descriptive CVD Epidemiology.
- Risk factors, high risk groups and complications of CVDs.
- Screening strategies for CVDs.
- CVDs Prevention and control measures globally and in the local context.

Done by:
　　Team leaders: Khalid Aleisa & Ghada Alhadlaq
　　Team members: Abdulmalik Alhadlaq, Shatha Alghaihb & Moataz altokhais

Revised by: Basel almeflh

Important | Extra | Notes

Editing file

Introduction:

- Cardiovascular diseases comprise especially the major disorders of the heart and the arterial circulation supplying the heart, brain, and peripheral tissues.
- Evidence indicates that CVDs are already epidemic in low- and middle-income as well as high-income regions of the world and have become deep-rooted in most societies in recent decades.
- CVDs are leading causes of morbidity and mortality burdens worldwide.

## Public health significance of CVDs:

- They significantly contribute to morbidity and mortality rates: potential life years lost, common cause of premature death, and labor force (economic costs).
- According to the WHO, CVDs account for 31% of all global deaths.
- A major impact on life expectancy.
- Contributes to deterioration of the quality of life.
- They are a leading cause of mortality in developed countries and a rising tendency in developing countries (disease of civilization).

Cardiovascular Epidemiology:

1. Descriptive epidemiology:
   Describing distribution of CVDs by person (i.e., age, gender, ethnicity) time and place.

2. Analytic epidemiology:
   Analyzing relationships between CVDs and risk factors (which increase the probability of disease occurrence at population level), risk models, and multicausal developments.

3. Experimental epidemiology/Interventions:
   Strategies of CVD prevention (primordial, primary, secondary, tertiary; individual vs community levels).
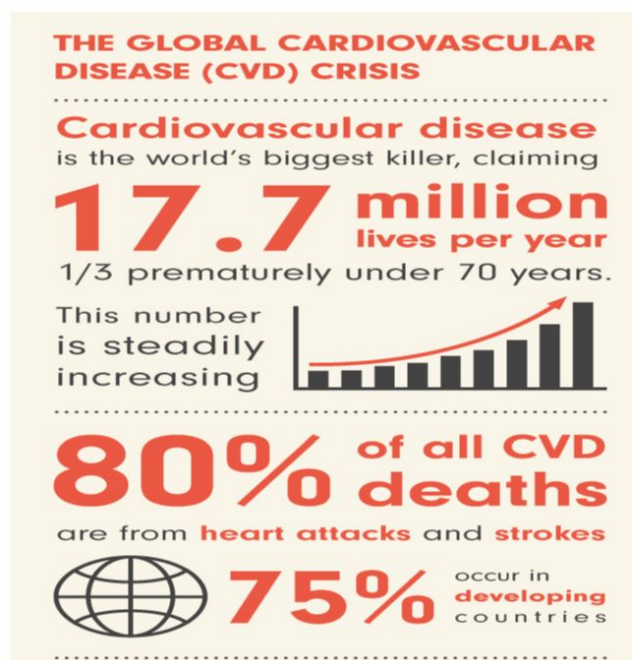
Descriptive epidemiology:

