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A review on prevalence, causes, preventions, and treatments of coronary artery disease

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ABSTRACT

Background: Coronary artery diseases (CAD) is a disorder of the heart and the blood vessels, which claimed 17.1 million lives a year worldwide (World Health Organization, 2010). Men and women may develop CAD at the age of 40. Men were reported more prone to get CAD than women. However, more women than men died from CAD. Coronary heart disease (CHD) was having the high prevalence died rate in the US general population. In the United States of America (USA), for example, CAD is the leading cause of death in adults, accounting for approximately one-third of all deaths in subjects over the age of 35-years. Atherosclerosis increases the risk of getting CAD. **Objective:** To identify studies that report prevalence, causes, preventions, and treatments of coronary artery disease. **Design and data sources:** Systematic review with searches in several articles related to prevalence, causes, prevention, and treatment of CAD. Data were collected through interviews, clinical examinations, laboratory tests, electrocardiograms, previous medical history of patients and Pose chest pain questionnaire. **Results:** The prevalence rate of Cad is high is various countries especially reported in US. The primary cause of CAD is atherosclerosis. Primary and secondary prevention of Cad can be used to reduce CAD incidences. **Conclusion:** CAD is the major public health problem worldwide. CAD is the leading cause of death in people. People must have the awareness toward the causes and prevention of CAD. Atherosclerosis is the primary cause of the CAD. In most cases, patients with ESRD have more than a 10-fold increased risk for CHD death per 1000 person-years than a patient with five Framingham risk factors projected over time. Preventions and treatments that could be taken are primary and secondary prevention of CAD, medication, and lifestyle changes, which includes following plant-based nutrition, exercise, drugs consumptions and cardiac catheterization.

Key words: Causes, coronary artery disease, prevalence, preventions, treatments

INTRODUCTION

Coronary artery diseases (CAD) are known as the disorders of the heart and the blood vessels, which claimed 17.1 million lives a year worldwide (World Health Organization, 2010).[1-3] The lifetime risk of developing CAD at the age of 40 is 50% for men and 33% for women.[4] However, more women than men died from CAD.[2,5] Coronary heart disease (CHD) is the leading cause of death in the US general population.[5,6] In the United States, almost in every 34 s, someone dies from the diseases, and each year there are 6 million hospitalizations accounting for near $300 billion health-care cost due to the diseases.[1] In the United States of America (USA), for example, CAD is the leading cause of death in adults, accounting for approximately one-third of all deaths in subjects over the age of 35-years. Hence, emphasis on its primary as well as secondary prevention was given great attention by health authorities in western countries.[7]

CHD remains one of the leading causes of death in the United States, accounting for approximately 17% of overall national health-care expenditures.[8] The overall prevalence of CAD in Kingdom of Saudi Arabia (KSA) is 5.5%, a figure midway to those reported from other countries. Classical risk factors for CAD, namely, older age, male gender, overweight, hypertension, current smoking, diabetes mellitus, hypertriglyceridemia, and hypercholesterolemia are important risk factors in Saudi population.[7] In Scotland, mortality from CHD is very high in both sexes' and shows considerable geographical variation.[9] Nearly 50% deaths due to CAD in Ireland.[10,11]

The CADs can play a crucial medicolegal role to decide the cause of sudden death whether natural or unnatural.[10] Getting at the root cause of CAD requires a different approach. CAD begins with progressive endothelial injury, inflammatory oxidative stress, diminution of nitric oxide production, foam cell formation, and development of plaques that may rupture to cause a myocardial infarction (MI) or stroke.[12] Cardiovascular disease, including heart disease and stroke, is the leading cause of death worldwide, including low-income and middle-income countries. Dietary saturated fat increase serum cholesterol, which in turn leads to coronary atherosclerosis.[13] Atherosclerosis, the primary cause of cardiovascular diseases, affects the medium and large arteries due to the buildup of fat, cholesterol, and other substances on the inner walls of arteries. The atherosclerotic CHD causes chest pain, shortness of breath, heart attack, and other symptoms. Other major risk factors contributing to cardiovascular diseases

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include heredity, high blood pressure,[3] diabetes,[3] obesity, high blood cholesterol level,[1] hypercholesterolemia, diabetes, and smoking.[14,15] Several factors account for the increasing burden of cardiovascular diseases, including a longer average lifespan, decreased physical activity, increased consumption of unhealthful foods,[16] and psychosocial factors such as socioeconomic status and factors (e.g., drug therapy).[15]

