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Review

Physical Inactivity and Clinical Cardiovascular Impact- Updating Narrative Review

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Abstract

Introduction: Cardiovascular diseases are considered one of the commonest worldwide deaths. A sedentary lifestyle is occupying one of the ten major global primary causes of death and disability. Either a sedentary lifestyle or physical inactivity is a significant cardiovascular risk factor. The physical inactivity is a fearsome alarming for increasing cardiovascular morbidity and mortality. Simplicity, economic, and effectivity are the main advantages of physical activity in cardiovascular prevention. Understanding the clinical effects of lack of exercise on the cardiovascular system is mandatory for primary or secondary prevention. The objective of this review is to explore the clinical impact of exercise and physical inactivity on the cardiovascular system that was the purpose of current research.

Methods: Narrative literature focused on the clinical adverse of exercise and physical inactivity on cardiovascular diseases.

Conclusion: Awareness of the clinical impact of physical inactivity on cardiovascular diseases is a pivotal way in prevention rather than the treatment. So, physical activity is a decisive feature for securing cardiovascular health integrity and critical targeting the primary or secondary cardiovascular prevention.

Keywords: *Physical inactivity, Clinical Cardiovascular impact, Exercise, Cardiovascular diseases*

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Introduction

Historical bit

In ancient China; at beginning of the 30th century BC., human harmony was first depicted in the "Yellow Emperor's Book of Internal Medicine"[1] promote the principles that:" the people were crucial for prevention but that prevention was vital for extended life".[2] With time, developing of these rules on the 6th-century Chinese philosophy Taoism in Chinese culture had happened, where exercise became the present daily activities. Tai Chi Chuan is a developing system of physical activity that teaches light-footed movements had commenced at the beginning of the 200th B.C. with Hua T'o. This system has recently been reported to decreasing the rate of cardiovascular syncope in Americans elder".[3] In Indian history, as early as the 30th B.C., physical activity was recognized as an essential principle for daily living activities. The Ajur Veda developed the Yoga as a philosophy that included global detailed programs of extension and flexibility postures. The basics were first organized in 600 B.C. in the Upanishads and later in the Yoga Sutras by Patanjali from 200 B.C. to 200 A.D.[4] In Greek philosophy, at the beginning of the 5th century BC. Greek Hippocrates had been identified the ancient link between exercise and well health, where stated that: "All parts of the body which have a function, if used in moderation and exercised in labors to which each is accustomed, become thereby healthy and well developed and age slowly; but if they are unused and left idle, they become liable to disease, defective in growth and age quickly".[4,5]

Definitions

Regards the link between physical activity with exercise and their effects on health. There are several terms usually implicated in exercise researches linked to cardiovascular diseases literature. Physical activity, exercise, physical fitness, sedentary life, and cardiac disorders are commonly prescribed used terms (Table 1).

The definition of physical activity (PA) is defined as the physical movement resulting from skeletal muscle contraction by spending a certain amount of energy. However, physical activity encompasses many activities such as cleaning, gardening, and walking the dog.[8]

Exercise is a type of physical activity, that is, planned, organized, repeated, and purposeful movements with the objective of improving or maintaining more than one physical fitness ingredient.[8,9] Exercise may refer to the cardiac rehabilitation program that maintaining more than one physical fitness features8. Physical fitness has been outlined as the ability to do daily duties with hardiness and attentiveness, in absence of excessive fatigue, and with ample energy to enjoy leisure-time pursuits and meet unforeseen emergencies.[9] Physical fitness encompasses several features such as stamina, flexibility, balance, etc. Physical fitness is commonly linked to the personal ability to perform physical activity8 Health-related fitness has been defined as the ability of a person to perform his or her daily activities. Doing physical activity or exercise on most days of the week can help to increase the ability to perform your daily activities more easily8. A sedentary lifestyle is a lifestyle category comprising brief or no physical activity.[10] People reported doing no leisure-time physical activity.[11] Cardiovascular diseases are numerous

diseases of both heart and blood vessels.[12,13] They are usually encompassing; dyslipidemia, coronary disease, cerebrovascular accidents, hypertension, heart failure, and arrhythmia.[14]

