

Strategies, detection, and prediction of cardiovascular disease of elderly people in public health

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Abstract. Cardiovascular disease (CVD) is the chronic disease with the highest mortality rate among the elderly in China, and also has a very high prevalence rate, posing a major threat to the health and economy of the elderly. Many improvements are currently underway in China to face the prevention, control and treatment of cardiovascular disease in the elderly. These include measures such as regular medical check-ups at community sites and the popularization of early symptoms of CVD. All these measures have played a positive role in improving CVD among the elderly in China. However, there is a lack of an article to summarize the measures taken in China. This article analyzes the database of studies on CVD in Chinese older adults, summarizes existing CVD prevention, detection, and treatment protocols for older adults in China; and analyzes the strengths and weaknesses of China's current CVD response. Finally, the paper looks at future CVD responses in China and summarizes newly enacted CVD-related policies in China. This paper summarizes the literature on CVD in the elderly in China, which provides a more convenient reference for future research, but it cannot predict China's CVD response or future situation, and future research can make suggestions for improving China's current CVD response based on the literature review.

Keywords: Cardiovascular disease, public health, elderly people.

1. Introduction

Cardiovascular diseases (CVDs) are a group of disorders of the heart and blood vessels [1]. It includes high blood pressure, myocardial infarction, atherosclerosis, arrhythmia, valvular heart disease, stroke, and other health problems.

CVD is a serious disease that causes physical discomfort for the patient. CVD can cause fatigue, sleep disorders, breathing problems, chest tightness, chest pain, and other symptoms that can have a significant impact on a patient's standard of living [2]. Apart from physical health, CVD also causes a huge financial burden on the family. As a chronic disease, CVD requires regular reviews and long-term treatment, incurring a large amount of medical expenses for the family. In 2003, this disease burden caused a direct loss of 209 billion yuan (\$26.1 billion). By 2020, the cost per hospitalization due to in China will increase to RMB 11,992.87 (US\$1,900.61), with total expenditures reaching RMB 2.2 trillion (US\$348.65 billion) [3]. Therefore, it is particularly important to prevent, diagnose and treat CVD diseases.

CVD is one main cause of death of chronic diseases among the elderly in China. The incidence of CVD is associated with many factors, including unhealthy lifestyles and the accelerated aging of our

population. The most important determinant of cardiovascular health is a person's age. The older a person is, the greater risk of developing CVD. Therefore, society should pay attention to the health condition of the elderly and take timely measures to deal with possible cardiovascular and cerebrovascular diseases.

Recently, China has taken a series of preventive measures in the face of such a public health problem. For primary prevention, including public awareness and education among the elderly. There is an extensive number of campaigns to raise awareness of the problem. The risk factors include hypertension, diabetes, dyslipidemia, etc. By educating the general public about the risk factors, the public will have a healthy lifestyle and decrease the probability of CVD [4]. Furthermore, China has focused on the communication of CVD to the population. It can effectively convey the change in lifestyle and adherence to preventive measures of the public. Last but not least, there are some environmental factors [4]. Air pollution has significant effects on the risk of CVD, by protecting the atmosphere and living in an environmentally friendly, CVD case numbers decrease as well. Apart from primary prevention, China did secondary prevention. Including medication adherence, regular screening and monitoring, and programs aiming at improving the management of CVD levels. All of these comprehensive measures are taken by the Chinese government. These policies can target CVD, and integrate public policies, community engagement, and clinical interventions to improve the management of CVD.

CVD is now becoming a major public health concern, and more and more people are recognizing the dangers of CVD. Significant progress has been made in CVD research, but there are still some important research gaps and challenges in prevention, detection, and diagnosis that need to be further explored and addressed. This article will provide an overview of preventive, diagnostic and therapeutic measures to help patients and relatives cope better with CVD.

2. Case study

2.1. Profile of the elderly population studied

The high-risk CVD in elderly people is characterized by a combination of age-related changes, comorbidities, and lifestyle patterns. The age-related change includes physiological aging. Jennifer L. Rodgers etc. mentioned that the increasing oxidative stress and inflammation contributes to the onset and manifestation of CVD in aging people. Reactive oxygen species are associated with the development of CVD and the production of reactive oxygen species increases with age. Oxidative stress (including excessive ROS production during cardiac aging) leads to mitochondrial dysfunction, and therefore cardiac aerobic metabolism and function are compromised, promoting cardiac aging, and moreover leading to atherosclerosis, which triggers the development of CVD [5]. In addition, the elderly heart also produces pro-inflammatory markers, including IL-6 and TNF α [6]. These inflammatory factors lead to hypertrophy and fibrosis of the heart, which ultimately leads to cardiac dysfunction.

