REVIEW ARTICLE

Current Updates in Risk Factor Modification and Excercise Following Coronary Artery Disease

Nia Dyah Rahmianti[1*], Teuku Yusrizal[1], Makhyan Jibril Al-Farabi[1,2]

[1]Department of Cardiology and Vascular Medicine, Dr. Soetomo General Hospital, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia
[2]University College London, London, United Kingdom

ARTICLE INFO

Article history:
Received 23 February 2020
Received in revised form 25 May 2020
Accepted 04 June 2020
Available online 30 June 2020

Keywords:
Coronary,
Exercise,
Heart,
Risk,
Update

) Corresponding author:
dr.niadyahramianti@gmail.com

ABSTRACT

Coronary artery disease (CAD) becomes primary disease causing morbidity and mortality in developed country. Chronic CAD disease progress over years or decades and becomes a significant health burden worldwide. Most CAD cases occur in individuals with at least one risk factor. Thus, risk modification and regular exercise are part of coronary artery disease management to reduce disease progression. Regular exercise training is an intense technique to expand the threshold of angina-free activity levels in stable disease conditions when symptomatic CAD has developed. This review will explain the current updates in the risk management and exercise that can be used to improve patients' quality of life and reduce the severity progression of the disease.

Introduction

Coronary Artery Disease (CAD) is a major cause of morbidity and mortality. Cardiovascular disease accounts for 31% of all deaths in the world. More than 4 million deaths annually result from cardiovascular disease. More than 15.5 million people aged over 20 years suffer from CAD and contribute around 800,000 deaths in America.[1,2] Meanwhile, overall CAD incidence in Indonesia reach 138,380 or 9.89% of total mortality. The result of Indonesian health registries shows that CAD is the seventh highest in non-communicable diseases in Indonesia.[3]

CAD cases can occur in individuals with at least one risk factor. An important point of heart rehabilitation program is achieving a healthier lifestyle through risk factor modification programs that should be a part of all individuals.[3,4] In this article, we aim to review the risk factors of CAD, control or modification of risk factors, and cardiac rehabilitation programs related to CAD.

Risk Factors

CAD risk factors are classsified into two main variables, reversible and irreversible. Reversible or modifiable risk factors include a sedentary lifestyle, smoking, hypertension (HT), hypercholesterolemia, obesity, diabetes mellitus (DM), and psychosocial. Irreversible risk factors or non-modifiable including age (men aged >40 years, women >50 years old, gender (men are more at risk of heart disease), history of premature CAD in first-degree relatives before 55 years in men and 65 years in a woman.[5]

1. Sedentary Lifestyle

The term "sedentary" or "physically inactive" is used to indicate the lack or absence of physical activity. Sedentary lifestyle is commonly found in modern times in various sectors of life. For example, in employment sector where the rapid technological advancements (robotics, computers, etc) resulting in lower physical activity energy expenditure (including more sitting time) in the workplace compared to the previous decades. Likewise with the use of transportation (e.g., cars) and leisure activities (e.g., gadgets or screen-based activities).[6]

The indications of sedentary lifestyle behavior related to cardiovascular risk (Figure 1) came from Jerry Morris's manuscript epidemiological study in 1953. The study was conducted on 31,000 London Transport employees aged 35-64 years. Eventhough the study was not specifically designed to explain the risk of sitting against cardiovascular disease, it was stated that most of bus drivers who always sit

Biomolecular and Health Science Journal.
Available at https://e-journal.unair.ac.id/BHSJ ; DOI: 10.20473/bhsj.v3i1.17994

had almost double rate of fatal CAD compare to conductors who spent most of their working day with climb the stairs, walk and stand.[6]

2. Smoking

Globally, 1.3 billion people estimately are smoker. Most of them lives in developing countries, where smoking rates are calculated at 50 percent for men. In 2017, estimated 15.2 percent of adults aged 18 years (16.7 percent of men and 13.7 percent of women) in the United States are smoker.[7]

