Diet, nutrition and cardio vascular diseases

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Introduction

- The diets people eat, in all their cultural variety, define to a large extent people’s health, growth and development.

- Risk behaviors, such as tobacco use and physical inactivity, modify the result for better or worse.
Introduction

- All this takes place in a social, cultural, political and economic environment that can aggravate the health of populations unless active measures are taken to make the environment a health-promoting one.
Introduction

- **The second half of the 20th century** has witnessed major shifts in the pattern of disease, in addition to marked improvements in life expectancy.

- **This period is characterized by profound changes in diet and lifestyles** which in turn have contributed to an epidemic of non-communicable diseases.
Introduction

- This epidemic is now emerging, and even accelerating, in most developing countries, while infections and nutritional deficiencies are receding as leading contributors to death and disability.
Introduction

- In developing countries, the effect of the nutrition transition and the concomitant rise in the prevalence of cardiovascular diseases will be to widen the mismatch between health care needs and resources.

- Already scarce resources will be stretched ever more thinly.
Introduction

- Because **unbalanced diets, obesity and physical inactivity** all contribute to heart disease, addressing these, along with tobacco use, can help to stem the epidemic.

- A large measure of success in this area has already been demonstrated in many industrialized countries.
The “lag-time” effect of risk factors for CVD means that present mortality rates are the consequence of previous exposure to behavioral risk factors such as:

- inappropriate nutrition,
- insufficient physical activity,
- increased tobacco consumption.
Diet, physical activity and cardiovascular disease

- **Biological factors contributing principally to increased risk:**
  - Overweight,
  - Central obesity,
  - High blood pressure,
  - Dys-lipidaemia,
  - Diabetes,
  - Low cardio-respiratory fitness
Diet, physical activity and cardiovascular disease

Unhealthy dietary practices include:

- The high consumption of saturated fats, salt and refined carbohydrates,
- Low consumption of fruits and vegetables, and these tend to cluster together.
Fatty acids and dietary cholesterol

The relationship between dietary fats and CVD, especially coronary heart disease, has been extensively investigated, with strong and consistent associations emerging from a wide body of evidence accrued from:

- animal experiments,
- observational studies,
- clinical trials
- metabolic studies conducted in diverse human populations
Fatty acids and dietary cholesterol

- **Saturated fatty acids** raise total and low-density lipoprotein (LDL) cholesterol, but individual fatty acids within this group, have different effects.

- **Myristic and palmitic acids** have the greatest effect and are abundant in diets rich in *dairy products and meat*.

- **Stearic acid** has not been shown to elevate blood cholesterol and is rapidly converted to oleic acid in vivo.
Fatty acids and dietary cholesterol

- The most effective replacement for saturated fatty acids in terms of coronary heart disease outcome are polyunsaturated fatty acids, especially linoleic acid.

- This finding is supported by the results of several large randomized clinical trials, in which replacement of saturated and trans fatty acids by polyunsaturated vegetable oils lowered coronary heart disease risk.
Fatty acids and dietary cholesterol

- **Partial hydrogenation**, the process used to increase shelf-life of polyunsaturated fatty acids (PUFAs):
  - creates trans fatty acids (geometrical isomers that adapt a saturated fatty acid-like configuration.) and also
  - removes the critical double bonds in essential fatty acids necessary for the action.
Fatty acids and dietary cholesterol

- Metabolic studies have demonstrated that trans fatty acids render the plasma lipid profile even more atherogenic than saturated fatty acids, by not only elevating LDL cholesterol to similar levels but also by decreasing high density lipoprotein (HDL) cholesterol.
Fatty acids and dietary cholesterol

Several large cohort studies have found that intake of trans fatty acids increases the risk of coronary heart disease.
Fatty acids and dietary cholesterol

- Most trans fatty acids are contributed by industrially hardened oils.

- Even though trans fatty acids have been reduced or eliminated from retail fats and spreads in many parts of the world, deep-fried fast foods and baked goods are a major and increasing source.
Fatty acids and dietary cholesterol

- When substituted for saturated fatty acids in metabolic studies, both monounsaturated fatty acids and n-6 polyunsaturated fatty acids lower plasma total and LDL cholesterol concentrations.
Fatty acids and dietary cholesterol

- The only nutritionally important monounsaturated fatty acids is oleic acid, which is abundant in olive and canola oils and also in nuts.

- The most important polyunsaturated fatty acid is linoleic acid, which is abundant especially in soybean and sunflower oils.
Fatty acids and dietary cholesterol

- The most important n-3 PUFAs are two acids found in fatty fish, and α-linolenic acid found in plant foods.
Fatty acids and dietary cholesterol

The biological effects of n-3 PUFAs are wide ranging, involving:

- lipids and lipoproteins,
- blood pressure,
- cardiac function,
- arterial compliance,
- endothelial function,
- vascular reactivity and cardiac electrophysiology,
- as well as potent anti-platelet and anti-inflammatory effects.
Fatty acids and dietary cholesterol

- The very long chain n-3 PUFAs powerfully lower serum triglycerides but they raise serum LDL cholesterol.

