The prevalence of cardiovascular diseases in Indonesia and its relation to physical activity

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Abstrac: CVD is considered a health problem worldwide and it is a leading cause of death and disability. CVD has an impact on the socio-economic conditions of patient, family and country. This paper aims to determine the prevalence of CVD in Indonesia and its relation to physical activity. A literature review study was conducted to explain the goals set, namely by examining the concept of CVD, the concept of physical activity and some evidence about the role of physical activity on CVD. Literature searches using electronic data based include Google, Google scholar and PubMed. A number of studies have shown that there was an association of moderate to vigorous physical activity with CVD, especially several prospective studies. Strategies to increase physical activity need to be carried out as an effort to prevent CVD and reduce CVD risk factors.

Keywords: Prevalence, cardiovascular disease, physical activity.

Introduction

Cardiovascular diseases (CVD) is considered a major health problem in the world. These diseases are not only a problem in developed countries, but also in developing countries. CVD is not a diagnosis of one type of disease, but is a collection of several non-communicable diseases that occur in the heart and blood vessels. Along with population growth and changes in the epidemiology of CVD, globally the mortality rate from CVD is increasing (Roth, Forouzanfar, Moran & Barber, 2015). It is even known to cause disability (Mendis, Puska & Norrving, 2011) and is the leading cause of death in the world (WHO, 2016; Jankovic, Geelen, Streppel & de Groot, 2015).

Besides having an impact on disability and death, CVD also has a negative impact on the socioeconomic conditions of the sufferer, family, community and country. The effect on sufferer is in the form of loss of patient productive time, where sufferers cannot perform activities properly or may not even be able to move at all, such as in patients with heart disease, moderate and severe stroke. In the family, it results in the loss of working time and financial loss, due to caring for the patient. Meanwhile, the negative impact on the country is the economic burden, where the country must bear a large enough cost for handling CVD problems. It is reported that BPJS Kesehatan funds spent on heart disease in 2014 amounted to Rp.4.4 trillion. Then it increased to Rp.7.4 trillion in 2016 and increased again in 2018 to Rp.9.3 trillion (Hanifah, 2019).

The death rate from CVD in developed countries has decreased, but in poor and developing countries there is a worrying situation. There is a rapid increase in the number of deaths from CVD and in 2008 more than 17.3 million people died from the disease (Mendis et al, 2011). In

2010, CVD (ischemic heart disease and stroke) caused the death of 12.9 million people, or one in four deaths worldwide (Lozano, Naghavi, Foreman & Lim, 2012). It is estimated that the death rate from this disease will continue to increase, especially coronary heart disease and stroke which will reach 23.3 million deaths in 2030 (Kemenkes RI, 2014).

The death rate due to CVD that occurs in various parts of the world is different. According to Nichols, Townsend, Scarborough & Reyner (2014) in Europe, CVD is still the leading cause of death with more than four million deaths per year. Roth et al (2015) mention that in South Asia there were more than 1.7 million deaths in 2013 and this is considered the largest increase in CVD deaths, while in East Asia there were 1.2 more million deaths in the same. When viewed by country, in 2012, Georgia became the country with the highest prevalence of CVD deaths (67%). In the same year, in Australia, America and Singapore the prevalence of death from CVD was 31%, in China 45% and in Malaysia by 36%, (WHO, 2014).

In Indonesia, there was also an increase in deaths due to CVD, from 30% in 2011 (WHO, 2011) to 37% in 2014 (WHO, 2014). Based on the results of the Baseline Health Research (Riskesdas) 2013, there is an increase in the prevalence of CVD in Indonesia. Stroke, for example, increased from 8.3‰ in 2007 to 12.1‰ in 2013. Hypertension cases also increased from 7.6 percent in 2007 to 9.5 percent in 2013. (Kemenkes RI, 2014). For this reason, it is necessary to study a number of studies that assess the relationship between physical activity and CVD, because physical activity is considered to have a major role in preventing CVD.

Methods

To search for research articles or literature, we use electronic search engine tools. A number of these search engines are Google, Google scholary and PubMed. The articles searched for are those published from 2001 to October 2020. The keywords that the author uses in tracking articles are physical activity and cardiovascular disease.