Smoking has different impact that can cause atherogenesis, including adverse effects on serum lipid and insulin resistance, damaging free lipid radicals so the development of proatherogenic oxidation particles, especially oxidized low-density lipoprotein (LDL) cholesterol, where similar effects are seen in acute passive smoke exposure. Smoking activates the sympathetic nervous system, resulting in increased blood pressure (BP), heart rate, and vasoconstriction of venous also coronary arteries.[7]

Smoking is also associated with increased inflammation (as measured by C-reactive protein), in prothrombotic conditions through the inhibition of plasminogen tissue activators release from endothelium, fibrinogen concentration, platelet activity (probably because of increased sympathetic activity), expression factor and increase overall blood viscosity due to secondary polycythemia in patients with pulmonary disease. Smoking also involves in microvascular constriction via various biochemical, physiological, and metabolic factors. It changes coronary microcirculation and generates angina and/or cardiac dysfunction by altering the endothelial and platelet function also the adrenergic nervous system that related in metabolic vasoregulation.[7]

3. Hypertension

Hypertension (HT) is the main independent CAD risk factor in all races/genders/ age groups. Based on The 7 Joint National Committee, HT is a condition when systolic blood pressure (SBP) ≥140mmHg or diastolic blood pressure (DBP) ≥90mmHg.[8]

Various pathophysiological mechanisms contribute to the increase and damage of target-related organs, including CAD. This mechanism includes the improvement of sympathetic nervous system and the activation of renin-angiotensin-aldosterone (RAA) system, deficiencies in vasodilator release or activity, such as prostacyclin and nitric oxide (NO). Other mechanisms are changes in the concentration of natriuretic peptides; expanded expression of inflammatory cytokines in arterial and growth factors; consequences on hemodynamics; also functional and structural abnormalities in the arteries especially endothelial dysfunction and an increase in vascular stiffness. This neurohumoral pathway interacts with hereditary, environmental and demographic factors (such as increased exposure or reaction to psychosocial stress, excessive sodium intake, and low potassium and calcium intake) will lead a person to have HT and CAD.

The occurrence of metabolic abnormalities, such as obesity, DM, and insulin resistance, also causes the generation of vasoactive adipose cytokines that increase vasoconstriction, endothelial dysfunction, inflammation, and increased oxidative stress in blood vessels thereby increasing the risk of BP and cardiovascular disease. This pathophysiological mechanism targets potential new therapeutics for the prevention and treatment of HT and CAD with advantages that may exceed BP reduction.[8]

a. Dyslipidemia

Dyslipidemia is defined as lipid metabolism disorder that characterized by an increase or decrease in lipid fraction in the plasma. Abnormalities of lipid fraction shows a deacrease of HDL cholesterol (<0.9mmol/l or 35mg/dl), but increase in total cholesterol (>5.20mmol/l or 200mg/dl), LDL cholesterol (>3.34mmol/l or 130mg/dl), triglyceride levels (>2.8mmol/l or 250mg/dl). In the process of occurring atherosclerosis, all fractions have an important role and are closely related to each other, so it cannot be discussed separately.[5,7,9]

Atherosclerosis is the process of hardening of blood vessels that characterized by the accumulation of several substances in the form of fat deposits, platelets, macrophages, leukocytes, calcium, and other cellular waste products that build up in tunica intima to tunica media layer. Atherosclerotic lesions are classified into three stages morphologically: initial lesions or so-called fatty streaks, fibrous plaques, and advanced atherosclerotic plaques. Fatty streaks can be found at the age of 10 years and increase in frequency at the age of 30 years. Fibrous plaque is a typical lesion developed in atherosclerosis. Advanced atherosclerotic plaques are fibrous plaques that have changed by the increase of cell necrosis, bleeding, calcium deposits or quantified endothelial surface above and thrombus formation.[9,10]

b. Obesity

Obesity defined as a condition of increasing body fat both throughout the body and in certain body parts. Obesity can be determined through anthropometric measurements such as body fat distribution, Body Mass Index (BMI), or percent body fat through measurements of lower fat skin and abdominal circumference measurements. The Framingham Heart Study shows that obesity carries a risk of 1.5 times a CAD in respondents who are obese compared to those who do not.[11]

