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Analysis of Risk Factors of CVDs in Middle-aged and Elderly People and their Countermeasures

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Abstract:

Cardiovascular disease (CVD) is a group of diseases that affect the heart and blood vessels, including stroke, coronary heart disease, and peripheral artery disease. There have been some successful studies on risk factors for CVD. For example, some bad health conditions, such as high blood pressure and diabetes, as well as some bad lifestyle habits, such as smoking, can lead to CVD. However, previous studies mainly focused on limited factors and did not carry out comprehensive analysis and summary, especially for middle-aged and elderly people. This article mentions risk factors for disease, age, and lifestyle, and suggests some solutions related to education, self-management, and medication that are common among patients. In addition, some of the measures and policies implemented by many countries and organizations for the prevention and control of these diseases are discussed. This article provides a convenient reference for future studies to understand CVD and other related studies. In the future, we hope to reduce the mortality and morbidity of CVDs as much as possible through continuous research on CVD risk factors and treatment methods.

Keywords: Cardiovascular disease; risk factors; diabetes mellitus; hypertension; lifestyle habits.

1. Introduction

Cardiovascular diseases (CVDs) are a group of diseases affecting the heart and blood vessels including stroke, coronary heart disease, peripheral arterial disease and so on. They are one of the major health issues in the middle-aged and elderly population. As the aging of population is becoming more and more serious, CVDs should gain more attention due to their high rate of legality and disability for the middle-aged and elderly whose bodily functions are decreasing. Preventing, identifying, and controlling CVDs is conducive to improving the health status of the middle-aged and elderly, thereby reducing the medical cost of families or governments, and also helping people to better understand the public health policies corresponding to CVDs. The risk factors of CVDs have been studied and have had several

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achievements. For example, some health conditions, such as hypertension, diabetes mellitus, are essential risk factors for CVDs, while some bad lifestyle habits, including smoking, can also lead to stroke and other CVDs [1]. In addition, the decrease of hormone levels, mainly testosterone and estrogen can increase the risk of CVDs [2]. However, Previous studies focused on limited factors and did not carry out comprehensive analysis and summary. So, this essay aims to analyze the risk factors of CVDs in middle age and senior people and investigate effective measures. Through this study, this paper can not only provide help and a scientific basis for the identification of risk and prevention approaches of CVDs in middle-aged and elderly people but also can evaluate and support public health policies. In addition, the conclusion helps raise the awareness of middle-aged and elderly people and promote the formation of a healthy lifestyle, thereby reducing the incidence of CVDs.

By conducting a thorough analysis of existing literature, this paper aims to identify key risk factors that influence the development of CVDs in middle-aged and elderly adults, including lifestyle habits, disease and age three aspects. Furthermore, this article will analyze approaches for dealing with CVDs from two perspectives: education and self-management, drug prevention and treatment. Finally, in conjunction with public health policy at the social level, this paper will discuss the impact of public health policy on CVDs among middle-aged and elderly populations.

2. Risk Factors

2.1 Diseases

2.1.1 Type 1 diabetes mellitus

Type 1 diabetes mellitus (T1DM) has some causal relationships with CVDs. T1DM is a disease that usually occurs in childhood and adolescence which can have the effects all life time. A recent study indicates that T1DM can affect peripheral atherosclerosis and coronary atherosclerosis by using MR analysis, but they couldn't observe any association between T1DM and Heart Failure (HF), Atrial fibrillation (AF), Myocardial Intelligence (MI), stroke and so on. A two-step MR was used in the study to carry out mediation MR analysis to investigate potential confounding factors and has found that hypertension can take part in the causal association of T1DM on peripheral atherosclerosis as well as coronary atherosclerosis [3].

2.1.2 Type 2 diabetes mellitus

Type 2 diabetes mellitus (T2DM) is related with the development of CVDs as well, which is proved by other MR studies. The characteristics of T2DM is the resistance of insulin and a low efficiency of insulin secretion and it is usually diagnosed in middle age. Even though T2DM has the causal effect on CVDs, inconsistency exists on the association with AF as well as Ischemic Heart (IH) [4].