Result

Cardiovascular diseases

CVD is a term that is widely used for various diseases that affect the heart and blood vessels (WHF, 2012). According to Mendis et al (2011), the cardiovascular diseases include coronary heart disease, cerebral vascular disease (stroke), aortic and arterial disease such as hypertension and peripheral vascular disease, congenital heart disease, rheumatic heart disease, cardiomyopathy and cardiac arrhythmias, etc. WHF divides CVD into four groups as follows (WHF, 2012):

a. Types of CVD in the heart including: *angina pectoris, acut coronary syndromes, arrhythmia, congenital heart disease* dan *cardiomyopathy*.
b. Types of advanced CVD in the heart including: *ischaemic heart disease, valvular disease, inflammatory heart disease,heart failure, rheumatic heart disease* dan *coronary heart disease*.
c. Types of CVD in the brain namely: *cerebrovascular disease* atau stroke (*ischaemic* dan *haemorrhagic)*.
d. Types of CVD in the circulatory system including: *peripheral artery disease, hypertensive heart disease, deep vein thrombosis* dan *pulmonary embolism*.

Physical Activity

WHO explains that physical activity is a term used for various activities carried out throughout the day that involve muscle movement (WHO, 2008). These movements include lifestyle activities such as sports. Skeletal muscle contractions that produce body movement and which cause an increase in energy expenditure are considered physical activity (Zajko, Proctor, Singh & Minson, 2009). Technically, Caspersen, Powell & Christenson (1985) define physical activity as "any force exerted by skeletal muscles that results in energy expenditure above resting level".

Measurement of physical activity intensity based on MET (metabolic equivalents) (Costa, Ogilvie, Dalton & Westgate, 2012). It was further explained that light physical activity spent 1.5-3 MET, moderate physical activity spent 3-6 MET dan vigorous physical activity consumes 6 MET. Moderate physical activity includes brisk walking (5 km/hour), cycling 15 km/hour weight training (<20 kg), sweeping the yard, mopping, swimming, washing clothes. Vigorous physical activity includes brisk walking (>7 km/hour), jogging, cycling 16 km/hour, hoeing, lifting/carrying wood/stone/rice pedaling a trishaw (Kemenkes RI, 2018). In addition, the US Department of Health and Human Service (2018) describes that there are four levels of physical activity including: inactive, less active, active and very active. A person is said to be inactive if he does not do moderate and vigorous physical activity. If a person does less than 150 minutes of moderate-intensity physical activity a week or 75 minutes of vigorous-intensity physical activity or an equivalent combination, he or she is considered inactive. A person is called active if he does physical activity with moderate intensity for 150 minutes to 300 minutes a week. Meanwhile, someone is said to be very active if the physical activity he does in the moderate intensity category is more than 300 minutes a week.

Another way to monitor the intensity of physical activity is through a person's target heart rate during physical activity. The Center for Disease Control and Prevention (CDC) (2020) explains that a person's target heart rate for moderate physical activity is 64%-76% of the maximum heart rate based on a person's age. To get an estimate of the maximum heart rate, it can be done by subtracting a person's age from 220. For example, for a 55 year old person, the estimated maximum heart rate is 220 - 55 years = 165 heart beats per minute (bpm). The calculation of the target heart rate of 64% and 76% becomes:

a. 64% rate: 165 x 0.55 = 106 bpm
b. 76% rate: 165 x 0.76 = 125 bpm

Conclusion: 55 year old people need a steady heart rate between 106-125 bpm during moderate physical activity.

Furthermore, the target heart rate for vigorous physical activity is between 77% and 93% of maximum heart rate. The calculation is the same as moderate physical activity. For example, for a 40 year old person, the estimated maximum heart rate is 220 – 40 years = 180 bpm. The 77% and 93% target heart rate calculations become:

a. 77% rate: 180 x 0.77 = 139 bpm
b. 93% rate: 180 x 0.93 = 167 bpm

Conclusion: 40 year old people need a steady heart rate between 139-167 bpm during vigorous physical activity.

Overview of CVD Prevalence in Indonesia

A Riskesdas with a cross sectional approach was carried out by the Ministry of Health in 2018. Based on the results of the survey, several figures were found about the prevalence of CVD in Indonesia. Nationally, the prevalence of heart disease was 1.8%. North Kalimantan was the province with the highest prevalence of heart disease (2.2%), followed by DI Yogyakarta (2.0%) and Gorontalo (2.0%). The lowest prevalence of heart disease occurred in the province of NTT (0.7%). According to age group, the highest prevalence of heart disease occurred in the 75 year age group (4.7%), followed by the 65-74 year age group (4.6%) and the 55-64 year age group (3.9%). The prevalence in the female group was higher (1.6%) than the male group (1.3%). According to education, the highest prevalence was in the group that finished diploma education and higher education (2.1%) and judging from the type of work, the civil servant/military/policemen/state-owned enterprises/regional- owned enterprises group (2.7%) and the non-working group (2.0%) had a higher prevalence. Finall y, based on the area of residence, where the prevalence of heart disease in urban areas is higher (1.6%) than in rural areas (1.3%).