Obesity in adults is associated with metabolic syndrome, which is an independent risk factor for cardiovascular disease. The diagnosis is assessed if a patient has 3 out of 5 risk factors, namely; 1) Central obesity determined by abdominal circumference >90cm in man and >80cm in woman; 2) HDL levels <50mg/dl in woman and <40mg/dl in man; 3) Triglycerides >150mg/dl; 4) Fasting blood sugar levels >110mg/dl; 5) BP >130/85mmHg.[11]

c. Diabetes mellitus

Diabetes mellitus (DM) is a disease caused by high blood sugar level. It happens due to impaired insulin secretion. Framingham study stated that the incidence of cardiovascular disease in men with DM is two times higher than non-diabetic men and also three times higher in women with DM than non-diabetics.[12]

Hyperglycemia produces several biochemical changes, some of which: it is considered to increase the reduction of nicotinamide adenine dinucleotide (NAD+) to NADH but has not been shown to be a cellular oxidative stressor; increase production of uridine diphosphate (UDP) N-acetyl

glucosamine where it might change cellular enzymatic functions. Importantly, glycosylation of proteins in arterial walls is thought to contribute to diabetic atherosclerosis. Non-enzymatic reactions between glucose and arterial wall proteins result in advanced glycation end products formation. The end of advanced glycation is considerated interfering with endothelial cell function and accelerating atherosclerosis directly.[12]

Hyperglycemia increases the formation of reactive oxygen species (ROS). ROS inhibits the production of endothelial NO, vasodilators, and platelet activation regulation. Moreover, ROS prevents the migration of vascular smooth muscle cells into intimal plaques, a step needed to stabilize coronary plaque. The plaque then carries an increased risk of rupture, as is known to have coronary plaque diabetes.[12]

d. Psychosocial

The risk of developing cardiovascular disease increases in people with some social condition, such as low socioeconomic status, lack of social support, stress at work and home, hostility, depression, anxiety, and other mental disorders. Psychosocial risk factors are barriers to medication adherence and efforts to improve lifestyle, as well as efforts to promote healthy lifestyles in patients and population.[13]

Heart Rehabilitation Program

The heart rehabilitation services aim to improve and restore heart function, identify and overcome risk factors, reduce disability, also improve cardiac care for the patient who have prior CAD. The heart rehabilitation program will serve as a secondary prevention program which aim to reduce the incidence of recurrent heart disease and reduce post-myocardial infarction mortality.[5,14] Without proper rehabilitation, patient will tend to have more disability, lower quality of life and higher mortality rate.[14,15]

In summary, a comprehensive cardiac rehabilitation program must include the following components: (1) assessment of the condition and medical history of the patient, (2) education and counseling in order to increase patient knowledge and awareness, (3) effort to control risk factors; concerning education, lifestyle modification and treatment needed, (4) physical exercise program and physical activity counseling.[14,15] Risk factor modification can be done on a reversible factual risk. Here are some changes that can be made:

a. Diabetes

A strict control of blood sugar exhibits to lower the risk of heart disease by slowing the development of atherosclerosis. Exercise can also help improve DM control. Increased glycemic control and lifestyle changes are effective in reducing long-term complications and improving prognosis in patients with impaired glucose tolerance. The American Heart Association (AHA) recommends glycemic control with A1c levels of less than 7% for patients with type 1 diabetes or non-pregnant type 2 diabetes to reduce macrovascular and microvascular complications.[1,16]

Early detection and management of impaired glucose tolerance individuals should be an important priority in health interventions to control DM epidemic in the upcoming years. Basic interventions by maintaining healthy diet and optimizing physical activity may have more significant impacts in population. An unhealthy habits could be changed by policy interventions based on a tax collection study on sugar-sweetened beverages in Mexico.[16]

b. Hypertension

Some of efforts to avoid HT are by reducing the salt intake in food, doing regular exercise to improve body condition and combined with pharmacological management. The decision to start therapeutic pharmacology of BP depends on cardiovascular risk and the category of HT.[13]