Table 1-Summery of definitions related to physical activity and exercise

Term	Definition
• **Physical activity**	• Any bodily movement generated by contraction of skeletal muscles that increases energy expenditure above resting levels[7-9,145].
• **Exercise**	• A subcategory of physical activity that is planned, structured, and repetitive with the intent of improving or maintaining health[9,10,145].
• **Sedentary lifestyle**	• A type of lifestyle encompasses brief or no physical activity[11]
• **Sedentary behavior**	• A lack of physical activity or activities that do not increase energy expenditure above the resting level or activities with energy expenditures ≤ 1.5 METs in a sitting or leant posture (e.g. sleeping, watching television, video gaming, computer use) [46].
• **Physical fitness**	• A ability to carry out daily tasks with vigor and alertness, without undue fatigue, and with ample energy to enjoy leisure-time pursuits and meet unforeseen emergencies[10] or a measurable attribute for individual that achieve ability to perform physical activities without undue fatigue[145]
• **Health related fitness**	• A person ability to perform his or her daily activities[9].
• **Cardiorespiratory fitness**	• Ability of the circulatory and respiratory systems to supply oxygen during sustained physical activity[145].
• **Leisure-time physical activity**	• Activities that one take parts in during their free time that results in considerable energy expenditure[209].
• **Occupational physical Activity**	• Activities that are correlating to doing of a job which might include walking, hauling, lifting, pushing, carpentry, shoveling, and packing boxes[209].
• **Aerobic exercise**	• A form of exercise that involves the use of large muscle groups to perform repetitive activities that result in increases in heart rate and energy expenditure (e.g. walking; cycling) [145].
• **Anaerobic exercise**	• Anaerobic exercise has been defined by the ACSM as intense physical activity of very short duration, fueled by the energy sources within the contracting muscles and independent of the use of inhaled oxygen as an energy source[53].
• **Resistance training**	• A form of exercise designed to improve muscular strength and/or endurance wherein physical effort is performed against an opposing force that elicits resistance to induce muscular contraction, typically at a high intensity of effort for a short duration of time (e.g. weight lifting)[145].
• **Muscular strength**	• The amount of external force that a skeletal muscle can exert[210].
• **Muscular endurance**	• The ability of muscle groups to exert external force for many repetitions or successive exertions[210].

Table 2: General clinical effects of sedentary lifestyle[14,18,27-32].

• Atherosclerosis
• Coronary artery disease
• Hypertension
• Arrhythmia
• Heart failure
• Stroke
• Diabetes
• Obesity
• Death

Clinical cardiovascular impact of sedentary lifestyle and physical inactivity

A sedentary lifestyle or physical inactivity is a significant[15] and established[16,17] cardiovascular risk factor. It is one of the 5th leading cardiovascular risk factors (along with hypertension, dyslipidemia, smoking, and obesity) as

summarized by the American Heart Association (AHA).[9,18] Both direct or indirect consequences of the sedentary lifestyle implicated. The marked outstanding direct impact of a sedentary lifestyle is an elevated basal mass index (BMI) due with obesity.[19] Indirectly, an increased BMI due to a sedentary lifestyle can result in reduced work efficiency and elevated absenteeism from required daily activities.[20] There is an inversed relationship between physical activity and cardiac events.[21-26] Lack of physical activity can participate in increasing the cardiovascular risk[27-29] especially; hypertension,[28-30] arrhythmia,[28,29] dyslipidemia,[30] diabetes[28,29,31,32], and obesity[28,29,31]. (Table 2). Fear alarms increase with high weight, development of insulin resistance, diabetes mellitus and cardiovascular disease.[33] The serious impact is more significant among those of sedentary lifestyle for more than 5 hours per day. This risk factor is independent of hard exercise and BMI. People that have a sedentary lifestyle for more than 4 hours per day have a 40% higher risk than those that sit fewer than 4 hours daily. But those that exercise for more than 4 hours weekly are as healthy as those that sit fewer than 4 hours per day.[34,35] Recently, there is been a linear relationship between sedentary behaviors and poor cardiovascular outcomes[36-44]. Sedentary behavior represents any waking behavior that involves an energy expenditure of less than 1.5 metabolic equivalent units (METs)[45-46]. However, resident behavior can be assessed by time spent with television. Cardiovascular pathologies have been associated with obesity, diabetes mellitus and premature death.[47] Numerous studies have reported that prolonged total sedentary time has a mischievous relationship with cardiovascular morbidity and mortality.[48]

Epidemiology, statistics, and some studies

According to the World Health Organization (WHO), physical inactivity appeals to the lives of about 3.2 million people per year.[49] The incidence of sedentary lifestyle is increasing in high-income countries, but it is high in some low and middle-income countries as well[49-51]. Immobility is responsible for one third of coronary artery diseases.[18] Indeed, more than 250000 deaths per year in the United States that are assigned cardiovascular disease are due to physical inactivity[18,53].