2.1.3 Hypertension

Hypertension is not only the potential confounding factor of T1DM, but also one of the main risk factors of CVDs. Blood pressure (BP) increases as age increases so that hypertension can be dangerous for the elderly. The causation between elevated BP and CVDs is very clear due to a series of impactful reports and one of the most essential report was predicated from 61 cohort studies, providing risk references from 12.7 million people [5]. It is found out that the increase of the death caused by CVDs is related with the higher systolic BP (SBP) and diastolic BP (DBP), above the normal ones of 115 and 75 mmHg respectively [5]

2.2 Age

Age plays an important role in the degradation of cardiovascular functionality, which means that old adults are more likely to develop CVDs. The increase of aging is also leads to a decrease in the body's functionality so that several conditions, including obesity and hypertension, have a higher possibility of existing and aggravate [2]. those conditions have causation with CVDs. In addition, the decline of estrogen and testosterone can cause deterioration of CVDs in both male and female [2]. Studies indicate that estrogen protect women from CVDs before menopause and after menopause, the morbidity rate increases steadily [2]. estrogen has the cardio-protective function in men as well. It has been indicated that males have the likelihood to develop CVDs approximately ten years earlier than females because of the decline of estrogen after adolescence. Testosterone is the main sex hormone in men, which can also exert cardio-protective function for men. the elderly are more likely to suffer from hypogonadism leading to low secretion of testosterone with other concurrent factors such as obesity. Low level of testosterone in older men has the causal effect to stroke as well as the mortality causing by CVDs [2]. In postmenopausal women, low levels of testosterone also has relationship with CAD.

Lots of behavioral and lifestyle risk factors, including physical inactivity, poor diet quality, stress, smoking and alcohol consumption, and poor sleep quality, can contribute to CVDs. Not having physical activities is a major risk factor for CVDs. In comparison to middle-aged adults, older persons had lower levels of physical activity and

higher rates of cardiovascular diseases (CVDs), according to a study on the impact of physical exercise on CVD risk in middle-aged and older adults. Moreover, a negative correlation between physical activity and the incidence of CVDs was noted across all age categories [6].

2.3 Diet Quality

Increased lethality rate and incidence rate are associated with dystrophy among older adults [7]. In a study on the relationship between dietary habits and CVDs risk in middle-aged and elderly people, the recent research progress on the relationship between lifestyle and CVDs is reviewed [8]. Our article uses one of the studies outlined in the study as an example to support the idea that poor diet quality is a risk factor for CVDs. The Health Professional Follow-Up Study summary states that since diabetes is a common risk factor for CVDs, western dietary patterns—higher intakes of fat and alcohol and lower intakes of grain fiber and magnesium—are strongly linked to type 2 diabetes (T2DM) and may raise the incidence of CVDs [8].

2.4 Smoking

In Australia, a study on the effect between smoking and the risk of CVD subtypes mentioned that smoking increases the risk of CVDs [9]. However, it is important to note that current and recent smokers have the highest risk of CVD related to smoking, compared to those who have never smoked or quit smoking a long time ago [9]. The longer and the more frequently a person smokes, the higher their risk of developing CVD [9]. Moreover, current smokers aged 45-64 have about three times the risk of AMI (acute myocardial infarction, one of the most critical CVDs) compared to never smokers, and the relative risk for those aged 80 and older being 1.65 (a hazard ratios, which uses to estimate relative risks for CVD results) [9]. Nevertheless, since the incidence of CVDs is much higher in elderly people, the absolute excess incidence of CVDs because of smoking is generally higher in the older population compared to the younger population [9].

According to a book called *Cardiovascular, Respiratory, and Related Disorders*, there is strong evidence that smoking causes atherosclerotic CVD and also increases cardiovascular risk associated with high blood pressure [10]. The development of metabolic syndrome, a collection of metabolic abnormalities including a high waist circumference, high blood pressure, abnormal blood sugar, and high lipid levels, which are also risk factors for CVD, is also made more likely by smoking-induced insulin resistance, centripetal obesity, and dyslipidemia [10]. Smoking was a more powerful independent predictor of cardiovascular and all-cause death in older individuals [10]. Pooled data from 25 cohort studies of more than 500,000 older adults (over 60 years of age) showed that current smokers had more than double the risk and former smokers had a 37 percent increased risk compared to never smokers [10]. Therefore, there is no denying that smoking is a risk factor for CVDs.

2.5 Sleeping

Data from an Indian study showed a significant association between sleep problems and CVDs in men [11]. Short sleep duration and poor sleep quality were independently associated with an increased risk of heart disease in a queue study of Taiwanese residents conducted between 1996 and 2014 [11]. A study examining bedtimes, sleep patterns, and the incidence of cardiovascular disease (CVD) in middle-aged and elderly Chinese individuals noted that individuals who go to bed early or late (after 10:00 p.m. and after 12:00 a.m.) have an increased risk of CVD, particularly stroke [12]. In addition, the article describes low-risk sleep patterns as having a nap lasting less than or equal to 60 minutes, going to bed between 10:01 p.m. and 12 a.m., and getting between 7 and 8 hours of sleep each night [12]. A study of Swedes showed that poor sleep quality in Swedes was associated with a higher risk of CVDs [12].