Angiotensin-converting enzyme (ACE) inhibitors, β-blockers, calcium channel blockers (CCB), diuretics, and alpha-blockers are the primary factors to HT control. β-blockers is the most potent factor, due to the combination of antihypertensive effect and lower oxygen myocardial consumption via inotropic and heart rate reduction. Diuretics and ACE-inhibitors also have a beneficial impact on reducing mortality.[1]

c. Hypercholesterolemia

Lowering total cholesterol and increasing HDL are associated with reduced risk of heart disease. Lipid reducing strategy is achieved by implementing a low-cholesterol and low-fat diet alongside weight reduction, eventhough without exercise. American Heart Association (AHA) suggests that the quantity of calories from fat in food should not exceed 30%.[9,17]

The objective of cholesterol therapy for people with CAD is to control LDL levels (Table 1). As outlined National Cholesterol Education Program Cholesterol guidelines, cholesterol control accomplished through a three-step program. Stage I is the adoption of nutrition guidelines, lifestyle changes, and general improvements in health habits. Stage II includes fiber supplements and possibly nicotinic acid. Stage III involves lipid lowering drugs therapy. Cholesterol concentration can increase 5-16% with physical activity expansion.[18]

Table 1. Recommendations for controlling lipid profile.[13]

Recommendations	Class[a]
LDL-C is targeted at <1.8mmol/L (<70mg/dL) or a 50% minimum reduction is recommended if the baseline is between 1.8-3.5mmol/L (70-135mg/dL) in very high cardiovascular risk patients	I
LDL-C is targeted at <2.6mmol/L (<100mg/dL), or a 50% minimum reduction is recommended if the baseline is between 2.6-5.1mmol/L (100-200mg/dL) in high cardiovascular risk patients	I
In other patients under LDL-C reduction treatment, target LDL-C <3.0mmol/L (<115mg/dL) must be considered	IIa

[a] Recommendation class

[b] Evidence level

d. Obesity

People who are overweight are recommended to reduce their body weight (BW) by 10%, although the effect of weight loss on total cholesterol and LDL is insignificant. Every 10kg decrease in BW is associated with reduction about 8 mg/dl of LDL cholesterol. Otherwise, each 1 kg BW decreasing is related with an increase HDL cholesterol of 4 mg/dL and a reduction in triglyceride concentration of

1.3 mg/dL.[9]

Based on World Health Organization (WHO) the threshold for waist circumference was divided into two recommended levels: (a) Maximum waist circumference ≥94cm in man and ≥ 80cm in woman indicating that there should be no more weight gain, (b) waist circumference ≥102cm in man and ≥88cm in woman shows that weight loss must be made.[13]

e. Healthy diet

The Dietary Approaches to Stop Hypertension (DASH) trial shows a dose-response relationship between sodium reduction and a decrease in BP. Although the relationship between salt intake and BP is still controversial, the evidence shows that salt reduction is a meaningful way to prevent CAD and stroke. The maximum recommended salt intake is 5g/day, while the optimal intake level is 3g/day. Usually, 80% of salt intake comes from processed foods, while only 20% is added later. Increasing potassium intake and reducing sodium intake contributes to a decrease in BP. The primary sources of potassium are fruit and vegetables. Otherwise, WHO guideline recommends an energy intake of sugar (mono- and disaccharides) of a maximum of 10%, including added sugars and sugars in fruit and fruit juices.[13]

The risk estimates collected from prospective cohort studies show that eating fish at least once a week reduces the risk of CAD by 16% compared to non-fish eater. A meta-analysis shows that eating fish 2-4 times a week reduces the risk of stroke by 6% compared to once a week.

