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Pattern and significance of blood lipids

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Triglycerides, phospholipids and cholesterol are the major lipids transported in the human plasma. The functions of triglycerides are energy storage, mostly in the adipose tissue: phospholipids are integral components of all cell membranes while cholesterol is essential for biosynthesis of cell membranes, steroid hormones and bile synthesis. Lipids circulate in blood into spheric particles called lipoproteins. In addition to lipids, lipoproteins include proteins (called apoproteins) which enable the lipids to be soluble in blood and add specific identity features to the particles and subsequent metabolic specificity. These lipoproteins may be classified into four major classes: chylomicrons and very low density lipoproteins (VLDL) characterized by a high triglycerides content ("triglycerides-rich-lipoproteins") and low density lipoproteins (LDL) and high density lipoproteins (HDL) characterized by a high cholesterol content "cholesterol-rich-lipoproteins".

Chylomicrons are synthesized in the intestine cells and transport the alimentary fats to the adipose and muscle cells and to the liver. VLDL are synthesized in the liver and transport the endogenous fats to the adipocytes (fat or lipid storage cells located throughout the body) and muscle cells. LDL mostly arise as metabolic products of VLDL (as VLDL triglycerides are given out along) and bring cholesterol to the peripheral cells. HDL are essential for the reverse transport of cholesterol from the peripheral cells (particularly from the arterial wall).

Plasma lipid and lipoprotein levels are markedly influenced by intrinsic factors such as age, gender and genetic inherited traits, as well as by modifiable factors such as diet, body weight and physical activity. Furthermore, hyperlipidemia can be secondary to several diseases (i.e., hypothyroidism, diabetes mellitus, obstructive liver disease, etc.).

Cholesterol and its lipoprotein carriers play a key role in the origin and the progression of atherosclerosis. Atherosclerosis consist of arterial lesions resulting in a progressive thickening of the arterial wall and subsequent narrowing (stenosis) of the lumen. Insufficient blood (and oxygen) supply in target organs results as a consequence (ischemia). The development of the atherosclerotic lesions in the arterial wall is progressive and asymptomatic during decades until symptomatic ischemic complications occur. Coronary heart disease (angina pectoris, myocardial infarction, acute cardiac death), cerebrovascular disease (stroke) and peripheral occlusive disease are the most common clinical ischemic manifestations of the atherosclerotic vascular stenosis.

Clinical and epidemiological studies have shown a close relation between the extent and severity of coronary atherosclerosis and serum cholesterol or LDL-cholesterol. In contrast, high levels of HDL-cholesterol are associated with a low incidence of coronary heart disease. Thus, the opposing influence of total cholesterol and HDL-cholesterol have led to use the ratio total cholesterol/HDL-cholesterol as a better predictor of coronary heart disease risk.

The coexistence of hypercholesterolemia, hypertension and cigarette smoking results in a multiplicative risk of developing cardiovascular disease.

In the last decades, clinical trials in humans have demonstrated that reduction of high cholesterol levels using diet or drug therapy subsequently decreases the incidence of cardiovascular diseases and may cause regression of the atherosclerotic stenoses. Since atherogenic cardiovascular diseases are on the rise and lipid disorders not uncommon in the Seychelles, it is thus mandatory to elaborate definite guidelines regarding lipid disorders and their treatment in the Seychelles.

Workshops

Detection, evaluation and treatment of blood lipid disorders

Cardiovascular diseases (CVD) are an important cause of premature morbidity and mortality and have appeared to be now of major concern in the Seychelles. The Seychelles Cardiovascular Diseases Survey provided the opportunity to gain a population based knowledge on the prevalence of hypercholesterolemia, a major risk factor for CVD. Most of the results of the survey are presented above (see Tables 22–34 and Figures 25–37). Reduction of hypercholesterolemia is aimed

at reducing premature morbidity consecutive to cardiovascular disease and will involve both mass and individual strategies.

Distribution

Total cholesterol. Total cholesterol levels appeared to be in a favorable range for both men and women. As much as 61% of men and 53% of women had a cholesterol level smaller than 5.2 mmol/l (low risk range) while only 9% of men and 15% of women had cholesterol levels greater than 6.5 mmol/l (high risk range). Thirty percent of men and 32% of women had values between 5.2 and 6.5 mmol/l and may be considered to be at increased risk for cardiovascular disease. These cholesterol levels are among the lowest in comparison with the industrialized countries which have participated to the WHO MONICA Project. However, these values are much higher than those observed in China, raising the question of a possible recent increase of cholesterol levels in the Seychelles population, possibly related to the recent obvious improvement in the local socio-economical status.

HDL-cholesterol. Cholesterol contained in the high-density lipoproteins (HDL-cholesterol) is known to be inversely and independently correlated to ischemic heart disease (IHD). In Seychelles, HDL-cholesterol appear to be in a favorable range (mean values of 1.4 mmol/l for both men and women aged 25–64). Less than 10% of men and women had HDL-cholesterol levels smaller than 0.9 mmol/l (increased risk range).

Atherogenic index. The calculated ratio obtained by dividing total cholesterol by HDL-cholesterol is called the "atherogenic index". An atherogenic index greater than 6.5 and smaller than 8 defines subjects with "increased risk" of developing IHD, while values greater than 8 are considered to characterize "high-risk" subjects. Only 4% of men and 5% of women had an atherogenic index greater than 6.5.

