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Review Article

An Update on Risk Factors for Coronary Heart Disease and Dietary Recommendations for Treatment and Prevention

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I N F O

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A B S T R A C T

Globally, cardiovascular disease (CVD) is the number one cause of death and disability. Knowing the CVD risk factors could provide crucial insights into how to handle this major public health issue and comprehend its genesis. Many clinical illnesses are linked to autonomic imbalance, which is defined by an overactive sympathetic and an underactive parasympathetic nervous system. Many hereditary and behavioural variables influence the likelihood of getting coronary heart disease (CHD). The CHD threat issues have an idiopathic origin, which suggests that the illness may pass down through generations as a result of genetic variance. Two further probable causes of CHD include autonomic dysfunction and the Omega-3 Index. Although dietary modification is a key component of CVD prevention, the implementation of nutrition science in clinical practice is constrained due to a dearth of formal education in the discipline. The precise elements of a heart-healthy diet, scientifically supported dietary recommendations, the effect of nutrition on the management and prevention of CVD risk factors are all subjects covered in this article. Its objective is to update the body of information on these emerging approaches (in vitro, translational, animal, clinical) and to explain the rationale behind their possible use in the treatment of CAD. These novel therapeutics have the potential to successfully replace current therapeutic modalities. Our report provides significant updates on the ongoing scientific and medical work being done around the world.

Keywords: Coronary Heart Disease, Idiopathic Cause, Autonomic Imbalance, Diet, Omega-3 Index, Therapy

Introduction

People worldwide are experiencing increasing disability and are dying from coronary heart disease (CHD).[1,2] The world's biggest cause of death still is CHD.[3,4] The key threat issues for CHD include total cholesterol-TC, Low-density lipoprotein (LDL-C), High-density lipoprotein (HDL-C), as well as hypertension, smoking, diabetes, blood sugar levels. Other elements that affect CHD risk include Estrogen Replacement Therapy (ERT), left ventricular hypertrophy, obesity, a family history of early CHD.[5]

Many variables might increase one's chance of getting CHD, some of which are influenced by both genetics and lifestyle choices.[6,7] Many scientific investigations have discovered genetic polymorphisms substantially associated with CHD, they can account for 30%–60% of the difference in risk. Some techniques have been established for the pre-detection of genetic risk burden employing a variety of loci that can identify persons who are more at risk for incident CHD in big databases of epidemiological cohorts.[8–15] A multilocus genetic risk score has not yet been definitively demonstrated to be independently associated with recurrent CHD events, however, a few specific individual variants have been investigated for an association with recurrent occurrences in isolated investigations.[16–20]

This information in this study relates to the following:

- Risk factor prediction based on gender for coronary heart disease
- Diet and lifestyle that must be followed in order to prevent coronary heart disease
- Recent advancements in techniques in treating coronary heart disease

Epidemiology

CHD is the main reason for increasing death rates worldwide.[21,22] The risk of getting CHD in women is 33% which is less when compared to men which is 50% as per a survey conducted for both men and women who were 40 years old.[23] Regarding the percentage of risk factors that lead to CHD, the contribution of risk factors varies between men and women. In recent decades, the death rate has decreased in places like North America and Western Europe.[24] There is a similar mortality rate among men and women, according to reports on mortality.[25] A study that included 997 women (15% of the study population) also revealed that death rate trends are more positive in women than in men. However, there is disagreement on mortality because a drop in mortality was seen following 5.2 years of significant research.[26] Study results, however, revealed that the first group of patients treated with lovastatin did not see a decrease in the incidence of hospitalisation as compared to those who suffered a myocardial infarction, suggesting a major breakthrough in medical care and a slight decrease in the risk of cardiac arrest. [27] Furthermore, by lowering medicine avoidance in the first place, data from the World Health Organisation will allow for the profitable study of trends and causes in high-risk patients. When the MONICA project began, it was discovered that completely eliminating the incidence of this high-density cholesterol (HDL) allowed for a drop in the mortality rate of serious heart arrest.[28–30]

It is necessary to conduct more research to identify the dietary modifications that are most practical from an economic, social, logistical standpoint. The public health priority of improving diet can significantly lower cardiovascular disease (CVD) morbidity and mortality at the population level. Clinicians must be aware of the most recent dietary recommendations in order to provide evidence-based nutritional counselling to patients who are at high risk for CVD. Therefore, modification and prevention of risk factors are helpful in order to stay away from CHD.