Characteristics of a healthy diet is explained below (13):

Saturates fatty acids <10% of total energy intake, can be replaced by polyunsaturated fatty acids.

- As little as possible of trans unsaturated fatty acids, there should be no intake of processed foods and <1% of total energy intake from natural sources.
- Less than 5g of salt per day.
- 30-45g fiber/24hours, preferably from wheat products.
- More than 200g of fruits and vegetables per 24 hours (2-3 servings).
- Fish 1-2 times/week, one of kind is oily fish.
- 30g of beans without salt per day.
- The consumption of soft drinks and sugar-sweetened alcohol should be reduced. Alcohol consumption must be limited to 2cups/24hours (20g/day alcohol) for man and one glass/24hours 10g/day alcohol) for woman.

f. Stop Smoking

Smoking accelerates the occurrence of atherosclerosis and HT. A history of smoking, including daily tobacco consumption and addiction levels (assessed by the Fagerstrom test), can be a guide to the level of pharmacological support and assistance needed. If counseling fails, encouragement and motivation interventions also nicotine replacement therapy (NRT), varenicline or bupropion should be offered to help stop smoking. All forms of NRT (transdermal nicotine patches, gum, sublingual tablets, nasal sprays, inhalers) are also useful.[13]

Bupropion antidepressants help to stop smoking for a long term. Its effectiveness is similar to NRT. Bupropion is known to carry a risk of seizures without an increased risk of neuropsychiatric or cardiac and circulatory problems. Partial nicotine receptors as varenicline at standard doses increase the chance of stopping more than double compared to placebo. The number of people who quit smoking with varenicline is higher than bupropion. It was proven that 50% more people assisted by varenicline to stop smoking than nicotine patches and other NRT treatment. In addition, it was as effective to contribute until 70% more than nicotine gum.[13]

However, verenicline has a side effect issue which is nausea. This side effect most have yet a mild to moderate influence and usually disappear over time. Consuming two types of NRT at a time is as effective as using varenicline, and it supports smoking caesation in more people rather than just using one type of NRT.[13]

g. Physical activity and exercise

Health care providers must assess the level of physical activity of all sufferers, such as how many minutes/day and how many days/weeks spent doing physical activities with moderate or vigorous intensity. Each must be encouraged to find some activities that the patient can enjoy and included in their daily routine because such actions need to be carried out on an ongoing basis.[13] Table 2 showing a recommendation for physical activity at any condition.

Table 2. Recommendations for physical activity

Recommendations	Class[a]	Level[b]
For all ages of healthy adults are recommended to do aerobic exercise with moderate intensity at least 150 minutes/week or with vigorous intensity, or combination 75minutes/week	I	A
It is recommended to gradually add aerobic exercise with moderate intensity 300 minutes/week or with strong intensity, or combination 150 minutes/week	I	A
Regular assessment and counseling are recommended and if necessary to support increased volumes of physical activity over time	I	B
Physical activity is recommended for low-risk individuals with no further assessment	I	C
Some physical activity sessions can be carried out, at least ≥10 min each, distributed during the week, around 4-5 days and better every day	IIa	B
Clinical evaluations, including exercise tests, can be performed on sedentary people with cardiovascular risk factors and intend to engage in physical activity or strenuous exercise	IIa	C

[a] Class recommendations

[b] Evidence level

The most studied and recommended physical activity is aerobic with an advantageous dose-response effect on prognosis. It consists of rhythmic and continuous movement of large muscle mass. Daily activities which include aerobic such as active travel (cycling or walking), gardening, heavy housework, leisure activities and sports such as jogging or

running, brisk walking, nordic walking, hiking, cycling, aerobic dancing, swimming, skating, skiing, and rowing. The prescription given can be adjusted regarding frequency, duration, and intensity.[13]