Observational studies and one clinical trial with dependant-walking behaviors were reported that decreasing the "doses" of mobility are related with a decrease in the risk of cardiovascular disease.[17] In the summary report of the Hockley Valley Symposium, Kohl et. al (2001)[54] disclosed the association between the dose of physical activity and cardiovascular disease[54]. One study revealed that older person walking more than 1,5 daily miles have a comparable reduction of ischemic heart disease[55]. Walking is linked to cardioprotection in the Health of Nurses study (NHS)[56]. Moderate mobility in postmenopausal person has a comparable reduction of ischemic heart disease in the Iowa Women's Health Study (IWHS).[57] However, leisure-time exercise will be decreasing the mortality over a sixteen year follow up of guy with a highly risk of coronary artery pathology in the MRFIT study.[58] Evidence-based studies reported that reducing these risk factors will decrease the chance for occurrence of future cardiac event, such as a stroke, and reduces the needing for coronary revascularization. Long-time studies on large groups have documented the protective effects of physical activity for several of non-cardiac chronic diseases, such as non-insulin dependent diabetes (NIDDM), osteoporosis, obesity, and colorectal carcinoma.[25] Over 5-26 years of follow-up in several studies reported data were showing a graded inverse relationship of mobility intensity and duration with the incidence of cardiovascular diseases.[17]

Mortality and physical inactivity

The global cardiovascular mortality in 2015 was approximately 17.7 million which represented 31% of whole worldwide deaths.[14] Nearly, 2 million annual deaths are assigned to a sedentary lifestyle. WHO had warned that a lack of physical activity could very well be among the ten significant causes of both mortality and morbidity all over the world.[27] Physical inactivity may contribute to increasing higher deaths via indirect effects such as; low cardio-respiratory fitness, obesity, arterial hypertension, diabetes mellitus, and dyslipidemia.[59] A sedentary lifestyle is one of the main causes of preventable worldwide death.[60] However, both coronary artery disease and cerebrovascular accidents are considerable global-burden of disease and the most important causes of mortality, morbidity, and decreased goodness among survivals.[61-63] Coronary artery disease is the commonest cardiovascular diseases, and one of the main causes of worldwide mortality.[64] Numerous keys suggest that exercise capacity is a potent foreteller for sudden cardiac death in healthy people and in those with cardiovascular diseases.[65] Physical inactivity raises all-mortality cause and doubles the risk of high blood pressure, lipid disorders, hyperglycemia, obesity, and all other cardiovascular diseases.[27] Currently and according to the WHO statistics, sedentary lifestyles are representing about 60 to 85% in the world people in both developed and developing countries that a serious burden public health problem. Approximately, 66.3% of children have been insufficiently active rather than future serious health implications.[27] Nearly, more than 300,000 of early deaths and $90 billion in direct healthcare costs are attributed to morbid obesity and physical inactivity every year in the US19. Physical inactivity is accompanied by raise cardiovascular episodes and early cardiac sudden death6. this is the main cause of death in adults[66,67] in developing or developed countries.[16] A sedentary lifestyle is representing about 33.3% of deaths attributed to myocardial ischemia and type 2 diabetes68. However, observational studies-evidence reported that leisure-time physical activity is accompanied by decreased cardiovascular risk, male and female mortalities[69-71] in both middle-aged and elder patients[72,73].

Table 3- Suggested mechanisms through which physical activity may prevent the development of hypertension[145].