Overall, not only T1DM, T2DM, hypertension or other diseases have the effect on CVDs, but also the age itself can be the risk factors of CVDs related with many aspects. Some lifestyle habits including bad diet quality, smoking and sleeping have the causal relationship with CVDs.

3. Solutions and Therapies

3.1 Education and Self-management

Since smoking is known as a risk factor for CVDs, quitting smoking should be suggested and widely spread. It has been counted that the number of people smoking decreased from 42.6% in 1965 to 13.7% in 2018 in rate in the US [12]. However, healthcare providers should also take part in the smoking cession for guiding and support because the relapses for the individuals who try to quit smoking by themselves have the possibility of 80%-90% within 3 months and this number increases to 95%-97% in 6 months [13].

In addition, physical activities are associated with anesis of hypertension, diabetes mellitus and so on. It is proved that resistance training is likely to restrain the increases in BP via beneficial changes in vasoconstriction regulation, while high BP can be prevented by aerobic exercises through salutary influence in autonomic nervous system

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activities. Exercises promote insulin sensitivity which helps to reduce the morbidity of diabetes [14].

Epidemiological studies have already given some thought to the association between sleeping time and cardio-metabolic risks and have demonstrated that short sleep duration has a causal relationship with the development of diabetes mellitus, hypertension, CHD, and metabolic syndrome, which also appears in too long sleep duration [13]. So, it is suggested that 7-8 hours of sleep per day may have the best benefit [13]. Among the elderly, sleep is usually accompanied by sleep disorders, so screening of regular sleep apnoea should be provided to recognize the disorders as soon as possible and treat them before any other risk factors exist [13].

The relationship between dietary habits and CVDs risk factors have been studied by more and more researches. Individuals who have fried, high-saturated-fat, high-calories foods and sugary drinks a great amount have a higher possibility of about 56% of having CHD, while Mediterranean diet has been observed to be related with the anesis of hypertension, diabetes and so on, which can lead to development of CVDs [13].

3.2 Drug Prevention and Therapy

Since hypertension is common in the elderly and has hazard of CVDs, anti-hypertensive drugs should be taken into consideration. Nowadays, anticoagulant medication is used for AF which is widely spread in older adults and the prevalence increases when people become older [1]. The main drug are novel oral anticoagulants (NOACs) which are safer and as effective as warfarin which was used before [1]. High BP and AF are two of the risk factors of stroke which can be suppressed by lipid-lowering agents [1]. ST-segment–elevation MI (STEMI) is a kind of CAD and it leads to the damage of heart muscles which is not reversible [1]. AHA recommends to use early and continuous β-Blocker medication for all STEMI patients [1].

4. Measures and Politics

Nowadays, due to the fact that CVDs are the leading cause of death worldwide [15], many countries and organizations are implementing measures and policies aimed at preventing and controlling these diseases. There is a growing focus on addressing CVDs from both a national perspective.

First, this paper will take World Health Organization (WHO) as an example, to show the role of organization in preventing and controlling CVDs. WHO has proposed several plans and targets in its focus on CVDs.

A global mechanism to reduce the avoidable burden of non-communicable diseases was adopted by the WHO Member States in 2013. The Global Action Plan for the Prevention and Control of NCDs 2013-2020 is included [15]. Nine voluntary global objectives are used to reduce premature deaths from NCDS by 25% by the year 2025 [15]. Two of the goals focus directly on the prevention and control of CVDs. The global prevalence of raised blood pressure is expected to be decreased by 25% between 2010 and 2025, according to target 6 [15]. At least 50% of eligible people should be given medication and counseling to stop heart attacks and strokes from happening by 2025, according to target 8 [15]. Additionally, goal 9 aims to ensure that 80% of necessary technologies and medicines, such as generics, for treating common non-communicable diseases are accessible in both public and private healthcare facilities [15].

Second, this paper will take two documents which published in China and British as examples to show the role of countries in preventing and controlling CVDs.

The Central People's Government of China issued the implementation Plan of the Healthy China Action - Cardiovascular and Cerebrovascular Disease Prevention Action (2023~2030) in 2023. Aiming to further carry out the prevention and treatment of cardiovascular and cerebrovascular diseases and improve the effectiveness of the prevention and treatment of cardiovascular and cerebrovascular diseases in China [16]. In terms of caring for patients with CVDs, the document generally mentions the following points [16].