Medium or heavy intensity aerobic exercise should be recommended according to absolute and relative intensity. Absolute intensity is energy amount released per minute during activity expressed as ml/minute, l/minute or with Metabolic Equivalents (METs). The vigorous intensity of 6 METs for maximum intensity (absolute intensity), equivalent to moderate intensity exercise at a younger age. For each addition of 1-MET exercise capacity, the risk of death decreased by around 12%. Guideline for METs values according to age standards: <50 years METs 8-9, 50-59 years METs 7-8, 60-69 years METs 6-7, 70 years up METs 5-6 (Table 3).[13]

Table 3. Classification of absolute and relative physical activities and examples

Absolute intensity			Relative intensity
Intensity	METs	Example	%HR max
Mild	1.1-2.9	Running <4.7km/hour, light housework	50-63
Moderate	3-5.9	Brisk walking (4.8-6.5km/hour), relaxing biking (15km/hour), vacuuming, decorating, planting (cutting grass), tennis (double), golf, water aerobics, dancing	64-76
High	≥ 6	Walking, cycling >15km/hour, jogging or running, heavy farming (continuing to dig or hoe), swimming, tennis (single)	77-93

Relative intensity is defined as degree of work needed. Determination of this intensity is relative, i.e. based on the healthiness of cardiorespiratory degree or the percentage of a person's measurements or the maximum estimated HR (% HRmax), i.e. 220-age. It can also be showed as an individual index effort rate, the energy exertion rating felt by the rating of perceived exertion (RPE) or the respiratory frequency (called Talk Test).[13]

Every individual is advised to do at least 30 minutes/day, 5 days/week of physical activity with moderate intensity or 15 minutes/day, 5 days/week for activities with high intensity, or a combination of both, carried out in a session with a minimum duration of 10 minutes, based on the ESC Guideline. In people with certain limited condition, shorter sessions (<10 minutes) can be performed.[13]

Each session of physical activity must include warming up, core (aerobics, neuromotor exercise, and, muscle strength/resistance), cooling down, and flexibility stage or stretching. Inactive adults must start sports gradually, starting with moderate or moderate intensity exercise in a short period (even <10 minutes) which is distributed in a week. However, to reduce the risk of muscle pain, injury and fatigue due to excess excercise, increasing frequency, duration, and intensity must be performed gradually.[13]

h. Psychosocial factors.

Mental health care related to depression (psychotherapy and drugs) is quite effective in reducing the incidence of heart disease, even it does not reduce total mortality. Physical activity can effectively improve the level of depression in patients with CAD. In patients with mutually hostile CAD, group-based host control not only lower hostility but also reduce depression, heart rate and cardiovascular reactivity to mental stress and increase social support and life satisfaction.

In summary, the objectives and targets for CV risk factors is shown on Table 4 and the recommendation for the patient with CAD is shown on the table 5.

Table 4. Objectives and targets for cardiovascular risk factors[13]

CV risk factor	Target
Smoke	Not exposed to tobacco in various forms
Diet	Low saturated fat intake ; vegetables, fruit, wheat products, and fish
Physical activity	Minimum aerobics moderate activity for 150minutes/week (30minutes for five days/week) or severe aerobic (vigorous), PA for 75minutes/week (15minutes for five days/week) or combination
Weight	BMI 20-25kg/m2. Waist circumference <94cm (male) or 80cm (female)
Blood pressure	BP less than 140/90mmHg
Lipids	
LDLc is the main target	Very high risk: <1.8mmol/L (<79mg/dL), or a minimum reduction of 50% if the baseline is between 1.8-3.5mmol/L (70-135mg/dL) High risk: <2.6mmol/L (<100mg/dL), or a minimum reduction of 50% if the baseline is between 2.6-5.1mmol/L (100-200mg/dL) Low to medium risk: <3.0mmol/L (<115mg/dL)
HDL-C	There were no targets, but> 1.0mmol / L (> 40mg/dL) in man and >1.2mmol/L (>45mg/dL) in woman indicated a lower risk
Triglycerides	There is no target, but <1.7mmol/L (<150mg/dL) indicates a lower risk and a higher level indicating the need to check other risk factors.
Diabetes	HBAIc <7% (<53mmol/mol)

