

Research on Effects of Dietary Intervention on Blood Pressure, Plasma Lipid and Blood Glucose of Patients with Coronary Heart Disease

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ABSTRACT. To investigate the effect of dietary intervention on blood pressure, blood lipid and body mass index in patients with coronary heart disease. Methods: 100 patients with coronary heart disease were recruited and randomly divided into control group (50 cases) and dietary intervention group (50 cases). The blood pressure, blood lipid and body mass index of patients with coronary heart disease before and after dietary intervention were compared. Results: After the intervention, the systolic blood pressure, diastolic blood pressure, total cholesterol level and other eight indicators of the two groups were improved, and the intervention group was significantly better than the control group, the difference between the two groups was statistically significant ($P < 0.05$). Conclusion: The dietary intervention for six months can effectively control the blood pressure, blood sugar and blood lipids of patients with coronary heart disease, which can be used as a useful reference to improve the health status of patients.

1. INTRODUCTION

According to *China Cardiovascular Health and Disease Report 2020*, at this stage, the number of people suffering from cardiovascular diseases in China is up to 3.3 billion, and the number of people suffering from coronary heart disease is 11.39 million, ranking second only to the number of people suffering from stroke. Coronary heart disease has gradually become one of the public health problems in China, and the means and methods to prevent and treat coronary heart disease need to be improved. The high recurrence rate of coronary heart disease cannot be ignored. Big data survey shows that the rate of re admission of Chinese patients with acute myocardial infarction due to cardiovascular events such as angina pectoris and heart failure within 30 days after discharge is 3%. Because of its high incidence rate, recurrence rate and mortality rate, the proportion of medical resources occupied by coronary heart disease patients is high, and cardiovascular diseases such as coronary heart disease have become the main medical burden in developed and developing countries [1].

Research shows that hypertension, overweight or obesity are common risk factors of coronary heart disease, which have an important impact on the incidence rate and mortality of coronary heart disease. Setting daily control standards for health indicators such as blood pressure, blood lipid and body mass index (BMI) for confirmed cases of coronary heart disease has a certain significance in the prevention of myocardial infarction and heart

failure and improving the quality of life of patients [2]. With the promotion of medical science, the public's awareness of disease prevention and control continues to increase, and dietary intervention is one of the basic nursing strategies for secondary prevention of coronary heart disease. As the cornerstone of secondary prevention of coronary heart disease, changes in lifestyle such as diet are of great significance for prolonging the life of patients with coronary heart disease. A large number of evidences based medical evidence shows that a healthy diet such as the Mediterranean diet featuring adequate intake of fruits and vegetables, nuts, beans, moderate intake of high-quality protein and a small amount of animal fat can effectively delay the progress of coronary heart disease and reduce the mortality of coronary heart disease. The guidelines of all countries include diet management in the primary or secondary prevention of coronary heart disease. The American Heart Association (AHA) listed healthy diet as one of the top ten important information in the *Primary Prevention of Cardiovascular Disease released in 2019*. How to improve the diet behaviour of patients with coronary heart disease and improve the diet compliance of patients with coronary heart disease has become the focus of attention. Diet control is a complex behaviour affected by many factors, and the causes of which have not been determined in the academic community. Research has proved that the determination of belief is a prerequisite for behaviour change. If we want to promote patients' behaviour change, we should first explore the causes of their behaviour [3]. As one of the

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classic theories of behaviour change theory, health belief model is an important concept to analyze human health behaviour. Therefore, for patients with coronary heart disease, dietary intervention with low economic cost but high health benefits may become an effective chronic disease control measure worth considering. The purpose of this study was to explore the effect of dietary intervention for months on blood pressure, blood lipid and BMI in patients with coronary heart disease.

2. RESEARCH OBJECTS AND METHODS

2.1 Research objects

Recruitment information was publicized through the hospital bulletin board, the hospital's official account and other channels. A total of 100 subjects were recruited among admitted coronary heart disease patients, including 69 males and 31 females; Age 33-71 years old. The inclusion criteria were coronary heart disease patients who volunteered to participate in the study and signed an informed consent form. We randomly divided the recruited patients into two groups: control group and dietary intervention group. Coronary artery (coronary artery) angiography is used as the diagnostic standard of coronary heart disease. If the patient's coronary artery stenosis is more than 50%, it can be considered as coronary heart disease. The research scheme of this intervention was discussed, reviewed, and approved by the hospital ethics committee. The follow-up survey and relevant intervention measures have been informed by the subject or family members [4]. Exclusion criteria for subjects: secondary abnormal blood pressure and blood lipid. Patients with other serious cardiovascular diseases. Take anti thyroid and other drugs that affect blood lipid metabolism. Long term bed rest cannot cooperate with blood pressure, blood lipid and related examinations. Thyroid disease. Immune diseases. Patients with advanced malignant tumors [5].