The description of hypertension according to a doctor's diagnosis or taking medication shows that the prevalence in Indonesia is (8.84%). By province, North Sulawesi is the province with the highest prevalence of hypertension (13.53%) and Papua is the province with the lowest prevalence (4.75%). Based on age group, the highest prevalence of hypertension is the age group 75 years or more (25.26%) and the next is the age group 65-74 years (24.53%) and the age group 55-65 (19.30%). In addition, it is known that the female group has a higher prevalence of hypertension (11.57%) than the male group (6.07%). In terms of education level, information was obtained that the prevalence of hypertension was highest in the group who had not/never attended school (15.80%) and the lowest was in the group who had graduated from high school (5.53%). Meanwhile, judging from the occupation, it is known that the prevalence of hypertension is highest in the unemployed group (13.30%), then followed by civil servant/military/policemen/state-owned enterprises/regional-owned enterprises group (10.71%). By region, the prevalence of hypertension in rural areas (8.06%) is lower than in urban areas (9.46%).

In addition to heart disease and hypertension, stroke is also a type of CVD. Riskesdas results show that the prevalence (per mile) of stroke in Indonesia is 10.9‰. The province of East Kalimantan has the highest prevalence (14.7‰) followed by DI Yogyakarta (14.6‰), while the lowest is in the province of Papua (4.1‰). According to age group, the highest prevalence of stroke is the age group 75 years (50.2‰), then the age group 65-74 years (45.3‰) and the age group 55-64 years (32.4‰). In contrast to heart disease and hypertension, the prevalence of stroke was higher in the male group (11.0‰) than in the female group (10.9‰). In terms of education, it was found that the no/never school group had the highest prevalence of stroke (21.2‰) and the junior high school group had the lowest (6.8‰). Based on occupation, the findings in the field showed that the highest prevalence was in the unemployed group (21.8‰), then in the civil servant/military/policemen/state-owned enterprises/regional- owned enterprises group (12.2‰). Compared to rural areas (8.8‰), the prevalence of stroke is higher in urban areas (12.6‰).

A number of previous descriptions can be simplified that the prevalence of CVD (heart disease, hypertension and stroke) is higher in people who are older than those who are younger. As people get older, the potential for people to experience one, two or three of these diseases is greater. The prevalence of CVD was also found to be higher among people who worked as by civil servant/state-owned enterprises/regional-owned enterprises and people who did not work than people with other jobs. Furthermore, it was found that the prevalence of CVD was higher in people living in urban areas than in people living in rural areas. This condition may be related to a person's physical activity. As people get older, there are various declines in physical function, including decreased physical strength or weakness, so that it has an impact on physical activity which also decreases. Besides that, it is common knowledge that people who do not work and who work as by civil servant/state-owned enterprises/regional-owned enterprises group have lower physical activity than people who work as fishermen, farmers and laborers. Furthermore, the area of residence is usually also related to a person's physical activity. For example, more people in the village walk to work, such as to rice fields, gardens and other jobs. Meanwhile, people who live in urban areas use more means of transportation, such as motorbikes, city buses, trains and other means of transportation to work. Therefore, further discussion is needed about the contribution of physical activity to CVD.

The link between physical activity and CVD

It is known that physical inactivity has an impact on the prevalence of non-communicable diseases (NCDs) such as CVD and globally it is considered a risk factor for death (WHO, 2010). CVD can be prevented through greater physical activity (Glazer, Lyass, Esliger & Blease, 2013), so one of the public health strategies for CVD prevention is to focus more on highlighting the importance of physical activity. However, according to Orkaby & Forman (2017) CVD prevention strategies through physical activity are rarely used, even though in addition, physical activity can also reduce some of the physiological changes that occur with aging.