Table 5. Recommendations for coronary artery disease

Subject	Recommendation
Physical activity counseling	If exercise capacity> 5 MET does not show a symptom, it is recommended to return to daily excercise; if not, the patient must continue the physical activity by 50% of the maximum exercise capacity and increase little by little. It must be combined with various activities such as walking, climbing stairs, and medically supervised exercise.
Exercise training	At low risk patients, it is recommended to perform aerobic 2 hours/week in 55-70% of the MET or heart rate at the start of symptoms (≥1500 kcal/week). In patients with moderate to high risk, an individual program is recommended, which starts with <50% MET and 1 hour/week of exercise with 10-15 repeatings per set to moderate fatigue
Diet / Nutrition Counseling	To achieve and maintain a healthy BMI, the recommended calorie intake is balanced with energy expenditure (physical activity). It is recommended to take low cholesterol and high-fat diet
Management of weight control CAD	Patients with normal weight heart disease are controlled not to increase weight gain. At each consultation, patients are promote to consistently maintain weight through physical activity, calorie intake to achieve and maintain a healthy BMI. Maximum waist circumference is one of indication to start changing lifestyle.
Lipid Management	Based on lipid profiles, statin therapy is recommended. Lipid, glucose metabolism, and creatinine control are recommended every year.
Blood pressure and smoking cessation	BP monitoring and smoking cessation are recommended for a structured approach
Psychosocial management	Examination of psychosocial risk factors must be considered. Interventions for multimodal behavior are recommended

Conclusion

Most of CAD is the result of the interaction from various risk factors. Heart risk factors are classified into two main variables: reversible and irreversible. Irreversible risk factors consists of age, genders, history of vascular disease, and family history. Reversible risk factors consists of obesity, lifestyle, hyperlipidemia, smoking, and health conditions. Essential part of the heart rehabilitation program is achieving better lifestyle by modifying risk factors for CAD. The heart rehabilitation program consists of primary and secondary prevention, which is carried out after the manifestation of heart disease. Primary prevention programs encourage early risk factor control to achieved maximum benefit while secondary prevention aims to reduce mortality by controlling modifiable risk factor.

Conflict of Interest

The author stated there is no conflict of interest

Abbreviation

AHA :American Heart Association;
ACE : Angiotensin-converting enzyme;
BMI : Body Mass Index;
CAD : Coronary Artery Disease;
CCB : Calcium Channel Blockers;
CAD : Coronary Artery Disease;
DM : Diabetes Mellitus;
DASH : Dietary Approaches to Stop Hypertension;
ETT : Excercise tolerant test;
HDL : High-density Lipoprotein;
HR : Heart Rate;
HT :Hypertension;
LDL :low-density lipoprotein;
METs : Metabolic Equivalents;
MI : Myocard Infarct;
NAD : Nicotinamide Adenine Dinucleotide;
NRT : Nicotine Replacement Therapy;
NO : Nitric Oxide;
ROS : Reactive Oxygen Species;
RAA : Renin-Angiotensin-Aldosterone;
SBP: systolic blood pressure.