Omega-3 Index: An Up-to-date Peril Agent

Generally speaking, n-3 and n-6 are the two main types of polyunsaturated fatty acids (PUFAs). Double bonds are believed to start at location 6th from the CH-methyl end of omega 6, while the "Ω3 series" has double bonds that begin at position three. n-6 PUFAs are in charge of producing inflammatory mediators, whereas n-3 polyunsaturated fatty acids generate uncertain or anti-inflammatory signalling molecules. The phospholipids found in cell membranes contain arachidonic acid, a 6 PUFA that is crucial for the body's eicosanoids to be produced. PUFAs are a family, but depending on whether they come from plants or animals, they have different levels of potency. The three most significant and extensively studied PUFAs are Docosa Hexaenoic Acid (DHA), Eicosa Pentaenoic Acid (EPA), Alpha-Linolenic Acid (ALA).

Although a diet low in omega-3 FAs is linked to an elevated risk of mortality and CHD,[31,32] assessing a person's Ω3 intake is not a good way to gauge how much Ω3 is present in their body because Ω3 concentrations vary among food categories, as well as among different kinds of fish and vegetables. Other factors that could affect the blood levels of omega-3 FAs after ingesting a meal high in omega-3 FAs include the heterogeneity of the uptake of ingested EPA and DHA as well as the variance in bioavailability across people (the levels of EPA and DHA in lean and pregnant women were compared to those in obese and pregnant women[33]).

The risk of CHD death rate was inversely correlated with the Omega-3 Index. The greatest cardioprotection was shown to be related to an Omega-3 Index of 8%, while the least was found to be associated with an index of 4%.[34] The Omega-3 Index is an odd, functionally similar, easily variable, unusual tool that serves as the primary risk factor

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for fatal CHD. However, research suggests that it may be highly conceptually beneficial in reducing CHD.[35]Three omega FAs decrease TG-rich lipoproteins and enhance anti-aggregatory and vasodilatory prostanoids like prostacyclin to avoid vasospasm and thrombosis. By integrating it into the mitochondria and plasma membranes, stabilising them, preventing oxidation, it is believed to contribute to the prevention of arrhythmias. Moreover, "3 omega FAs" have been demonstrated to suppress the activation of the nuclear factor-B and ikappa B kinase as well as a number of other transcription factors that inhibit reactive oxygen species, along with lower proinflammatory cytokines like interleukin-6 and tumour necrosis factor.[36,37] They serve as building blocks for the creation of specific mediators that can lower inflammation.

Compared to direct anti-inflammatory treatments, anti-inflammatory qualities of omega-3 FAs were thought to lessen interference with self-protection. These pathways are thought to work in concert to provide the CVD protection linked to omega-3 FA consumption as well as the additional benefit on numerous other systems and diseases.[38] Table 1 shows the various agents that are an obstacle in the path of a healthy life.

Table 1.Men and Women's Peril Agents

Peril Agents	Men	Women
Low-density lipoprotein (LDL)	√√√	√√√
Total cholesterol levels (TC)	√√√√	√√√√
High-density lipoprotein (HDL)	√√	√√√
Thyroglobulin (TG)	√	√√
Apolipoprotein AI (Apo A-I)	√√√√	√√√√
Apolipoprotein B (Apo-B)	√√√√	√√√√
Apolipoprotein (a) Apo (a)	√√	√√
Diabetes	√√√	√√√√
Smoking	√√√	√√√
Obesity	-	-
Body mass index (BMI)	√√√	√√√
Waist hip ratio (WHR)	√√√√	√√√√
Hypertension	√√	√√
Hormones	_	√√
Family history/ idiopathic cause	√√	√√√
Homocysteine	√	√
Fibrinogen	√√	√√
Inflammation	√	√√
Psychological factors	√	√
Helicobacter pylori infection and *Chlamydia pneumoniae*	–	–

Single tick (√): Low, Double tick (√√): Moderate, Triple tick (√√√): High, Four ticks (√√√√): Highest/ greatest

Perfect Diet for a Healthy Life

The manifestation of diseases caused by environmental factors is fortunately mostly avoidable because these factors are controllable. One of the main factors currently connected to a variety of ailments, including diabetes, is diet. A key factor affecting human health is the type and quantity of food ingested. Diet, which can be either diet-only, diet-plus-oral hypoglycaemic medicines or diet-plus-insulin, is a crucial part of managing diabetes holistically.[39–41] Diets are tailored to each individual based on factors such as weight, age, gender, health, occupation, etc.

Both healthy nutrition and health require a balanced diet. It protects us from many chronic, non-communicable diseases, like diabetes, cancer, heart disease.[42,43] A balanced diet that excludes excessive amounts of salt, sugar, saturated fat, trans fats is necessary for good health.[44–46]

The dietary guidelines that were employed in this review are a group of advisory statements that offer rapid dietary advice for the population's treatment of cardiovascular issues in an effort to enhance general nutritional well-being and cholesterol control and avoid or lower LDL levels.