Functional category	Increase	Decrease
1. Pathophysiological	• ↑ Arterial Compliance • ↑ Arterial lumen diameter • ↑ Angiogenesis • ↑ Arteriogenesis • ↑ Endothelial Function	• ↓ Arterial Stiffness • ↓ Vascular Resistance • ↓ Intima-media thickness • ↓ Inflammation
2. Metabolic/Endocrinal	• ↑ Renal Function • ↑ Sodium Handling • ↑ Insulin Sensitivity/Glucose Handling	• ↓ Body Weight/Body Mass
3. Autonomic	• ↑ Parasympathetic Activity • ↑ Baroreflex Sensitivity	• ↓ Sympathetic Activity • ↓ Renin-angiotensin System Activity • ↓ Vascular responsiveness to adrenergic- and endothelin-receptor stimulation
4. Neuro/psychiatric	-	• ↓ Oxidative Stress • ↓ Psychosocial Stress

Modified from Keith et al (2013) [145]

Scoping, clinical consequence of physical inactivity, and benefits of regular exercise

General benefits of regular exercise

The effects of regular exercise on the cardiovascular system are well-established. Physical activity has an affirmative effect the cardiovascular risk factors.[18] It is one of the most successful ways in the prevention of cardiovascular diseases and health promotion.[53] Over many years, regular exercise has been still cardiovascular health promoter[74,75]. The possible useful impacts of physical activity on cardiovascular risk may be mediated via intermediate risk factors effects.[76] However, sedentary is a proven-cardiovascular risk factor.[65] Exercise will help physicians in controlling blood pressure[77], improving the blood lipid profile[78], and increasing the insulin sensitivity[79]. Regular physical activity has shown a reduced incidence of strokes[80]. Regular Exercise helps to decrease many risk factors such as obesity[81,82], dyslipidemia[83,84], hypertension[77,85], metabolic syndrome[86], and diabetes mellitus[87,88](Figure 1). So, physical activity related-cardiovascular health benefits may be comprising the following: increased exercise threshold for angina, controlling of hypercholesterolemia, hypertension, diabetes, improved ability to perform daily activities, diminished dependence on cardiac drugs, and improved feelings about being able to cope after a heart attack or surgery[8]. Physical activity decreases the risk of premature mortality in general and of ischemic heart disease, hypertension, colon cancer (CRC), and diabetes in particular[25]. In addition, physical activity participates in weight loss, diabetic control[89-90], improved blood pressure[91], improved lipid profile[92-94], and increased insulin sensitivity[95]. A sedentary lifestyle and low physical fitness are independent predictors of mortality in type 2 diabetic patients[96].

Coronary heart disease and physical inactivity

Cardiorespiratory fitness is a powerful foreteller of cardiac disease rather than all-cause mortality[97-99]. Increasing the cardio-respiratory fitness accompanied to corresponding decreases in cardiovascular disease risk[97,100]. Coronary artery disease is the most frequent cause of death in adults in developed countries worldwide[101]. A sedentary lifestyle is an outstanding pleiad for factors predisposing to cardiovascular disease, particularly ischemic heart disease[102]. Historically, in the 1930s; the survivors of acute coronary syndromes (ACS) were advised to rest in bed at least 6 weeks[103,104]. In a more recent, study of more than 44000 male workers with a follow-up period of 475 755 person-years, regular physical activity decreased ischemic heart episodes rates by the same rate[105]. Indeed, the ratio of myocardial infarction (MI) that assign to the sedentary lifestyle is 12%17. The attributable risk proportion that prevalence is inversely related to physical activity levels[17]. However, there is a relationship between exercise and ischemic heart disease as a specific cardiovascular diseases outcome[25]. Exercise is strongly and inversely linked to coronary artery disease risk[25,68,106,107.] A sedentary lifestyle is estimated to cause 30% of coronary artery disease[18]. The relationship between exercise and cardiovascular diseases changed from prescription to prescription. Continuous exercise training and/or high-intensity interval training (HIIT) is sometimes used in the cases of increased cardiovascular risk, ischemic heart disease, and heart failure with preserved with reduced ejection fraction[111,112]. However, there are many protective factors will be strengthened by physical activity. Strong exercise

intensity is accompanied by a lower risk of all-cause mortality among older men or ischemic heart disease among health professionals[116]. Regular exercise is improving angina-free activity in the patients of established ischemic heart disease[117], preventing cardiac attacks[118], and reducing mortality rates[119]. Despite exercise have fleeting increase the risk of an acute coronary event in the patients of advanced coronary atherosclerosis, physically active people have a substantially lower overall risk for major coronary events[25,120-122].