References

1. Mack M, Gopal A. Epidemiology , Tr adit io n al and Novel Risk Factors in Coronary artery disease Epidemiology Risk factors. Heart Fail Clin. 2016;12(1):1–10.
2. Roger L, Go AS, Lloyd-jones DM, Adams RJ, Berry JD, Brown TM, et al. Heart Disease and Stroke Statistics — 2011 Update A Report From the American Heart Association. Circulation. 2011 Feb 1;123(4):e18-e209
3. Ghani L, Dewi M, Novriani H, Penelitian P, Daya S. Coronary Risk Factor in Indonesia. Buletin Penelitian Kesehatan, Vol. 44, No. 3, September 2016 : 153 - 164
4. Sanchis-Gomar F, Perez-Quilis C, Leischik R, Lucia A. Epidemiology of coronary heart disease and acute coronary syndrome. Ann Transl Med. 2016;4(13):256–256.
5. Bartels MN. 2016. Cardiac Rehabilitation. Essential Physical Medicine and Rehabilitation pp 119-14. Humana Press: USA
6. Stamatakis E, Rezende LFM De, Rey-lo JP. Sedentary Behaviour and Cardiovascular Disease. Eur J Epidemiol. 2018; 33(9): 811–829.
7. Jackson E, Barnes G. Cardiovascular risk of smoking and benefits of smoking cessation. Updotate 2018;1–16.
8. Rosendorff C, Lackland DT, Allison M, Aronow WS, Black HR, Blumenthal RS, et al. Treatment of hypertension in patients with coronary artery disease A scientific statement from the American Heart Association , American College of Cardiology , and American Society of Hypertension American Heart Association , American College of Cardiology , and American. J Am Soc Hypertens. 2015;1–46.
9. Catapano AL, Chairperson EAS, Ireland IG, France MJC, Uk PD, Uk JH, et al. ESC / EAS Guidelines for the management of dyslipidaemias The Task Force for the management of dyslipidaemias of the European Society of Cardiology (ESC). Eur Heart J. 2011 Jul;32(14):1769-818.
10. Bahri Anwar. 2014. Dyslipidemia as Risk Factor for Coronary Artery Disease. USU Publisher. North Sumatra Indonesia
11. Oemiati R. Coronary Heart Disease [CHD] with Obesity in Kebon Kalapa Village , Bogor (Baseline Cohort Study of Non-communicable Diseases Risk Factors). HSR Journal vol 17 no 4 2014;385–93.
12. Chiha M, Njeim M, Chedrawy EG. Diabetes and Coronary Heart Disease : A Risk Factor for the Global Epidemic. Int J Hypertens. 2012;2012:697240.
13. Task A, Members F, Piepoli MF, Hoes AW, Germany CA, Uk CD, et al. 2016 European Guidelines on cardiovascular disease prevention in clinical practice The Sixth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of

10 societies and by invited experts) Developed with the special contribution of the European Association for Cardiovascular Prevention & Rehabilitation (EACPR). Eur Heart J. 2016 Aug 1;37(29):2315-2381
14. Wenger NK. Current Status of Cardiac Rehabilitation. J Am Coll Cardiol. 2008 Apr 29;51(17):1619-31.
15. Radi B, Joesoef AH, Kusmana D. Cardiac Rehabilitation in. Indonesian Journal of Cardiology 2009;30(2):43–5.
16. Johannessen A, Azab M, Al-shdaifat A, Abumweis SS, Agraib LM, Tayyem RF. Risk factors for coronary artery disease in patients undergoing elective coronary angiography in Jordan. 2017;1–5.
17. Leon AS, Franklin BA, Costa F, Balady GJ, Berra KA, Stewart KJ, et al. Coronary Heart Disease An American Heart Association Scientific Statement From the Council on Clinical Cardiology (Subcommittee on Exercise , Cardiac Rehabilitation , and Prevention) and the Council on Nutrition , Physical Activity , and Metabolism (Subcommittee on Physical Activity), in Collaboration With the American Association of Cardiovascular and Pulmonary Rehabilitation. Circulation. 2005 Apr 5;111(13):1717.
18. Loewen. Peter. Are the New Guidelines for the Use of Lipid-Lowering Agents Sound , and Should Their Adoption Be Encouraged?. Can J Hosp Pharm. 2014 May-Jun; 67(3): 246–247.
19. Piepoli MF, Hoes, Arno W, Stefan Agewal et al. 2016 European Guidelines on cardiovascular disease prevention in clinical practice. In italy: Elsevier Ireland Ltd. All rights reserved; 2016. p. 207–74.
20. Morag K. 2014. Exercise Leadership in Cardiac Rehabilitation for High Risk Groups. Wiley Blackwell: United Kingdom
21. Purnawarman A. The Effect of Physical Exercise Toward Endhotelial Function. JKS 2014;109–18.