In 1980: CVD used to be the disease of developed country and that my refer to their longer life expectancy beside their lifestyle.
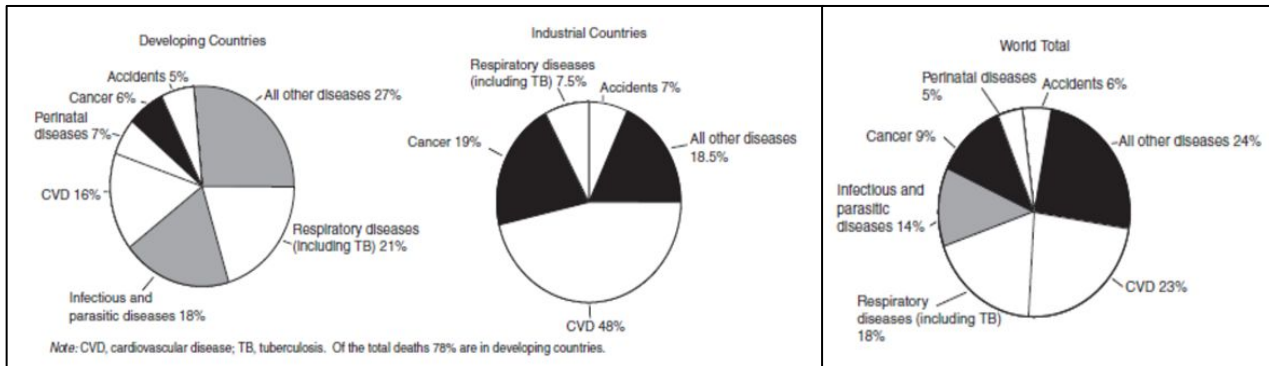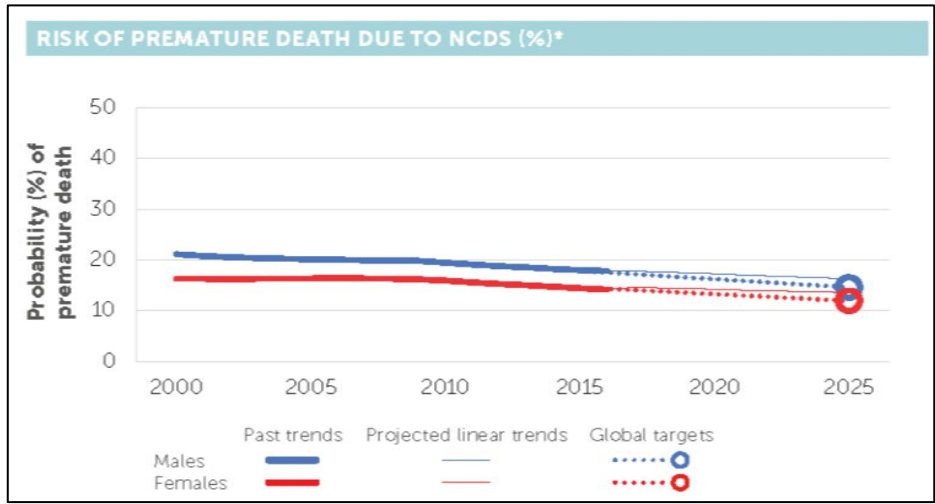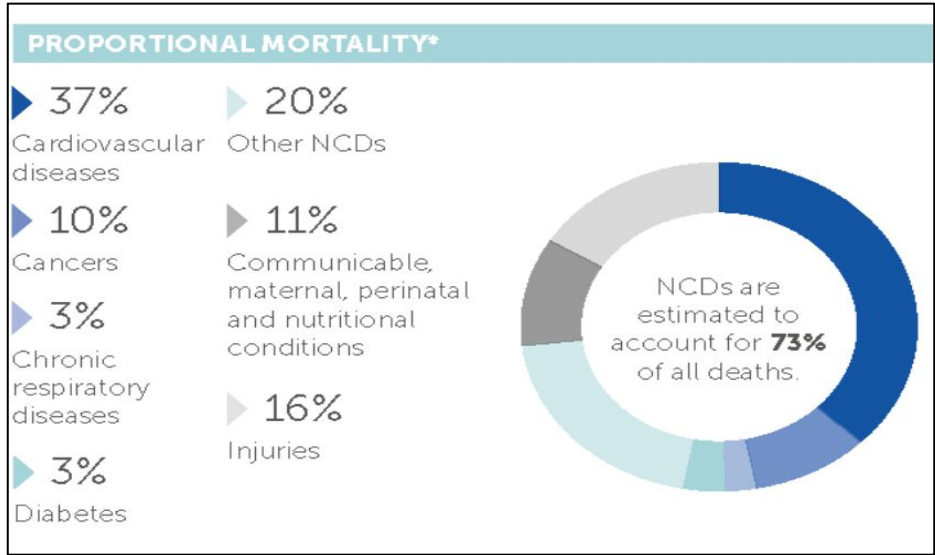

WHO 2019: Nowadays CVD is a global disease that affect everyone but some stats as the one below still shows that is more common in developing countries.