- Therefore, their effect on coronary heart disease is probably mediated through pathways other than serum cholesterol.
Fatty acids and dietary cholesterol

- Cholesterol in the blood and tissues is derived from **two sources**: diet and endogenous synthesis.

- **Dairy fat and meat** are major dietary sources.

- **Egg yolk** is particularly rich in cholesterol but unlike dairy products and meat does not provide saturated fatty acids.
Fatty acids and dietary cholesterol

- Although dietary cholesterol raises plasma cholesterol levels, observational evidence for an association of dietary cholesterol intake with CVD is contradictory.

- There is no requirement for dietary cholesterol and it is advisable to keep the intake as low as possible.

- If intake of dairy fat and meat are controlled, there is no need to severely restrict egg yolk intake, although some limitation remains prudent.
Dietary fibre

- Dietary fibres is a heterogeneous mixture of **polysaccharides** and **lignin** that cannot be degraded by the endogenous enzymes of vertebrate animals.

- **Water-soluble fibres** include pectin’s, gums, mucilage’s and some hemicelluloses.

- **Insoluble fibres** include cellulose and other hemicelluloses.
Dietary fibre

- Most fibres reduce plasma total and LDL cholesterol, as reported by several trials.

- Several large cohort studies carried out in different countries have reported that a high fibre diet as well as a diet high in whole grain cereals lowers the risk of coronary heart disease.
Sodium and potassium

- High blood pressure is a major risk factor for coronary heart disease and both forms of stroke (ischaemic and haemorrhagic).

- Of the many risk factors associated with high blood pressure, the dietary exposure that has been most investigated is daily sodium intake.

- It has been studied extensively in animal experimental models, in epidemiological studies, controlled clinical trials and in population studies on restricted sodium intake.
Sodium and potassium

- Sodium intake is directly associated with blood pressure.

- A difference in sodium intake of 100 mmol per day was associated with average differences in systolic blood pressure of 5 mmHg at age 15–19 years and 10 mmHg at age 60–69 years.

- Diastolic blood pressures are reduced by about half as much, but the association increases with age and magnitude of the initial blood pressure.
Sodium and potassium

- It was estimated that a universal reduction in dietary intake of sodium by 50 mol per day would lead to:
  - 50% reduction in the number of people requiring antihypertensive therapy,
  - 22% reduction in the number of deaths resulting from strokes
  - 16% reduction in the number of deaths from coronary heart disease.
Sodium and potassium

- The first prospective study using 24-hour urine collections for measuring sodium intake, (which is the only reliable measure), demonstrated a positive relationship between an increased risk of acute coronary events, but not stroke events, and increased sodium excretion.

- The association was strongest among overweight men.
Sodium and potassium

- A meta-analysis of randomized controlled trials showed that potassium supplements reduced mean blood pressures (systolic/diastolic) by 1.8/1.0 mmHg in normo-tensive subjects and 4.4/2.5 mmHg in hypertensive subjects.

- Several large cohort studies have found an inverse association between potassium intake and risk of stroke.
Sodium and potassium

- While potassium supplements have been shown to have protective effects on blood pressure and cardiovascular diseases, there is no evidence to suggest that long-term potassium supplements should be administered to reduce the risk for CVD.

- The recommended levels of fruit and vegetable consumption assure an adequate intake of potassium.
Food items and food groups

fruits and vegetables:

- While the consumption of fruits and vegetables has been widely believed to promote good health, evidence related to their protective effect against CVD has only been presented in recent years.

- Numerous ecological and prospective studies have reported a significant protective association for coronary heart disease and stroke with consumption of fruits and vegetables.
Fish consumption:

- Fish consumption is associated with a reduced risk of coronary heart disease.

- It was estimated that in high-risk populations, an optimum fish consumption of 40--60 g per day would lead to approximately a 50% reduction in death from coronary heart disease.
Food items and food groups

- In another trial mortality was reduced by 29% in survivors of a first myocardial infarction in persons receiving advice to consume fatty fish at least twice a week.

- A recent study based on data from 36 countries, reported that fish consumption is associated with a reduced risk of death from all causes as well as CVD mortality.
Several large epidemiological studies have demonstrated that frequent consumption of nuts was associated with decreased risk of coronary heart disease.

Most of these studies considered nuts as a group, combining many different types of nuts.
Food items and food groups

- Nuts are high in unsaturated fatty acids and low in saturated fats, and contribute to cholesterol lowering by altering the fatty acid profile of the diet as a whole.

- However, because of the high energy content of nuts, advice to include them in the diet must be tempered in accordance with the desired energy balance.
Food items and food groups

Boiled, unfiltered coffee:

- It raises total and LDL cholesterol because coffee beans contain a terpenoid lipid called cafestol.

- The amount of cafestol in the cup depends on the brewing method: it is zero for paper-filtered drip coffee, and high in the unfiltered coffee still widely drunk.
Food items and food groups

- In Greece, the Middle East and Turkey. Intake of large amounts of unfiltered coffee markedly raises serum cholesterol and has been associated with coronary heart disease.