Dietary Recommendations for the Management of Cardiovascular Disease

A significant part in managing heart failure can be played by certain foods because they lower blood cholesterol levels. Consuming meals that shield against the consequences of heart and renal disease is also very important.[47]

The chief diet foods that can significantly contribute to controlling the condition are as follows:

Leafy Vegetables

Figure 1.Green Leafy Vegetables

While being very nutrient-dense, green, leafy vegetables (Figure 1) are low in calories. They have a significant impact on metabolic regulation as well because they are low in digestible carbohydrates.[48]

The dietary information for 100 g of leafy greens is as follows:[49]

Water - 91%
Calories - 23 kcal

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Protein - 2.9 g
Fibre - 2.2 g
Sugar - 0.4 g
Carbohydrates - 3.6 g
Fat - 0.4 g

Cinnamon

Figure 2.Cinnamon

Cinnamon (Figure 2) has a reputation for being a powerful antioxidant as well as a diabetes-controlling agent. Several carefully conducted studies have shown that cinnamon can lower blood lipid levels and enhance immune response. Cassia cinnamon should, however, only be consumed in amounts no greater than a teaspoon per day because this type of cinnamon contains coumarin, higher doses of which may have negative health effects. Ceylon cinnamon, on the other hand, does not have a lot of coumarins.

100 g of cinnamon has the following nutritional value:[49]

Sodium - 10 mg
Fibre - 1.2 g
Sugar - 2.2 g
Carbohydrates - 81 g
Protein - 4 g
Potassium - 431 mg
Calories - 247 kcal

Fatty Fish

Figure 3.Fish

Salmon, sardines, mackerel can all be eaten by the populace suffering from CVD. These oily fish (Figure 3) are excellent providers of omega-3 fatty acids, DHA (docosahexaenoic acid) and EPA (Eicosapentaenoic acid), which have significant heart health advantages. Increasing these fats in the diet may be especially beneficial for diabetics, who have a higher risk of heart disease.

100 g of fatty fish has the following nutritional value:[49]

Fat - 12.5 g
Calories - 280 kcal
Carbohydrates - 0 g
Sugar - 0 g
Sodium - 86 mg
Fibre - 0 g
Protein - 39.2 g

Chia Seeds

Figure 4.Chia Seeds

Chia seeds (Figure 4) have a high fibre content but have fewer easily absorbed carbohydrates. The viscous fibre present in these seeds reduces blood lipid levels. It accomplishes this by reducing the speed at which food passes through the intestines and is digested.

The nutritional information of 100 g of chia seeds is as follows:

Fat - 8.7 g
Carbohydrates - 12 g
Fibre - 9.8 g
Protein - 4.7 g
Sugar - 0 g
Calories - 138 kcal
Sodium - 5 mg

Greek Yoghurt

Figure 5.Greek Yoghurt

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Greek yoghurt (Figure 5) can help in cardiovascular maintenance through a healthy reduction in blood cholesterol and triglyceride levels, which in turn, lowers their chance of developing heart disease.

155 g of Greek yoghurt has the following nutritional constituents:

Vitamin B_{12} - 1.2 mcg
Potassium - 220 mg
Protein - 16.1 g
Carbohydrates - 5.68 g
Sodium - 56.2 mg
Fat - 0.265 g
Calories - 92 kcal
Sugar - 5.1 g
Calcium - 111 mg
Vitamin B_6 - 0.1 mg

Flaxseeds

Insoluble fibre made up of lignans is present in flaxseeds (Figure 6), also referred to as alsi in India. It improves blood sugar management and lowers the risk of heart disease.

Figure 6.Flaxseeds

The dietary information for 1 tablespoon (10 g) of flaxseeds is as follows:

Fat - 4.3 g
Carbohydrates - 3 g
Calories - 55 kcal
Protein - 1.9 g
Sugar - 0.2 g
Fibre - 2.8 g
Sodium - 3.1 mg

Nuts

Figure 7.Nuts

It is well known that all nuts (Figure 7) contain fibre, although quantities vary, they are low in digestible fibre. Consuming nuts of all varieties can lower HbA1c and lessen inflammation, according to research. Additionally, it can reduce LDL cholesterol and blood sugar levels.

The nutrition information for 100 g of nuts is:

Carbohydrate - 21 g
Fat - 54 g
Protein - 20 g
Saturated fat - 9 g
Sodium - 273 mg
Potassium - 632 mg
Dietary fibre - 7 g
Sugar - 4.2 g
Calories - 607 kcal

For those with CVD issues, a low-fat vegetarian diet that includes portions of fruits, vegetables, grains, legumes, but no animal products, has benefits. A study showed that 43% of the vegan group experienced significant improvement in cardiovascular problems.[47] The American Diabetes Association's (ADA) advice is the foundation of the vegan diet. Among those who continued on their lipid-lowering medication regimens, the vegan group also had higher reductions in total and LDL cholesterol.[50,51] Figure 8 shows the association of diet with CVD.