- CVDs are the number 1 cause of death globally.
- 17.9 million people die every year from CVDs (that's 31% of all global deaths)
- 1.1 billion adults have raised blood pressure and less than 1 in 5 have it under control.
  Why? Because HTN isn't controlled by medication only but it needs to modify your lifestyle and here in Saudi Arabia patients depend only on medications!
- Major risk factors contributing to CVDs are:
    - Tobacco use
    - Consumption of foods high in salt
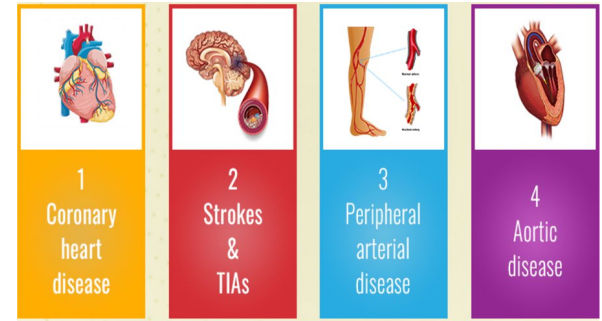   - High blood pressure

In Saudi Arabia 2018:

PROPORTIONAL MORTALITY*

▶ **37%** Cardiovascular diseases

▶ **20%** Other NCDs

▶ **10%** Cancers

▶ **11%** Communicable, maternal, perinatal and nutritional conditions

▶ **3%** Chronic respiratory diseases

▶ **16%** Injuries

▶ **3%** Diabetes

NCDs are estimated to account for **73%** of all deaths.

SELECTED ADULT RISK FACTOR TRENDS

CURRENT TOBACCO SMOKING

% of the population

2000 2005 2010 2015 2020 2025

OBESITY

% of the population

2000 2005 2010 2015 2020 2025

RAISED BLOOD PRESSURE

% of the population

2000 2005 2010 2015 2020 2025

Past trends   Projected linear trends   Global targets

Males
Females

RISK OF PREMATURE DEATH DUE TO NCDS (%)*

Probability (%) of premature death

2000   2005   2010   2015   2020   2025

Past trends   Projected linear trends   Global targets

Males
Females

Types of cardiovascular diseases (CVD):

1. Coronary heart disease(CHD):
   manifested by myocardial infarction (MI),
   angina pectoris, heart failure, and coronary death.
2. Cerebrovascular disease:
   manifested by stroke and transient ischemic attack (TIA).
3. Peripheral arterial disease:
   manifested by intermittent claudication.
4. Aortic disease:
   Aortic atherosclerosis and thoracic or abdominal aortic aneurysm.

Causes of CVD:

The exact cause of CVD isn't clear. But there are lots of things than can increase your risk of getting it. These are called "risk factors"

1) High blood pressure	2) Smoking	3) High cholestrol
4) Diabetes	5) Inactivity	6) Being overweight or obese
7) Family history of CVD	8) Ethnic background	9) Other risk factors

Risk factors of CVDs:

Risk factors fall into three broad categories:

1. Major risk factors:
   Research has shown that these factors significantly increase the risk of heart and blood vessel (cardiovascular) disease.

2. Modifiable risk factors:
   Some major risk factors can be modified, treated or controlled through medications or lifestyle change.

3. Contributing risk factors:
   These factors are associated with increased risk of cardiovascular disease, but their significance and prevalence haven't yet been determined.

1.   Major Risk Factors that can't be Modified:

a) Increasing age	The majority of people who die of coronary heart disease are 65 or older. (Men > 45 and Females >55).
b) Male gender	Men have a greater risk of heart attack than women do, and men have attacks earlier in life.
c) Heredity (including race)	Children of parents with heart disease are more likely to develop heart disease themselves. Family history of a premature MI (defined as MI before age 55 years in men and 65 years in women).