1. Strengthen cooperation between medical institutions and disease control agencies [16]. This will improve the quality of prevention and treatment of cardiovascular and cerebrovascular diseases, and provide ongoing training for medical personnel to better manage such diseases and associated risk factors [16].
2. Make good use of the combination of Internet and medical and health services [16]. The use of the internet technology to enhance the ease and effectiveness of medical care, allowing for the exchange of information between hospitals, encouraging the use of intelligent technology to prevent and treat cardiovascular and cerebrovascular diseases, and elevating the quality of community medical care [16].
3. Building an emergency system and strengthening emergency services, so that relevant medical personnel can ensure the rapid treatment of patients with cardiovascular and cerebrovascular diseases in emergency situations, and improve the success rate of treatment [16]. In addition, by 2030, all major hospitals should be able to perform a treatment technique called intravenous thrombolysis, and by establishing an "emergency map" to improve the efficiency of treatment [16].
4. Medical quality management is indispensable, improve

the treatment guidelines and operating norms of cardiovascular and cerebrovascular diseases, ensure the quality of medical services, and monitor and evaluate the quality of medical services, timely detection of problems and improvement, which is conducive to caring for patients with CVDs [16].

5. Strengthen clinical medical research and network building [16]. Support the research of cardiovascular and cerebrovascular diseases through national programs, encourage medical institutions and research centers to make scientific and technological achievements in this field, and improve the scientific and technological level of the prevention and treatment of cardiovascular and cerebrovascular diseases [16].

The British government has detailed instructions on the prevention of CVDs and made many recommendations to its people, such as diet, but what is presented here is a national policy on the prevention and treatment of CVDs. The prevention of CVDs can be divided into three levels, which together constitute a comprehensive prevention system [17]. Primary prevention is the most basic preventive measure to reduce the probability of CVDs in the population as a whole and to minimize the duration of the disease [17]. Secondary prevention is to detect signs of CVDs as early as possible, even if there are no obvious symptoms but also can be treated in time to prevent the development of the disease [17]. For people who already have CVDs, the goal of tertiary prevention is to reduce the risk of exacerbation or recurrence of the disease and to help patients maintain their normal ability to work and live [17].

Public Health England (PHE) plays an important role in this process. PHE needs to review the available evidence to identify effective ways to prevent CVDs, develop evidence-based plans for interventions that target risk factors for CVDs to implement these programs with different partners and evaluate the results, to advocate and promote effective prevention policies to improve the health of the entire population and to work to address the social inequalities associated with CVDs, such as ensuring that all people have access to necessary prevention services and resources [17]. Simply, PHE's job is to ensure that everyone can prevent the onset and progression of CVDs through a healthy lifestyle and timely health care through a variety of means and partners [17].

From the data in CVD Statistics 2017, published by British Heart Foundation, it can be concluded that the number of cases of all diseases of the circulatory system (I00-I99) from 2015 to 2016 calculated in 2017 was 1,767,552 [18]. From the data in Heart & Circulatory Disease Statistics 2019, published by British Heart Foundation, it can be concluded that the number of cases of all heart and circulatory diseases (I00-I99) from 2017 to 2018 calculated in 2019 was 1,721,922 [19]. So, when comparing the two numbers, it is evident that the second one is lower than the first one. Therefore, in terms of the incidence of CVD, it can be concluded that the policy is indeed having a significant impact.

5. Conclusion

CVDs are the main cause of death and disability among the elderly. In this article, risk factors including diseases, age and lifestyle habits are mentioned and some of the solutions are provided which are related with education, self-management and drugs, which are quite common among patients. Also, some measures and policies which are implemented by many countries and organizations, aiming at preventing and controlling these diseases are talked about as well. Through this article, it can be more easy for other studies to look for about CVDs and to find other relevant studies. However, the health condition of older adults cannot be as fine as young people, so there are more concurrent risk factors of CVDs, including hypercholesterolemia, hyperuricemia and so on, which make it harder for the studies to sum up all the factors. In addition, there are a lot of therapies on the market. some of them have proved to be useful while others are not, so mentioning all the solutions is difficult too. In the future, we hope that the mortality and morbidity of CVD decrease as much as possible by continuous studies of their risk factors and therapies.

Authors Contribution

All the authors contributed equally and their names were listed in alphabetical order.

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