CVD is a complication of many common diseases in old age. Jennifer J. Rodgers, etc. mentioned that diabetes mellitus is associated with a higher risk of cardiovascular complications. Patients have an extremely high coverage of vascular complications, and diabetic myocarditis is a major cause of morbidity in diabetic patients [5].

The lifestyle patterns influence the risk of CVD among elderly people. The diagnosis of CVD is higher in older adults who drink alcohol, smoke, are obese, or have diabetes or hypertension. Marseglia L., etc. mentioned that obesity is associated with oxidative stress, so obesity can also cause hypertension, high blood sugar, and high cholesterol, which can lead to an increased risk of cardiovascular complications [7]. Smoking is a major cause of CVD. Smoking leads to elevated levels of triglycerides, which can lead to atherosclerosis. Smoking also makes the blood thicker and more prone to clotting, and it also narrows the blood vessels and damages the cells lining them, among other things [8]. Similarly, figures out Roerecke figures out that alcohol consumption contributes to atherosclerosis and inflammatory responses, which is a high risk factor for CVD [9].

2.2. Findings

In conclusion, age in the elderly is an independent influence on CVD. In addition to this, chronic diseases that are common in older people can also lead to CVD complications, such as diabetes. Higher blood pressure, high cholesterol, etc. And poor lifestyle habits of the elderly, such as smoking, alcohol consumption, obesity, etc., will increase the risk of CVD. Therefore, avoiding these CVD high-risk factors can help older adults guard against CVD.

3. Current situation of Chinese CVD control

Since we already know some of the major influences on CVD in older adults, we can manage these influences to reduce the risk of CVD in older adults. China has also taken many measures to control the number of CVD in the elderly. For example, it has upgraded the technology for CVD treatment, emphasized community education and publicized the seriousness of CVD, and updated The 2023 China Guidelines for Lipid Management, which is a risk assessment for CVD aimed at improving CVD awareness, treatment, and control rates [10]. However, China's response to CVD in the elderly is still lacking.

3.1. Limited early detection methods

China faces significant challenges in the early detection of CVD among its elderly population. The challenges in early detection of CVD includes insidious nature of risk factors and lack of primary prevention strategies.

Many of the high-risk risk factors for CVD, such as hypertension, dyslipidemia, and diabetes, are diseases that typically progress without noticeable symptoms. As a result, this makes it tough to detect CVD in its early stages. When these diseases have progressed to a certain point they can lead to vascular damage and the development of severe CVD, such as myocardial infarction and stroke. Thus, this late detection complicates early intervention and increases the burden of CVD. However, China currently lacks measures for early CVD detection [11].

For the primary prevention strategies, China currently lacks specific guidelines and expert consensus on CVD prevention for the elderly. Existing guidelines are not targeted to address the situation of older adults with different comorbidities, and are therefore lacking in early prevention [12]. At the same time, Jian Yongm Dong Lin, and Xue-Rui Tan, mentioned in their article that due to the large population base in China, more treatment and publicity about CVD is geared towards the general public, and there is a lack of individualized prevention and care needs [12]. Because different older adults have different physical conditions, primary detection methods require the development of personalized treatment plans that take into account the older patient's own clinical presentation and underlying medical conditions. This personalized treatment has also not been integrated into CVD clinical care in China.

3.2. Challenges in predicting cardiovascular progression

China faces a number of challenges in predicting disease progression, including complexity stemming from CVD and the limitations of current predictive models. As mentioned in the article by Shazia Rehman et al, CVD can lead to many complications. The symptoms and degree of progression of these complications also have an impact on CVD, so different factors converge to make the course of CVD difficult to predict [13]. So more accurate models are needed to predict it, but this is something that is currently lacking in the technical field. Moreover, current prediction models do not target some specific populations. For example, the Framingham Risk Score and the European SCORE Risk Charts are not good predictors of CVD in Chinese due to environmental, social, and genetic factors. Jiang et al. mentioed that these models often underestimate the risk in specific populations, especially for Uyghur and Kazakh Chinese [14]. Therefore, China currently needs a CVD analysis model adapted to the domestic situation to help predict the disease progression of CVD in the elderly. China needs CVD prediction models specifically tailored to the Chinese elderly population that take into account unique risk factors and disease patterns.