Recommendations. In overall, lipid levels found in the Seychelles stand in favorable ranges. In regard to major cardiovascular risk factors, hypercholesterolemia is found much less frequently than hypertension and cigarette smoking (respectively 12%, 22% and 32% for population aged 25–64). However, the highly increased risk of developing IHD when risk factors are cumulated necessitates the definitions of guidelines to apply to a minority of "high-risk" individuals while a "mass strategy" should be carried out in order to maintain the population lipid pattern in its present favorable range.

Blood lipid values

The above mentioned cut-off values indicating "moderate", "increased" or "high" risk of developing IHD are widely accepted in all industrialized countries, despite the fact that they are somewhat arbitrary. These values should therefore be considered in Seychelles as well. However, consecutive practical attitude regarding such cut-off values are to be balanced with the local epidemiological findings (i.e., a rather low incidence of IHD in Seychelles) and by the fact that the extent of the specific relation between IHD and lipid disorders has not yet been specifically addressed in Seychelles.

Recommendations. Blood lipids (cholesterol, HDL-cholesterol and triglycerides) should therefore be systematically required for all new cases of IHD in order to gain knowledge on the relation between IHD and dyslipidemias in the Seychelles.
Affiliation of the laboratory of Victoria to a reference center should be considered for maintaining accuracy and comparability of lipid values. Mass strategy and individual strategies are discussed below.

Mass strategy

Lipid disorders are not frequent in the Seychelles but the possibility of a present transition from favorable to less favorable levels of lipids in the Seychelles, related to recent socio-economic changes, should be considered. Thus attention should be brought to ensure that cholesterol level at the population scale does not increase in the near future.

Recommendations. The corner stone of a mass strategy should be based on diet advice:

1. The traditionally high fish consumption should be encouraged because of the scientific evidence that fish consumption is related with favorable effects on blood lipid pattern (related to a high content of non-saturated fats). As meat does not bring such a benefit (because of its high content in saturated fats, thus inducing an increase of blood cholesterol), the present European- and tourist-influenced trend to replace fish by meat should not be encouraged. Chicken is low in fats and therefore not detrimental in regard to blood cholesterol level and cardiovascular risk.
2. A high consumption of fats is common in the Seychelles, most of the regularly used fats and oils being rich in saturated fatty acids. While saturated fats increase blood choles-

terol levels, mono- or poly-unsaturated fats lower blood cholesterol levels and should be therefore preferred. Measures to promote the consumption of such oils have been discussed in the workshop devoted to a healthier lifestyle.

3. Fruit and vegetables rich in fibres contribute to lower blood cholesterol (among other benefits for health). Local fruit and vegetables are presently not so commonly consumed and should therefore be encouraged to be part of the usual daily diet.
4. Eggs are very rich in cholesterol. Not more than 2–3 eggs should be eaten per week. The hotel- and European-influenced trend to eat more eggs should not be encouraged.
5. Obesity is closely related to hypercholesterolemia (as well as to other cardiovascular risk factors such as hypertension and diabetes) and emphasis should be brought to the public attention in order to avoid this deleterious condition, affecting as much as one third of Seychellois women. A reduction of the traditionally high fat amount used for cooking should be promoted as a general measure aimed to reduce excess caloric intake.

These population-directed general recommendations will naturally apply as elementary rules for diet therapy in individuals found to have hypercholesterolemia.

Individual strategy

Theoretically, knowledge of one's own blood cholesterol level would be advisable for all adult subjects as would be knowledge of one's blood pressure. Such a statement is however not to be now recommended in the Seychelles because of an expected low benefit/cost ratio of such an attempt due to the demonstrated low prevalence of hypercholesterolemia in Seychelles and taking in account restricted facilities availability. Moreover, no definite case of familial hypercholesterolemia has been isolated in the Survey sample nor clearly demonstrated in local medical practice, pulling off the need of an early screening of such high-risk subjects in a large scale.

High cholesterol level is a demonstrated major risk factor for IHD, which is in turn a major cause of premature death. The risk of cardiovascular disease is moreover much higher when other cardiovascular risk factors are present. Case-finding of individuals with hypercholesterolemia associated with other conditions predisposing to cardiovascular disease is thus mandatory.

Recommendations. Recommendations for detection and therapy of hypercholesterolemia applying to high-risk individuals are summarized in Figure 46. It should be remembered that each 1% reduction of total cholesterol results approximately in a 2% reduction of the IHD risk.

Diet therapy should be the cornerstone of care of all hypercholesterolemic patients. Whenever present, obesity should be reduced. Basic principles for diet therapy have been mentioned in the "mass strategy" section. The concomitant help of a dietician is often required to ensure an optimal effect of this inexpensive therapy. A 10% reduction of total cholesterol may be expected by an adequate and realistic regimen. Hypocholesterolemic drugs are very effective and as much as 40% reduction of total cholesterol may be achieved by monotherapy. As most of these drugs are quite expensive (about 3 Seychelles rupees per day per patient) and treatment needs to be taken life-long, special attention should be paid to the selection of patients to benefit these drugs. These patients should at least have shown compliance to a previous 6-months diet therapy.