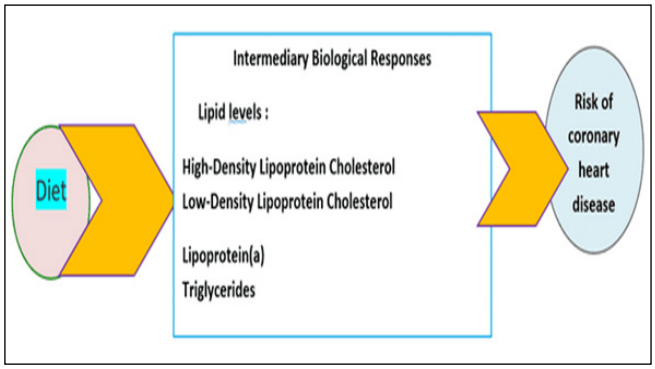

Figure 8.Prevention of Cardiovascular Disease through a Nutritional Diet

Recent Advancements in Treating Coronary Heart Disease

Over the past ten years, the application of robotic technology in cardiovascular medicine has grown to include interventional cardiology, percutaneous coronary procedures, peripheral vascular interventions. Research and technology are advancing day by day.[52] Over the years, many advanced instruments and techniques have been developed for diagnosing several diseases. Along with this, scientists have developed several novel techniques like the use of artificial intelligence for detecting the threat of CHD.

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Robotics

Over the past few years, robots have been used rapidly in industries.[53] Their use in the medical field started during the time when we were hit by the pandemic i.e., novel coronavirus. Robots are self-learning because their designs allow them to automatically respond correctly in certain situations. Medical students are taught a variety of therapies and surgical procedures with the use of robotic technology. They can practice various procedures on robots without having to worry about accidentally hurting a real patient. Robotic machines can mimic breathing, dilation of the pupils, birthing, beating of the heart. These tools are used by students to practice taking vital signs, inserting IVs, giving birth.

The current state of robotic surgery for the treatment of CAD is encouraging. These devices have top-notch technology and are of exceptional quality. Enhanced patient recovery times and shorter hospital stays are a few of their various advantages, which also include improved precision, increased visibility, improved ergonomics, lower radiation exposure (Figure 9).

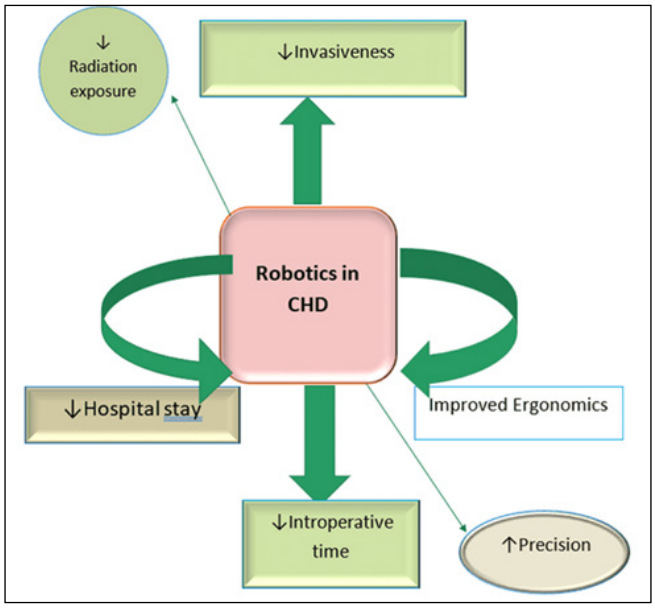

Figure 9.Potential Advantages of Robotics in the Treatment of CHD

Several sectors related to life sciences have come up and are developing many advanced strategies for the early detection of the risk of CHD. They include nanobiotechnology, 3D printing, drugs, stem cells.[54–59]

Conclusion

This article provides updated information on the risk factors for coronary heart disease, new developments in this area, the recommended diet for the disease. Maintaining a balanced diet and getting enough nutrients and minerals we need each day keeps us in good health. Early detection of CHD makes it much easier to take the essential precautions to prevent its progress. It is crucial to provide CVD patients with continuing, active, effective dietary guidance in order to prevent the development of the complications of CVD. Also, individuals must be provided with the resources necessary to control their weight, make better dietary choices, develop healthy eating routines. With the advancement and development of robotic technologies, a new era in interventional cardiology has also begun. Robotically assisted percutaneous coronary intervention (PCI) is a safe method with outcomes commensurate to those obtained by a manual method. Though it should always be remembered that "prevention is better than treatment", with consistent, ongoing research, the future of CAD therapy seems to be highly hopeful.

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