Role of physical inactivity on dyslipidemia or lipid profile and obesity

Indeed, follow up for the atherogenic lipid profile should be including the following three issues: elevated triglyceride (TG), decreased high-density lipoprotein cholesterol (HDL-C), and elevated low-density lipoprotein-cholesterol (LDL-C) to predict cardiovascular events[123]. However, the impact of lipid changes with chronic physical activity is strongest for high-density lipoprotein cholesterol and triglyceride[124]. Exercise can help lower both "bad" cholesterol blood level, or "the low- density lipoprotein (LDL-C)" level, and total cholesterol (TC), but can elevate the "good" cholesterol or "the high-density lipoprotein (HDL-C)" level[18]. Regular exercise aid in controlling blood glucose levels in diabetic patients. Although the effect of regular exercise is generally small and cumulative, the effect of continued, moderate exercise on overall cardiovascular risk can be dramatic[18]. There is a linear inverse relationship between physical activity, and coronary artery disease, or the combination of coronary artery disease and stroke[17]. The proficiently documented benefits of regular exercise can be gained even with sub-optimal activity levels well below the minimum WHO recommendations as well as at levels up to approximately five-times above these recommendations[125]. LDL-C is the deleterious lipoprotein (LP) that activating for the atherosclerotic pathway with increasing the risk for cardiovascular disease[126,127]. Hypertriglyceridemia is a dose-dependent association with cardiovascular-related and all-cause mortality[128]. In the other way, HDL-C is linked to a decrease in the prevalence of cardiovascular mortality[129] and incidence of ischemic heart disease[130,131]. But fewer studies have documented the relationship between sedentary behavior time and lipids levels. The ATTICA study demonstrated that physically active women had considerably lower levels of total cholesterol (TC), LDL-C, TG, and elevated levels of HDL-C on comparing to sedentary women[132]. Significance results occurred for HDL associations post-adjustment for age, smoking, and body mass index[30]. Clinical trials have demonstrated that regular exercise may increase HDL-C in healthy elderly subjects[133] and may increases HDL-C in overweight[134]; while having divergent effects on LDL-C versus HDL-C[135]. Aadland et al.[136] study founded the link between lipoprotein (LP) levels and physical activity versus sedentary life in healthy adults. They found positive associations between sedentary time and LDL-C, TC and TG, and between MVPA and HDL-C[30]. Other studies have revealed contradictory data; sedentary behavior time not accompanied by any lipoprotein cholesterol or triglycerides levels[137,138], accompanied by elevated triglycerides, total and LDL-C and reduced HDL- C[139], and with elevated HDL-C and TG[36]. Regular physical activity generates antiatherogenic vascular adaptations regardless of traditional risk factors[125]. Vascular endothelial dysfunction possesses a pivotal role in the development of atherosclerosis and atheromatous plaque rupture. Normal vascular endothelial function can be restored via exercise[125,140]. Recurrent exposure to mechanical stimuli during exercise can lead to antiatherogenic vascular adaptations in function and structure regardless of traditional risk factors[141].

Exercise can induce energy expenditure to obtain a negative energy balance and ameliorated weight control. Undergoing to moderate-level exercise for 150-200 minutes/week can preserving ideal body weight. If weight loss is indicated, the moderate-level exercise should exceed 250 minutes/week[123]. There is a dose-dependent association between the amount of exercise and the weight loss effect. So, the greater the weekly accumulation of physical activity, the greater the weight loss[142,143].

High blood pressure and physical inactivity

Exercise can reduce blood pressure and the incidence of hypertension by reducing vascular resistance and inhibiting of the sympathetic nervous system (SNS) and the rennin-angiotensin system[123]. Historically, Boyer and Kasch et al. (1970) in their study to reveal the blood pressure lowering after physical activity showed that the aerobic interval training program 2 days/week induced blood pressure lowering in both hypertensive and normotensive men[144]. Over the past, four to five decades, accumulating data reported stable findings concerning the protective effects of exercise in the prevention of hypertension[145].