- A shift from unfiltered, boiled coffee to filtered coffee has contributed significantly to the decline in serum cholesterol in Finland.
Disease-specific recommendations

Measures aimed at reducing the risk of CVD:

- Dietary intake of fats strongly influences the risk of cardiovascular diseases such as coronary heart disease and stroke, through:
  - effects on blood lipids,
  - thrombosis,
  - blood pressure,
  - arterial (endothelial) function,
  - arrhythmogenesis and inflammation.
Disease-specific recommendations

Measures aimed at reducing the risk of CVD (cont.):

- However, the qualitative composition of fats in the diet has a significant role to play in modifying this risk.
Measures aimed at reducing the risk of CVD (cont.):

- The evidence shows that intake of saturated fatty acids is directly related to cardiovascular risk.
- The traditional target is to restrict the intake of saturated fatty acids to less than 10%, of daily energy intake and less than 7% for high-risk groups.
- If populations are consuming less than 10%, they should not increase that level of intake.
Measures aimed at reducing the risk of CVD:

- To promote cardiovascular health, diets should provide a very low intake of trans fatty acids (hydrogenated oils and fats) or better avoiding their use in cooking and manufacture of food products,

- Limiting the intake of fat from dairy and meat sources,
Measures aimed at reducing the risk of CVD:

- using appropriate edible vegetable oils in small amounts,
- ensuring a regular intake of fish (one to two times per week) or plant sources of a-linolenic acid.
- Preference should be given to food preparation practices that employ non-frying methods.
Measures aimed at reducing the risk of CVD:

**Fruits and vegetables**

- Fruits and vegetables contribute to cardiovascular health through the variety of **phyto-nutrients, potassium** and **fibre** that they contain.
Measures aimed at reducing the risk of CVD:

- **Daily intake of fresh fruit and vegetables** (including berries, green leafy and cruciferous vegetables and legumes), in an **adequate quantity** (400--500 g per day), is recommended to reduce the risk of coronary heart disease, stroke and high blood pressure.
Measures aimed at reducing the risk of CVD:

**Sodium**

- Dietary intake of sodium, from all sources, influences blood pressure levels in populations and should be limited so as to reduce the risk of coronary heart disease and both forms of stroke.

- Current evidence suggests that an intake of no more than 70 mmol or 1.7 g of sodium per day is beneficial in reducing blood pressure.
Measures aimed at reducing the risk of CVD:

- The special situation of individuals (i.e. pregnant women and non-acclimated people who perform strenuous physical activity in hot environments) who may be adversely affected by sodium reduction needs to be kept in mind.
Measures aimed at reducing the risk of CVD:

- Restricting daily salt (sodium chloride) intake to less than 5 g per day. This should take into account total sodium intake from all dietary sources, for example additives such as monosodium glutamate and preservatives.

- Use of potassium-enriched low-sodium substitutes is one way to reduce sodium intake.
Measures aimed at reducing the risk of CVD:

- The need to adjust salt iodization, depending on observed sodium intake and surveillance of iodine status of the population, should be recognized.
Measures aimed at reducing the risk of CVD:

**Potassium**

- **Adequate dietary intake** of potassium lowers blood pressure and is protective against stroke and cardiac arrhythmias.

- Potassium intake should be at a level which will keep the sodium to potassium ratio close to 1.0, i.e. a daily potassium intake level of 70--80 mmol per day.

- This may be achieved through adequate daily consumption of fruits and vegetables.
Measures aimed at reducing the risk of CVD:

**Dietary fibre**

- Fibre is protective against coronary heart disease and has also been used in diets to lower blood pressure.

- Adequate intake may be achieved through fruits, vegetables and whole grain cereals.
Measures aimed at reducing the risk of CVD:

Fish

- Regular fish consumption (1-2 servings per week) is protective against coronary heart disease and ischaemic stroke and is recommended.

- People who are vegetarians are recommended to ensure adequate intake of plant sources of α-linolenic acid.
Measures aimed at reducing the risk of CVD:

Alcohol

- Although regular low to moderate consumption of alcohol is protective against coronary heart disease, other cardiovascular and health risks associated with alcohol do not favor a general recommendation for its use.
Measures aimed at reducing the risk of CVD:

- **Physical activity** is related to the risk of cardiovascular diseases, especially coronary heart disease, in a consistent inverse dose--response fashion when either volume or intensity are used for assessment.

- These relationships **apply to both incidence and mortality rates from all cardiovascular diseases and from coronary heart disease.**
Measures aimed at reducing the risk of CVD

- The current recommendation of at least 30 minutes of at least moderate-intensity physical activity on most days of the week is considered sufficient.

- A higher volume or intensity of activity would confer a greater protective effect.
Measures aimed at reducing the risk of CVD:

- The recommended amount of physical activity is **sufficient to raise cardio-respiratory fitness** to the level that has been shown to be related to decreased risk of cardiovascular disease.

- Individuals who are **unaccustomed to regular exercise** or have a high-risk profile for **CVD** should avoid sudden and high-intensity bursts of physical activity.
Thank you