In some case, the majority of the patients with end-stage renal disease (ESRD) have anatomic CAD. The patients with ESRD have more than a 10-fold increased risk for CHD death per 1000 person-years than a patient with five Framingham risk factors projected over time. More than 320,000 patients with ESRD that requires dialysis or kidney transplantation in the United States, half will die from cardiovascular causes, and patients with milder degrees of CKD are more likely to die of CAD than to develop kidney failure that requires renal replacement therapy.[6]

The causes and prevention of heart disease have been studied for years, and new information is emerging. Primary and secondary prevention of CAD seeks to achieve a reasonable balance among three factors: Efficacy, safety, and costs of intervention. The need for this balance pertains especially in the clinical setting, where professional and financial resources are constrained. The place of clinical management in primary prevention, in contrast to secondary prevention, remains to be clearly defined. Two functions of clinical involvement nonetheless can be visualized. First, by promoting healthier life habits, clinicians link the public health strategy to individuals; and second, by instituting specific risk-reducing therapies, clinicians move secondary prevention strategies across the boundary into high-risk primary prevention.[17] Secondary prevention in CAD is a major task to improve the prognosis of patients with cardiovascular disease.[18]

For the last several decades, saturated fat and cholesterol have been thought to be major contributors to CAD, and therefore, people are typically advised to strictly limit these in their diet.[13] Studies have shown that blood cholesterol level increases of even 1% can put someone at a 2% higher risk of heart disease.[19] Limiting dietary cholesterol can be quite difficult, depending on an individual's typical diet. For example, one large egg contains approximately 186 mg of cholesterol (NDL/FNIC Food Composition Database Home Page). This is over half of the recommended daily intake of 300 mg for a healthy person, and almost the entire amount (200 mg) recommended for someone at high risk for heart disease. Higher the concentrations of HDL cholesterol in comparison to LDL cholesterol have been shown to lower a person's risk for heart disease. Therefore, simply lowering overall cholesterol may not be the most effective approach to reducing risk of cardiovascular disease, unless LDL and HDL serum cholesterol levels are at a good ratio already.[19] Food may be the most important lifestyle factor in establishing the presence or absence of disease plant-based nutrition may prevent, halt, and reverse CAD.[12,20] Follow a plant-based nutrition not only can prevent CAD but also prevent diabetes and high blood pressure.[12,20] When foods that injure or cause endothelium dysfunction are avoided, the body readily restores the capacity of endothelial tissue to produce nitric oxide. Such change reduces production of vasoconstriction of endothelin and thromboxane by injured endothelial cells. Our insistence on daily ingestion of generous portions of green leafy vegetables favors an improved population of endothelial progenitor cells. Thus, this is a safety, diminished expense and prompt, powerful, and persistent results in treating the cause of vascular disease by whole-food plant-based nutrition offer a paradigm shift from existing practice.[12,20]

Depending on a person's genetics, diet may or may not be an important factor in preventing heart disease. Exercise is also beneficial for everyone in preventing heart disease. One study showed that women who exercise about 30 minutes a day at moderate intensity were able to significantly lower their risk of heart disease, up to 40% in some cases.[19] Although a healthy diet, physical exercise, and avoiding smoking can effectively prevent cardiovascular diseases, combined medications with statin drugs to reduce blood cholesterol and the drugs to lower blood pressure are required to lighten the burden of the diseases.[1,3]

One of the first acts of the National Heart Institute, later renamed the National Heart, Lung, and Blood Institute (NHLBI), was to establish the Framingham Heart Study in 1948, which involved the close collaboration of professionals from three disciplines: Clinical cardiology, biostatistics, and epidemiology. Their goal was to understand how heart disease developed by studying the lifestyles of the residents of Framingham, Massachusetts. The first description of their findings, "factors of risk in the development of CHD," indicated that elevations in blood pressure and cholesterol levels were associated with an increased incidence of ischemic heart disease and acute MI. The institution by the NHLBI of national programs to educate clinicians and the public about the importance of controlling these risk factors have contributed to dramatic improvements in age-adjusted cardiac death rates. Increasingly large multicenter clinical trials subsequently showed that both primary and secondary prevention was possible when steps were taken to lower blood pressure and serum total cholesterol. Fortunately, drugs to reduce these risk factors safely became available as a result of a series of productive collaborations between industry and academic medicine. In 1976, cardiologists were able to open acutely occluded coronary arteries by intracoronary infusion of the fibrinolytic agent streptokinase. Cardiac catheterization, the initial technique of balloon angioplasty was followed by the insertion of bare metal stents, and today, drug-eluting stents are used to prevent coronary restenosis. Obstructions in the heart and circulation can now be successfully opened, and abnormal openings successfully closed, in the catheterization laboratory.[16]