2. Major Risk Factors you can Modify, Treat or Control:

a) Tobacco Smoke:
- The risk that smokers will develop coronary heart disease is much higher than that for nonsmokers.
- Cigarette smoking is a powerful independent risk factor for sudden cardiac death in patients with coronary heart Disease.

- Causing:
  1. Mechanical damage of endothelium and atherosclerosis.
  2. Increase coagulability state as increase in fibrinogen level.
  3. Polycythaemia and so increase blood viscosity.
  4. Increase Low-density-lipoprotein (LDL), decrease high density-lipoprotein (HDL) and increase triglycerides.
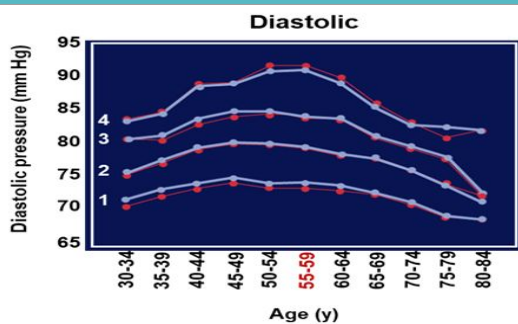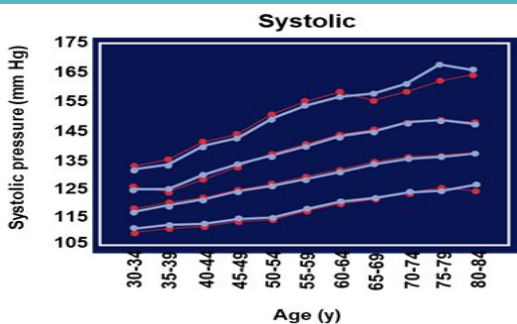
b) High Blood Cholesterol:
1. Low-density-lipoprotein (LDL) cholesterol = "bad" cholesterol:
   - A low LDL cholesterol level is considered good.
   - Lifestyle factors, such as a diet high in saturated and trans fats, can raise LDL cholesterol.

2. High-density-lipoprotein (HDL) cholesterol = "good" cholesterol:
   - Higher levels are typically better.
   - Low HDL cholesterol increases risk of heart disease.
   - Genetic factors, Type 2 diabetes, smoking, being overweight and being sedentary can all result in lower HDL cholesterol.

3. Triglycerides:
   - Triglycerides are the most common type of fat in the body.
   - A high triglyceride level combined with low HDL cholesterol or high LDL cholesterol is associated with atherosclerosis, which is the buildup of fatty deposits inside artery walls that increases the risk for heart attack and stroke.

c) Hypertension:
- High blood pressure increases the heart's workload, causing the heart muscle to thicken and become stiffer.
- Causing Mechanical damage of endothelium and atherosclerosis.
- When high blood pressure is present alongside obesity, smoking, high blood cholesterol levels or diabetes, the risk of heart attack or stroke increases even more.
- In patients <50 years of age, diastolic blood pressure was the strongest predictor of CHD risk.
- In patients ≥60 years of age, systolic pressure (pulse pressure) was the strongest predictor.

What happens to Blood Pressure with aging?	
Systolic pressure increases with age	Diastolic pressure increases with age but peaks between 55 and 60 years then starts to decrease.

Arterial stiffness is a cause of elevated systolic and lower diastolic pressure with aging.
- Systolic blood pressure and isolated systolic hypertension are major CHD risk factors at all ages and in both genders.
- The Framingham study found that the relative importance of systolic, diastolic, and pulse pressure (the difference between the systolic and diastolic blood pressures) changes with age.

As the Evidence showed that both systolic and diastolic are important in cases of hypertension especially in the age groups mentioned above! **Imp for MCQs and OSCE**

d) Physical Inactivity:
   ● An inactive lifestyle is a risk factor for coronary heart disease.
   ● Regular, moderate to vigorous physical activity helps reduce the risk of cardiovascular disease.
   ● Physical activity can help control blood cholesterol by ⬆ the good cholesterol (HDL)and ⬇ the bad one (LDL), diabetes and obesity. It can also help to lower blood pressure in some people.