3.3. Access barriers to healthcare

The main barriers to healthcare in China are cognitive and financial, as CVD is not sufficiently prevalent in the middle-aged and older age groups, so many people do not understand the seriousness of CVD. Xi Li et al. mentioned that there are significant gaps in awareness and knowledge of CVD amongst patients as there is still a lack of education about CVD. Most elderly patients are unaware of their CVD condition and the importance of regular checkups and adherence to treatment. Therefore, this lack of awareness leads to delays in diagnosis and treatment, which prevents timely treatment options for CVD and has serious implications for subsequent recovery [15]. Thus, China needs to target communities to publicize the seriousness of CVD, to educate middle-aged and elderly people on how to prevent CVD, as well as to detect and treat CVD in a timely manner.

People in mountainous or suburban areas in China face financial barriers since CVD causes severe financial burden to them. The cost of CVD treatment includes medical fees, hospitalization, medication, and surgery, among other things, and although China's social health insurance covers some of these, the cost of CVD treatment is still beyond the means of some low-income people [16]. As a result, the cost of CVD treatment is also a Barrier to healthcare for some segments of the Chinese population. This issue is urgent, but also faces many institutional and practical difficulties in China.

In the face of these shortcomings in CVD prevention and treatment in China, China has taken a number of measures to help prevent and treat CVD in the elderly and to reduce the potential patients of CVD.

4. Suggestions

4.1. Regular screening programs

China has implemented several regular screening programs to address the growing burden of CVD. China launched an early screening and intervention program for people at high risk of CVD in 2014. The Writing Committee of the Report on Cardiovascular Health and Disease in China chose a randomized sample of people aged 35-75 years to identify high-risk groups and implement interventions to prevent CVD [17]. China has also launched a number of chronic disease risk factor testing programs to identify high-risk factors and help prevent CVD. A number of community-based screening programs have also been conducted in China by Linssen, A. M. et al. These programs have been found to be effective in the early detection and prevention of CVD. Therefore, a very effective measure for the prevention and early detection of CVD is regular screening. Communities should encourage middle-aged and elderly people to undergo regular medical checkups to detect CVD in a timely manner and to understand their own health conditions, which is very effective in the diagnosis and treatment of CVD.

4.2. Technology integration for monitoring

China has been researching new technologies to better treat CVD. China has developed wearable sensors and mobile health applications (mHealth), which are used to detect cardiovascular health [18]. They can finely detect cardiovascular blood output, blood pressure, blood oxygen, heart rate and other biosignals to provide comprehensive monitoring. Thus the physical condition and physiological indicators of people with CVD can be monitored in a timely manner, which can help doctors to better track the patient's physical condition to develop a customized treatment plan. Meanwhile, China is also starting to improve the accuracy and actionability of CVD testing using AI technologies that analyze data from the above wearable devices and provide personalized care plans.

The Chinese government has launched several new programs to promote the use of emerging technologies in CVD. The "Healthy China 2030" plan emphasizes measures to transform CVD prevention and treatment through scientific and technological innovation, effectively promoting new technologies [19]. The establishment of chest pain centers and cardiac rehabilitation centers has also been of great help in the treatment of CVD. All of these national plans have had a positive impact on the prevention and treatment of CVD.

4.3. Promoting healthy lifestyle interventions

China has developed a number of policies to promote healthy lifestyle interventions to address CVD, including the aforementioned “Healthy China 2030” and the Healthy China Initiative. At the same time, China has also established community-based primary prevention and set up national demonstration zones for comprehensive chronic disease prevention and treatment. By 2020, China will have established 488 cardiovascular risk factor management zones for residents, as well as special clinics for hypertension intervention, focusing on the treatment of CVD [20]. China encourages healthy diets and reduced consumption of meat and lipids, and also popularizes and informs the masses about the effects and dangers of CVD through big data on the Internet.

5. Conclusion

China has taken various measures to address CVD, including public health initiatives targeting risk factors and efforts to improve the clinical management of CVD. However, there are some shortcomings, including inadequate medical care, difficulties in prevention due to complex etiology, and inability to detect disease in a timely manner. However, China has adopted a series of ongoing programs to address the significant impact of CVD on the population, with the hope that scientific and technological advances and policy changes will lead to the prevention and treatment of CVD, reduce the risk of CVD among the elderly and help keep people healthy through effective prevention and regular medical checkups, early detection and treatment of CVD. Finally, to reduce the growing burden of CVD, China needs to prioritize targeted CVD prevention and control strategies, improve healthcare equity, and increase utilization of preventive treatments. Addressing these challenges will require concerted efforts from all segments of society, including the government, healthcare providers, and the public. Effective management of CVD risk factors and continued investment in healthcare infrastructure will be critical to reducing China's future CVD burden.

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