Based on studies in animals showing the benefits of angiotensin-converting enzyme inhibitors in experimentally induced MI, the survival and ventricular enlargement trial showed that long-term administration of these inhibitors reduced mortality among patients with left ventricular dysfunction after infarction. The use of beta-adrenergic blockers and aldosterone blockers in these patients further reduced mortality.[16]

MATERIALS AND METHODS

Systemic Literature Search

A systemic literature search was conducted to identify the causes, prevention, and treatment of CAD. Apart from these articles that focus on studies on several causes mainly atherosclerosis will increase the risk of heart disease and to prevent or treat CAD, medication with lifestyle change and cardiac catheterization will do help.

Study Selection

Studies in primary care, outpatient, community settings, and hospital settings were included. Randomized controlled trials, controlled before and after studies, observational studies were appropriate for inclusion.

Complete articles were retrieved for further assessment if the information given suggestions of that study:

1. Include patients with CHD/cardiovascular disease/heart disease.
2. Patients who are having atherosclerosis.
3. Patients with ESRD.
4. Patients with diabetes.
5. Patients with hyperlipidemia.
6. Patients whom are heart disease and following plant-based nutrition.
7. Aimed at patients as well as health-care providers.
8. Used a design as described in the inclusion criteria for study design.

Data Collection

All trials identified for inclusion were independently assessed. Trial quality was assessed and the extracted data were required. Researchers were not blinded about information on authors and journals. Data were collected through interviews, clinical examinations, laboratory tests, electrocardiograms, previous medical history of patients, and Rose chest pain questionnaire. The quality of an individual trial was assessed by randomization selection of sample, intentional to treat analysis. Quality assessment was done individually by every individual researcher by scoring on these questions where answers were compared afterward. The extracted data were entered into a structured Excel sheet. Studies with comparable interventions were grouped and the results were synthesized in a narrative way.

RESULT

From the studies, the prevalence rate of CAD is high and is the leading cause of the death in the US,[5,6,8,14] Scotland,[9] KSA,[7] and Ireland.[10,11] The lifetime risk of developing CAD at the age of 40 is 50% for men and 33% for women.[4] However, more women than men died from CAD.[5]

At the end of some prevalence studies, we will get know the various causes and prevention, treatment of CAD. The primary cause of CAD is atherosclerosis.[1,13] Others risk factors of getting CAD are heredity, high blood pressure,[3] diabetes, obesity, high blood cholesterol level,[1] hypercholesterolemia, diabetes,[3] smoking,[14,15] decreased physical activity, increased consumption of unhealthful foods,[16] and psychosocial factors such as socioeconomic status and factors (e.g., drug therapy).[15]

In some cases, the majority of patients with ESRD have anatomic CAD, and the major clinical goals are to reduce the future risk for MI and death.[6] When it comes to human development, including the negative effect of heart disease, humans still have a lot to learn about the interactions of the human body with the environment as well as the role that genetics play in this process.[19] Primary and secondary prevention of CAD can be used to reduced CAD.[17] Secondary prevention is a major task to improve the prognosis of patients with cardiovascular disease.[18] Preventions and treatments that could be taken are medication and lifestyle changes, which includes following plant-based nutrition,[12,20] exercise, drugs consumptions (angiotensin-converting enzyme inhibitor, beta-adrenergic blockers, and aldosterone blockers), and cardiac catheterizations.[16]

CAD is a global health problem.[3] In the group of 177 (89%) adherent to plant-based nutrition patients, 112 reported angina at baseline and 104 (93%) experienced improvement or resolution of symptoms during the follow-up period. An additional patient with claudication also experienced symptom relief. Of adherent patients with CAD, radiographic or stress testing results were available to document disease reversal in 39 (22%).[12] Nearly 50% deaths due to CAD in Ireland.[10,11]

In Scotland, the measures of CHD prevalence were based on the Scottish Heart Health Study methods. The mortality from CHD is very high in both sexes and shows considerable geographical variation. Mortality statistics are based on the cause of death given by the certifying doctor and certification practice may vary between countries. There were 10,359 men and women aged 40–59 years from the 22 selected districts in the Scottish Heart Health Study. The overall response rate was 74%. The percentage with a history of angina was slightly higher in men than in women, and a history of MI was about 3 times more common in men.[9]