VERY IMP to counsel the patient about the physical activity in **OSCE** (Don't forget!)

e) Obesity:
   ● People who have excess body fat – especially if a lot of it is at the waist (central obesity) – are more likely to develop heart disease and stroke, even if those same people have no other risk factors.

There are different ways for measuring, the standard one is BMI but the waist circumstance is becoming much more important as it detect central obesity which carry the highest risk for developing CVD (put in mind central obesity is very common in saudi population)

f) Diabetes
   ● Diabetes seriously increases your risk of developing cardiovascular disease.
   ● Even when glucose levels are under control, diabetes increases the risk of heart disease and stroke.
   ● The risks are even greater if blood sugar is not well-controlled.

Contributing Factors to Heart Disease Risk

These factors aren't 100% a cause of CVD but they may aggravate/worsen the problem.

a) Stress:
   ● Individual response to stress may be a contributing factor for heart attacks. Increase in adrenaline and blood pressure.

b) Alcohol:
   ● Drinking too much alcohol can raise blood pressure, and increase your risk for cardiomyopathy, stroke, cancer and other diseases.
   ● It can also contribute to high triglycerides, and produce irregular heartbeats.

c) Prothrombotic Markers:
- Homocystinaemia (more among smokers).
- High fibrinogen (more among smokers).

d) Proinflammatory Markers:
- High sensitive C-Reactive Protein.

The level of CRP is important as it can show the correlation of inflammation and CVD. The inflammation is related to endothelial injury (atherosclerosis). It's not established yet as if a high CRP is a risk for CVD but may be in the future.

Clinical Interpretation of hs-CRP (high sensitivity C-reactive protein) for CV risk prediction:
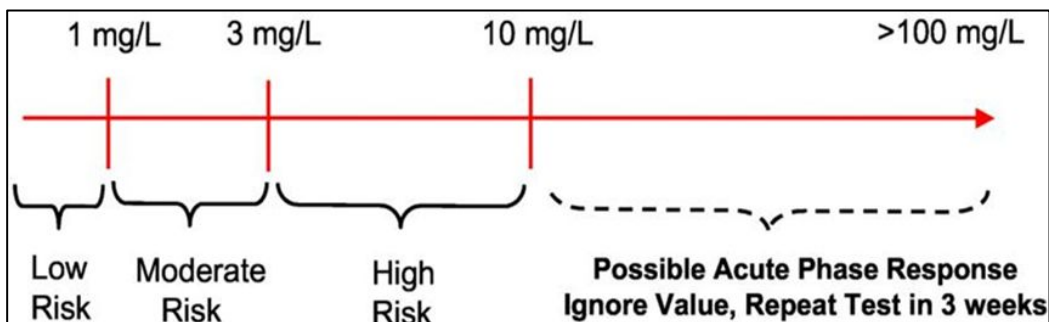
e) Microalbuminuria
- Microalbuminuria reflects vascular damage and appears to be a marker of early arterial disease.
- Urinary albumin excretion (UAE) between the ranges of (30-300 mg/day) -- is an indication of increased cardiovascular risk and endothelial dysfunction, and an independent marker for cardiovascular morbidity and mortality in individuals with and without diabetes.

MCQs: What's the most common/global/independent risk factor for CVD? **Hypertension!**

Screening strategies for CVDs

Primary purpose:	to identify patients whose prognosis could be improved with an intervention (in this case, medical therapy for risk factors or coronary heart disease [CHD]).

Screening & risk estimation:	• Screening for CHD should be distinguished from estimation of risk for CHD (or overall cardiovascular disease [CVD]).
	• By definition, both are performed in asymptomatic persons, and both aim to improve outcomes with interventions, if indicated.
	• However:
	  ➢ screening for CHD (or CVD) identifies existing disease. The patient already have the disease we screen to find it.
	  ➢ while estimating the risk of CHD (or CVD) does not directly identify existing disease but rather the likelihood of any future event related to CHD (or CVD). ex, estimating the risk for a 20 y/o male he does not have the disease at all but he may develop it in the future depending in his risk factors.
	MCQs: Very imp to distinguish between them!