Experimental interventional studies evidence has reported an association between exercise and hypertension as the favorable effects of physical activity on blood pressure reduction.[145] Weekly sports and exercise time are inversely proportional to the risk of hypertension. The probability of hypertension in people doing sports was 19% to 30% lower than those who did not.[147] A sedentary lifestyle and low cardiorespiratory fitness in middle age are accompanied to increased risk for hypertension.[25] Despite the strong supporting evidence role for exercise in the prevention of hypertension, the protective benefits of exercise in high-risk individuals still remain questionable.[145] Exercise is commonly recommended as an important lifestyle modification that may help in the prevention of hypertension.[145] The pathogenesis by which exercise-lowering blood pressure and prevention of hypertension are unclear.[145] Suggested mechanisms through which exercise may prevent the development of hypertension are summarized in (Table 3).

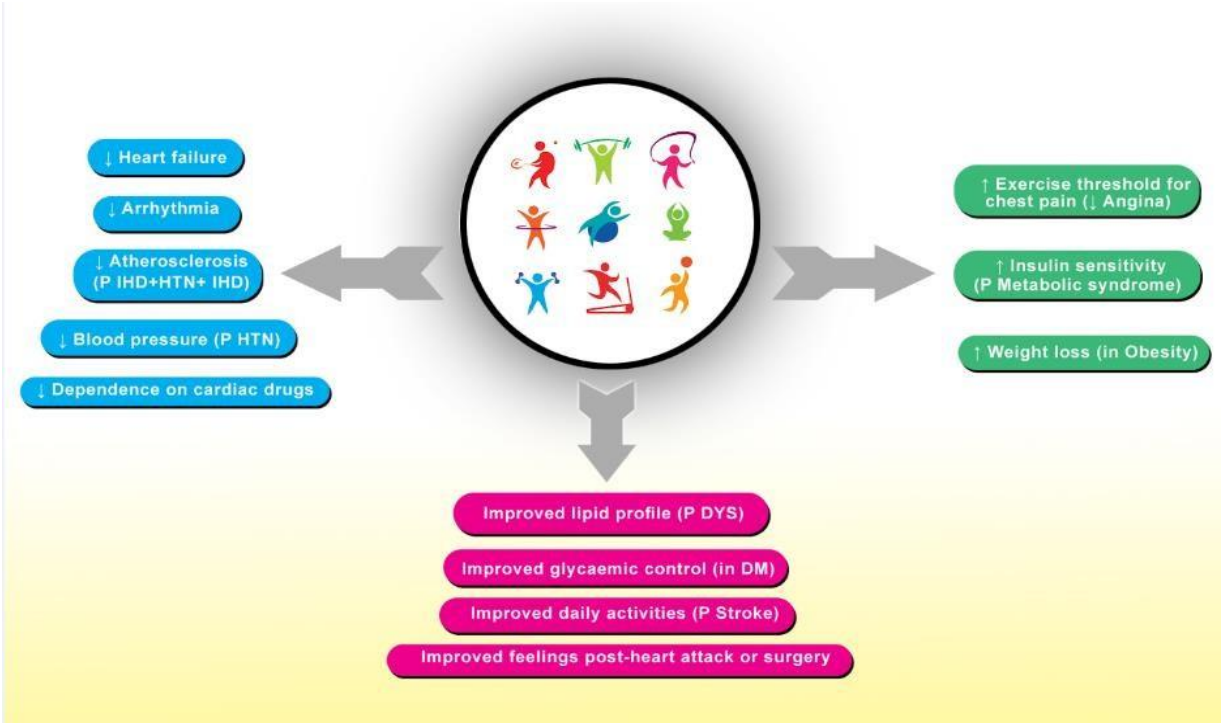

Figure 1-Clinical cardiovascular benefits of physical activity and regular exercise

Arrhythmia

Although patients with ischemic heart pathology have an increased risk of cardiac ventricular fibrillation (VF) during acute exercise, people with a normal functional cardiovascular mechanism do not experience this high risk.[120-122,148-151] Exercise can reduce the risk of VF in healthy people and by increasing supply and demand of heart muscle O2 inhibiting SNS activity.[152] Epidemiologic studies evidence reveals that an exercise lifestyle decreases the risk of sudden death.[153]