In KSA, the study was conducted by examining subjects in the age group of 30–70 years of selected households during the 5-year period between 1995 and 2000 in KSA. Data were obtained from history using a validated questionnaire and electrocardiography. A risk assessment model was developed by loading CAD as dependent variable and all statistically significant risk factors as independent variables, namely, age, gender, BMI, waist circumference, waist-height ratio, systolic BP, diastolic BP, ex-smokers, current smokers, fasting blood sugar, fasting TG, fasting serum cholesterol, and HDL-C, in bivariate logistic regression analysis. The data were analyzed to provide prevalence of CAD and risk assessment model. Of 17,232 subjects, 944 were diagnosed to have CAD. Thus, the prevalence of CAD obtained from this study is 5.5%.[7] Nearly 50% deaths due to CAD in Ireland.[10,11]

DISCUSSION

From several studies, CAD causes the major public health problem worldwide and is the leading cause of death in people. CAD remains the number one killer of women and men in western civilization despite 40 years of aggressive drug and surgical interventions.[12]

The present study revealed that CAD caused by heredity, high blood pressure, diabetes, obesity, and high blood cholesterol level, tobacco use, decreased physical activity, and increased consumption of unhealthful foods.[16] Atherosclerosis, the primary cause of cardiovascular diseases, affects the medium and large arteries due to the buildup of fat, cholesterol, and other substances on the inner walls of arteries.[1] Atherosclerosis is the hardening and narrowing of the arteries silently and slowly blocks arteries, putting blood flow at risk. The lack of oxygen-rich blood to portions of the heart muscle leads to ischemia of myocardial tissues and consequent alteration of heart function.[14] It is usually cause of heart attacks, strokes, MI, and peripheral

vascular disease, all together called as cardiovascular disease. Atherosclerosis begins with damage to the endothelium. It is caused by high blood pressure, smoking, or high cholesterol.[13] Damage to the endothelium leads to the formation of plaque. When bad cholesterol, or LDL, crosses the damaged endothelium, the cholesterol enters the wall of the artery that causes white blood cells to stream in to digest the LDL. Over years, cholesterol and cells become plaque in the wall of the artery. Plaque can grow in a slow, controlled way into the path of blood flow and causes significant blockages. The worst happen when plaque ruptures, allowing blood to clot inside the artery and cause stroke in the brain and heart attack in heart.

Once you have a blockage, it is generally there to stay. Primary and secondary prevention of CAD[17], medication, and lifestyle modification can slow down the process of plaque growing inside the artery. The plaque may even shrink slightly with aggressive treatment. A healthy diet especially follows a plant-based nutrition with exercise, and stop smoking had proved to lower the risk of heart attacks and strokes.[5,12] Taking drugs for high cholesterol and high blood pressure will slow and may even halt atherosclerosis. They could also lower your risk of heart attack and stroke. Angiography and stenting which use a thin tube inserted into an artery in the leg or arm, doctors can get to diseased arteries. Blockages are visible on a live X-ray screen. Angioplasty (catheters with balloon tips) and stenting can often open up a blocked artery. Stenting helps to reduce symptoms, although it does not prevent future heart attacks.[16]

CONCLUSION

In the end of several studies, CAD, the disorders of the heart and blood vessels are the major public health problem worldwide. CAD is the leading cause of death in people. People must have the awareness toward the causes and prevention of CAD. Atherosclerosis is the primary cause of the CAD. Others risk factors of getting CAD are heredity, high blood pressure, diabetes, obesity, high blood cholesterol level,[1] hypercholesterolemia, diabetes, smoking,[14,15] decreased physical activity, increased consumption of unhealthful foods,[16] and psychosocial factors such as socioeconomic status and factors (e.g. drug therapy).[15] In most cases, patients with ESRD have more than a 10-fold increased risk for CHD death per 1000 person-years than a patient with five Framingham risk factors projected over time. Preventions and treatments that could be taken are primary and secondary prevention of CAD,[18] medication, and lifestyle changes, which includes following plant-based nutrition,[12,20] exercise, drugs consumptions (angiotensin-converting enzyme inhibitor, beta-adrenergic blockers, and aldosterone blockers), and cardiac catheterizations.[16]

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