Who to screen?	• Usually, most asymptomatic adults are not screened for CHD. • However, American Heart Association recommends nearly all patients aged 20 years or older without established CVD should undergo periodic cardiovascular risk assessment every three to five years. • (LDL) cholesterol and/or (HDL) cholesterol, glucose level, BP, life-style, …are required.

American Heart Association (AHA) and American College of Cardiology (ACC) pooled cohort hard CVD risk calculator (2013) (see next slide for an example);	
1. Age (validated only in patients 40 to 79 years of age)	5. Systolic blood pressure (mmHg)
2. Gender	6. Blood pressure treatment (yes or no)
3. Total cholesterol (mg/dL)	7. Diabetes mellitus (yes or no)
4. HDL cholesterol (mg/dL)	8. Current smoking (yes or no)

CVD risk calculator:

1. A 63-year-old man,
known case of HTN, on medication.
No history of Diabetes or smoking.
Risk assessment was done.
If Calculated Risk ≥7.5%, So considered high.
CV Risk Assessment:
10 year risk score is >7.5%, high due to ??
Hypertension

2. A 48-year-old man,
known case of hypertension, diabetes and smoker.
10 year risk score is shown.
As it is high >7.5% even reaching higher levels.
This patient should be given high intensity statin
and even Aspirin for primary prevention
beside Lifestyle modification and stop smoking.
Smoking is the main problem here and because the
high estimation risk we start the patient immediately
with aspirin and statin to prevent the occurence of
CVD.

➢ The same patient,
if non-smoker and his HDL-C is within accepted range,
10 year risk score will drop from 21.87 to 7.05%

Cardiovascular disease prevention

Programs from the American Heart Association that pr[...]
health metrics, including:

1. Not smoking.
2. Being physically active.
3. Having a normal blood pressure.
4. Having a normal blood glucose level.
5. Having a normal total cholesterol level.
6. Being normal weight.
7. Eating a healthy diet.

Preventing CVD

A healthy lifestyle can lower your risk of CVD. If you already have CVD, staying as healthy as possible can reduce the chances of it getting worse.

1 — Stop Smoking
2 — Have Balanced Diet
3 — Exercise Regularly
4 — Get Down on Alcohol
5 — Maintain a Quality Weight
6 — Medication
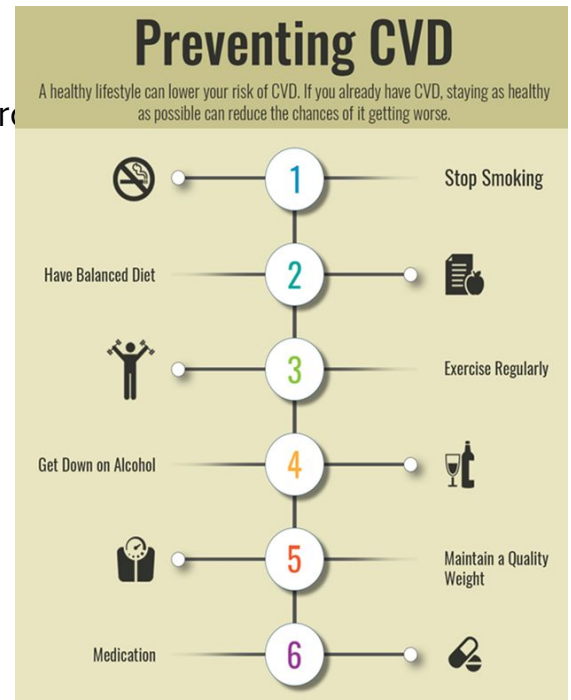
THE GLOBAL HEARTS INITIATIVE: Responding to the global cardiovascular disease crisis

An initiative to scale up national responses for prevention and management of cardiovascular diseases.

mpower — Technical package to defeat the global tobacco epidemic

SHAKE THE SALT HABIT — Technical package for salt reduction

HEARTS — Technical package for cardiovascular disease management in primary health care

In the 2030 Sustainable Development Agenda, governments have committed to step up action to reduce premature deaths from cardiovascular disease and other NCDs to improve health and promote development.