There are many studies that have proven the association of physical activity with CVD. A prospective study in America involving 71,018 women aged 50-79 years found that sitting 10 hours/day was associated with an increased risk of CVD compared to sitting 5 hours/day. The study also found that the risk of CVD was higher in women with low physical activity. A stronger CVD risk was found in women who sat for long periods of time with overweight (Chomistek, Manson, Stefanick & Lu, 2013). Another prospective study in England and Scotland involving 1,429 participants diagnosed with CVD by a doctor. The results showed that there were 213 of the total 446 deaths attributed to CVD causes. A lower risk of death was found in participants who did moderate to vigorous physical activity (Hamer, Ingle, Carroll & Stamatakis, 2012). A cohort study conducted on 130,000 people in 17 high, middle and low income countries. The researchers concluded that people who did more physical activity, in both high, middle and low income countries, were associated with a lower risk of CVD and death. (Lear, Hu, Rangarajan & Gasevic, 2017). These three results indicate that in addition to reducing the risk of CVD, higher physical activity (moderate to vigorous) can also reduce the adverse impact on CVD sufferers, namely reducing the risk of death. This is reinforced by Li, Loerbroks & Angerer (2013) who conducted a meta-analysis of 23 prospective epidemiological

studies. They revealed that the reduced CVD risk was associated with moderate and vigorous leisure-time physical activity.

In addition to being directly associated with a reduced CVD risk, higher physical activity is known to be associated with a number of CVD risk factors. Glazer and colleagues (2013) through the results of their study stated that higher levels of high-density lipoprotein (HDL), triglycerides, BMI and waist circumference as risk factors for CVD were significantly associated with moderate and heavy physical activity. Other findings such as the study conducted by Bento, Albino, Moura & Maftum (2015); Whelton, He, Appel & Cutler (2002) proved that there is a relationship between physical activity and blood pressure. This result is in line with the findings of Anwar, Peng & Mahmudiono (2020) where higher physical activity can prevent and reduce blood pressure (hypertension) levels. Physical activity is also associated with total cholesterol, triglycerides and HDL (Baltic, Baljic, Radjo & Mlaco, 2015; Durstine, Grandjean, Davis & Ferguson, 2001). Meanwhile, Wong, Katzmarzyk, Nichaman & Church (2004) proved the link between physical activity and body fat or obesity.

A number of findings have proven that moderate to vigorous physical activity has a significant role in health, especially for the prevention of CVD. Therefore, efforts to prevent CVD through physical activity need to be the main focus of all parties, including the government. In addition, this can have a positive impact on reducing CVD mortality and disability rates. The burden of costs that must be borne by the government for the handling or treatment of CVD sufferers can be reduced. Where so far the government has to spend a very large amount of money for handling CVD in Indonesia.

WHO recommends the level of physical activity that is beneficial to health according to age groups (WHO, 2010). In people aged 5 to 17 years, it is recommended to do 60 minutes of physical activity per day and the physical activity carried out is physical activity of moderate to heavy intensity. While in people aged 18-64 years, they should do at least 150 minutes of moderate-intensity aerobic physical activity per week or they should do at least 75 minutes of high-intensity aerobic physical activity per week. For people aged 65 and over, WHO recommends the same level of physical activity as those aged 18-64. People who are incapacitated due to chronic illness, they can perform physical activities according to their abilities and conditions. People in this group should not force themselves to do 150 minutes of moderate-intensity aerobic activity per week (US Department of Health and Human Services, 2018).

The Ministry of Health in the Riskesdas Guidebook (2018) provides a number of examples of moderate physical activity and vigorous physical activity. Moderate physical activity includes brisk walking (5 km/hour), walking uphill, walking in place, cycling (10-15 km/hour), moderate-intensity aerobics, yoga, jumping on a trampoline, weight training (<20 kg), dancing with moderate rhythm, volleyball, badminton doubles, diving, horseback riding, golf, housework such as sweeping, vacuuming, washing clothes, cleaning the bathroom etc. While vigorous physical activities include brisk walking (>7 km/hour), jogging/running, mountain climbing, cycling >16 km/hour, karate matches, boxing, judo, tae kwon do, jumping rope, dancing with a fast rhythm, competitive basketball, football, singles tennis, continuous swimming, badminton singles, water gymnastics, work lifting weight 20 kg, hoeing, felling trees, carrying/carrying wood/rice/stones, pedaling tricycles.

Conclusion

The results of the literature review show that the prevalence of CVD is higher in people who are older, do not work and are civil servants/TNI/Polri/BUMN/BUMD, and who live in urban areas. Physical activity with moderate to heavy intensity has an impact on better heart and blood vessel health. This is evidenced by the results of a number of studies, especially prospective studies and meta-analyses. For this reason, a strategy is needed to promote and increase the physical activity of the community, especially for people who are older, people who live in urban areas and people who work as civil servants/TNI/Polri/BUMN/BUMD. It is necessary to provide facilities for physical activities such as sports facilities for the community, especially for the older group, at work and in urban areas.

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