Stroke

The cited studies revealed the association between the level of exercise and stroke. Previous studies have not found a relationship between cardiovascular-respiratory pathologies and stroke.[25] Forty studies have shown that the risk of stroke is associated with physical activity and exercise. These cited closely studies for cardiovascular diseases and coronary artery disease. Thirteen of the studies were cohort study with follow-up period ranging from 5 to 26 years. Eight study confirmed an inverse relation.[25]

Classification, clinical benefits, and amount of physical activity

Classification and characteristics

There are numerous classifications in regard to physical activity. Physical activity can be classified as occupational (during work), leisure time (i.e. non-occupational), exercise (i.e. structural physical activity with particular reason), active living or daily activity (e.g. non-recreational walking, housework, and gardening), and commuting

(transportation) activities.[153,154] Moreover, physical activities can be classified into four major types i.e., aerobic, muscle-strengthening, bone- strengthening, and stretching[155]. (Table 4) Physical activity is usually outlined as having four dimensions: duration (e.g. minutes and hours), frequency (e.g. times per week or month), intensity (e.g. rate of energy expenditure), and type (e.g. walking, gardening, and swimming)[156]. Mostly, the easiest and most acceptable forms of physical activity are those that can be incorporated into everyday life. Examples include walking or cycling[157]. Exercise intensity can be evaluated by a number of indices including; maximal heart rate % (HR max), maximal O2 uptake % (VO2max), rate of energy expenditure (reported in metabolic equivalents (METS), or multiples of resting metabolic rate), self- reported rating of perceived exertion (RPE), and talk test[158].

Clinical benefits

Generally, the continued regular moderate physical activity has more benefits. It includes daily leisure activities such as hiking or various sports.[159] Regular exercise at an adult and advanced age significantly reduces heart, vascular and lung diseases and related deaths and improves quality of life.[159-165] Meta-analysis studies proposed that great level of leisure time physical activity had a good cardiovascular outcome by lowering the overall risk of incident coronary artery disease and stroke among men and women by 20% to 30%, while a moderate level of occupational physical activity might decrease 10% to 20% risk of cardiovascular diseases[166].

Amount of physical activity

The studies are revealing a linear dose-response relationship between physical activity and cardiovascular disease76. Meta-analysis studies reported a lowering in the risk of all cardiovascular outcomes and diabetes incidence with incremental rising levels of physical activities[167]. However, the link between sedentary behavior and all-cause mortality diverged by the level of moderate-to-vigorous physical activity. The result of sedentary behavior on all-cause mortality is strengthened with low amounts of moderate-to-vigorous physical activity[10].

Targets of individual physical activity[168-170]

(Grade of Recommendation/Level of Evidence; IB)

- Minimum 30 min/day for 5 days/week of moderate intensity physical activity (i.e. 150 min/week) or
- 15 min/day, 5 days/week of vigorous intensity physical activity (75min/week) or
- Both combinations.

All or non-rule

All or non-rule is the rule in dealing with physical activity. So, whatever the level of physical activity is better than none[170]. Indeed, any amount of physical activity will be yielding some form of health benefits. It is valuable in both primary and secondary prevention[161].

Aerobic exercise vs anaerobic exercise

Aerobic exercise is defined according to the American College of Sports Medicine (ACSM) as any activity that uses large muscle groups, can be maintained continuously and is rhythmic in nature[167]. Cycling, dancing, hiking, jogging, long distance running, swimming, and walking are typical examples of aerobic exercise. These activities are usually approached through the aerobic capacity, which is defined by the ACSM as the product of the capacity of the cardiorespiratory system to supply O2 and the capacity of the skeletal muscles to utilize O2[171]. The criterion measure for aerobic capacity is the peak O2 consumption (VO2), that may be measured by graded exercise ergometry or treadmill protocols with an O2 consumption analyzer or via mathematical formulas[53].

Wisløff et al (2002)[172] confirmed the benefit of aerobic training on the myocardium post-coronary episodes. However, they reported that the beneficial effects of aerobic training on cardiac remodeling and myocardial contractility[172].

Anaerobic exercise is defined according to the American College of Sports Medicine (ACSM) as a vigorous physical activity of very short duration, supported by the energy creators within the contracting muscles and independent of the use of inhaled O2 as an energy source[171]. Anaerobic exercise is potentially beneficial for cardiovascular system[53]. sprinting, high-intensity interval training (HIIT), and powerlifting are typical examples of aerobic exercise[53]. In a Turkish study published by Akseki Temür et al [173] evaluated the effects of anaerobic exercise using the C-type natriuretic peptide (CNP). They found a positive and favorable effect of anaerobic exercises on the lipid metabolism and lipid profile[53].