Counselling a patient at High Risk of CVD:

1. Start with estimating the risk of CVD.
2. Ask about family history of premature CVD. we ask first about non modifiable risk factors.
3. Always consider lifestyle modification: second step ask about modifiable risk factors.
   - Lifestyle modification including activities such as smoking cessation, increase in physical activity, or improvement in diet are of proven benefit and should be the primary interventions in all.

Very important to start gradually with the patient especially the difficult one we try to convince them to initially walk in the house or break the walk down. Then we encourage them to walk for 10 M continuously. **(OSCE)**

4. Encourage Exercise:	• Even moderate degree has a protective effect against CHD and all-cause mortality. • 150 minutes /week. • Exercise may have a variety of beneficial effects including an elevation in serum HDL cholesterol, a reduction in blood pressure, less insulin resistance, and weight loss. • Men who engaged in moderately vigorous sports activity have been reported to have a 23 % lower risk of death than those who were less active.
5. Smoking Cessation:	• Always ask about history of smoking. • Offer counselling to quit smoking.
6. Healthy Diet:	• Fruits and vegetables – There is growing evidence suggesting that fruit and vegetable consumption is inversely related to the risk of CHD and stroke. • Higher intake of red meat and high-fat dairy products has also been associated with higher risks of CHD. • Fiber – High fiber intake is also associated with a reduction in the risk of CHD and stroke compared with low fiber intake.
7. Use of Statins:	• Due to the evidence of benefit from statin therapy across a broad range of risk, we believe it is reasonable to start statin therapy in patients whose 10-year risk of CVD ≥7.5 percent. • Statin therapy lowers the risk of death by 15 to 20 percent and lowers the risk of nonfatal cardiovascular events by an even greater degree. • The reduction in major vascular events with statin therapy is directly proportional to the absolute reduction in LDL-C.

8. Control blood pressure

9. Control diabetes

10. Reduction of weight among obese and overweight persons?

11. Antiplatelet therapy
- For patients with established and stable atherosclerotic CVD, aspirin is recommended.
- Long-term antiplatelet therapy with aspirin reduces the risk of subsequent myocardial infarction (MI), stroke, and cardiovascular death among patients with a wide range of manifestations of occlusive CVD.
- In patients who are unable to take aspirin and in those with a history of gastrointestinal bleeding, clopidogrel is a reasonable alternative.

12. Antioxidant vitamins

- Antioxidant vitamins, the randomized evidence has not demonstrated clinical benefits on CVD in secondary or primary prevention regarding vitamin E and or vitamin C.

Conclusion:

1. Risk factors for CVD:
   Age, Gender, Smoking, Hypertension, Hypercholesterolaemia, Obesity, FH of premature CVD.

2. Contributing factors:
   High levels of Homocysteine, Fibrinogen, HSCRP and Microalbuminuria.

3. Prevention:
   Dealing with risk factors and importantly Life Style Modification

Summary

Cardiovascular Epidemiology:	
Descriptive epidemiology:	Describing distribution of CVDs by person (i.e., age, gender, ethnicity) time and place
Analytic epidemiology:	Analyzing relationships between CVDs and risk factors. risk models, and multicausal developments.
Experimental	epidemiology/Interventions: Strategies of CVD prevention (primordial, primary, secondary, tertiary; individual vs community levels).

Types of cardiovascular diseases (CVD):	
1- Coronary heart disease(CHD): manifested by myocardial infarction (MI), angina pectoris, heart failure, and coronary death.	2- Peripheral arterial disease: manifested by intermittent claudication.
3- Aortic disease: Aortic atherosclerosis and thoracic or abdominal aortic aneurysm	4- Cerebrovascular disease: manifested by stroke and transient ischemic attack (TIA).

Unmodifiable risk factors	
Increase age The majority of people who die of coronary heart disease are 65 or older. (Men > 45 and Females >55).	
Male gender	Heredity (including race)

Modifiable risk factors

Tobacco smoking Cause: 1. damage of endothelium and atherosclerosis 2. Increase coagulability and fibrinogen levels 3. Polycythaemia and increase blood viscosity 4. Increase LDL and triglyceride and decrease HDL	
High blood cholesterol	High triglyceride
Hypertension 1. High blood pressure increases the heart's workload, causing the heart muscle to thicken and become stiffer. 2. Causing Mechanical damage of endothelium and atherosclerosis.In patients <50 years of age, diastolic blood pressure was the strongest predictor of CHD risk. 3. In patients ≥60 years of age, systolic pressure (pulse pressure) was the strongest predictor.	
Physical activity : inactive=risk for coronary heart disease Regular active =reduce the risk of cvd	obesity
Diabetes	

Contributing factors to heart disease	
Stress: increase blood pressure	Alcohol: raise BP and triglyceride
Prothrombin markers: ● Homocystinaemia (more among smokers). ● High fibrinogen (more among smokers). Proinflammatory markers: High sensitive C-Reactive protein	Microalbuminuria: ● Microalbuminuria reflects vascular damage and appears to be a marker of early arterial disease. ● Urinary albumin excretion (UAE) ranges of (30-300 mg/day) -- is an indication of increased cardiovascular risk and endothelial dysfunction

Primary purpose:	to identify patients whose prognosis could be improved with an intervention (in this case, medical therapy for risk factors or coronary heart disease [CHD]).
Screening & risk estimation:	- Screening for CHD should be distinguished from estimation of risk for CHD (or overall cardiovascular disease [CVD]). - By definition, both are performed in asymptomatic persons, and both aim to improve outcomes with interventions, if indicated. - However: ➢ screening for CHD (or CVD) identifies existing disease. ➢ while estimating the risk of CHD (or CVD) does not directly identify existing disease but rather the likelihood of any future event related to CHD (or CVD).
Who to screen?	- Usually, most asymptomatic adults are not screened for CHD. - However, American Heart Association recommends nearly all patients aged 20 years or older without established CVD should undergo periodic cardiovascular risk assessment every three to five years. (LDL) cholesterol and/or (HDL) cholesterol, glucose level, BP, life-style, ...are required.

WHO:

CVD is number 1 cause of death globally (31% of all deaths)

Major risk factor contributing to CVD:

1. Tobacco
2. Consumption of food high in salt
3. High blood pressure

cardiovascular disease prevention			
Not smoking	Being physically active	Normal blood pressure	Normal blood glucose
Normal total cholesterol	Normal weight	Eating healthy diet	
Patients at high risk of CVD			
Exercise: 23% lower risk	Healthy diet: ● Higher intake of red meat and high-fat dairy products has also been associated with higher risks of CHD. ● Fiber – High fiber intake is also associated with a reduction in the risk of CHD and stroke compared with low fiber intake.		
Statins: Lower risk by 15-2-%	Antiplatelet therapy: For patients with established and stable atherosclerotic CVD, aspirin is recommended. ● Long-term antiplatelet therapy with aspirin reduces the risk of subsequent myocardial infarction (MI), stroke, and cardiovascular death among patients with a wide range of manifestations of occlusive CVD. ● In patients who are unable to take aspirin and in those with a history of gastrointestinal bleeding, clopidogrel is a reasonable alternative.		

Conclusion:

1. Risk factors for CVD:
   Age, Gender, Smoking, Hypertension, Hypercholesterolaemia, Obesity, FH of premature CVD.

2. Contributing factors:
   High levels of Homocysteine, Fibrinogen, HSCRP and Microalbuminuria.

3. Prevention:
   Dealing with risk factors and importantly Life Style Modification

Q: WHO and FAO recommend which of the following aiming to decrease

CVD by:

A-- Decrease diet fibers

B-- Decrease monounsaturated fatty acid

C-Decrease polyunsaturated fatty acid

D-Decrease trans fatty acid

Answer:D

Good luck!