In Iranian study publicized by Manshouriet al[174] reported that anaerobic training results in a remarkable decrease in human growth hormone (HGH). However, long-standing HGH deficiency can cause cardiovascular morbidity and mortality via inducing of premature atherosclerosis. HGH deficiency is responsible for elevated BMI and TG, lowering of HDL•C, rather than the development of hypertension[175]. Moreover, HGH deficient subjects may be presented by reduced LV posterior wall thickness, smaller LV mass index and compromised LV ejection fraction[176].

Table 4-Numerous classifications regards to physical activity (PA)[153-155]

Classifications I[153-154]	**Classifications II[155]**
• Occupational PA • Leisure time PA • Active living (Daily) PA • Exercise PA • Commuting physical activity PA	• Aerobic PA • Muscle-strengthening PA • Bone-strengthening PA • Stretching PA

Preventive measures

Primary prevention

Cardiovascular diseases are a largely preventable condition[15]. Physical activity is a pivotal key in preserving the healthy cardiovascular system rather than primary and secondary cardiovascular diseases prevention regardless of BMI[9,178,179.] Regular physical activity is more valuable in decreasing the mortality and cardiovascular events in the primary prevention[9]. Well-defined measures of primary prevention, mostly, regular physical activity has been

investigated, with significant risk lowering of both morbidity and mortality[61,180-185]. Regular physical activity is an efficaciously in lowering both the risk of all-cause and cardiovascular mortality in healthy people by 20– 30%[168-170,186-188]. Physically active men and women usually have a 25% to 30% reducing the risk of cardiac diseases than the less active[188-192]. In men, a healthy lifestyle and increased physical activity have been shown to lower the opportunities for developing cardiovascular disease[193]. The risk of these diseases is markedly lowered by convenient lifestyle modifications such as increased physical activity[33]. Moderate-high intensity physical activity is advised to prevent sedentary lifestyle diseases[194]. There are two reviews support the effectiveness of interventions to promote physical activity in the health care setting. On reviewing of [17] randomized controlled trials (RCTs) regarding the physical activity in adults, it is recommended that continued support had a moderate effect on self-reported physical activity and cardiorespiratory fitness, despite no obtaining a predetermined level of physical activity[195].

Secondary prevention

Cardiac rehabilitation (CR) is an essential therapy in reducing cardiovascular mortality by 26% and the incidence of later cardiovascular events[197,198]. Regular physical activity is highly remarkable in decreasing the mortality cardiovascular and later serious events in the secondary prevention[9]. However, patients in who have undergone cardiac rehabilitation with past percutaneous coronary interventions (PCI), cardiac valve surgery, have chronic heart failure that indicates transplantation, or has the peripheral arterial disease will be yielding a significant short and long-term cardiovascular diseases benefits[199-201]. Hypertension tight controlling is enhanced if there are lifestyle changes such as weighting loss and increasing physical activity[169,202]. Secondary prevention via exercise-based cardiac rehabilitation is the choice scientific program for decreasing morbidity and mortality in ischemic heart disease, in particular, post-myocardial infarction203. According to the ESC/AHA/ACC guidelines (with the highest level of scientific evidence-class I); exercise-based cardiac rehabilitation is a recommended method in the treatment of cases of coronary artery disease.[204-206] Furthermore, it is a cost-effective protocol after any acute ischemic event[207] and chronic heart failure[208]. It improves cardiovascular outcome by reducing recurrent hospitalization and health care expenditures rather than prolonging of the life[203].

Conclusion and Recommendations

The association between sedentary life or physical inactivity and fearsome cardiovascular episodes is well established. Atherosclerosis, ischemic heart disease, hypertension, arrhythmia, cardiac failure, diabetes, obesity, cerebrovascular accidents, and death are the final results for physical inactivity. Primary rather than secondary cardiovascular prevention using any exercise activities is a pivotal step for good and safe health.

Conflicts of interest

The corresponding author has no conflict of interest to declare.

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