2.2 Research methods

On the basis of routine clinical nursing and treatment, the patients were randomly divided into two groups: control group (n=50) and dietary intervention group (n=50). As for the control group, routine drug guidance was maintained and dietary health education was given to the patients through oral education, but no intervention was made to the patients' personal diet or meal choices. For the dietary intervention group, the intervention measures are as follows:

(1) Diet plan: The diet plan is provided by the nutrition department of the hospital, and dietary intervention measures that meet the nutritional needs and personal taste of patients are formulated. The general principle is to control the intake of saturated fatty acids and calories in daily diet and increase the intake of grain fiber foods. At the same time, according to the height, weight, blood pressure and physical activity of the patients, the health

intervention diet for the individual conditions of the subjects is formulated according to the food exchange method. Carbohydrate accounts for 0%~70% of the total calories, protein accounts for 1%~15%, and fat accounts for 0%~5%. Lipid foods rich in eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are selected. Lipid foods rich in saturated fatty acids are not eaten, and cereal products with enough fiber are supplemented. The intake was 3U/d, and the salt intake was reduced to 6g/d.

(2) Bedside nutrition prescription hanging: compare the average intake of each nutrient obtained with the daily dietary nutrient supply (RDA) recommended by the Chinese Nutrition Society, formulate a week diet according to the season, rehabilitation status and eating habits, instruct the cafeteria to make nutritious meals, hang them on the patient's bedside, update them once a week, and write a nutrition prescription for nutritional health consultation [6].

(3) Education and supervision: Nurses and doctors in charge take various forms of education to guide and demonstrate patients on the spot with knowledge such as treatment instructions, dietary prescriptions, and dietary precautions, and integrate nutrition prescription education into treatment operations to help patients understand the purpose of treatment and adhere to standardized dietary behaviour. At the same time, the responsible nurse shall carry out meal inspection once a week, give affirmation and rewards to those who meet the requirements, and persuade and correct those who fail to meet the requirements [7].

(4) Family participation: Organize a monthly communication meeting for patients and their families, give play to the role of family help and social support, encourage and urge patients emotionally, and help improve the compliance of subjects to the intervention measures. During the whole intervention stage, the researchers will determine the frequency and intake of core intervention food according to the height, weight and daily condition of the subjects, and adjust them according to the conditions of the subjects to ensure that the individual metabolism reaches the best state. At the same time, participants can upload photos of each meal, record the intervention diet and view the food type and specific frequency. The intervention period was six months [8].

2.3 Observation indicators

All patients used the same method to measure relevant observation indexes at the time of enrollment and follow-up: (1) Systolic blood pressure and diastolic blood pressure: blood pressure was measured with a desktop sphygmomanometer, repeated times, and the average value was taken. (2) Biochemical indicators: Take 10mL of venous blood on an empty stomach in the morning for laboratory testing of patients' blood biochemical indicators, including triglycerides (TG), total cholesterol (TC), high- and low-density lipoprotein cholesterol (HDL-C, LDL-C) and other items. (3) BMI: measure the body mass and height of the patient, and calculate the BMI of the patient according to $BMI = \text{body mass} / \text{height}^2$ (kg/m²). (4) Fasting blood glucose (FBG): Fasting blood glucose

refers to the blood glucose value detected in the plasma collected before breakfast after overnight fasting (no food for at least 8-10 hours, except drinking water), which can reflect the function of pancreatic islet B cells, generally indicating the secretion function of basic insulin, and is the most used detection indicator for diabetes. We used statistical software SPSS 20.0 to process and analyze the data. If it is measurement data, it shall be expressed by $\bar{x} \pm s$, and t test shall be adopted; If it is counting data, it is expressed as rate (n,%), and the comparison between groups is χ inspection. Take $P < 0.05$ as the standard of whether the difference is statistically significant.

3. RESULTS AND ANALYSIS

3.1 Results

Among the 100 recruited subjects, cases withdrew before intervention, 50 cases in the control group and 50 cases in the dietary intervention group. After dietary intervention, 0 patients withdrew from the intervention group and 0 from the control group due to personal reasons. Finally, 100 patients in the control group and patients in the dietary intervention group completed the entire intervention study. We investigated the 8 indicators of the control group and the experimental group before the intervention.

After 6 months of intervention, the weight and systolic blood pressure of patients in the dietary intervention group were significantly lower than those before intervention, and the levels of TG, TC and LDL-C were also significantly lower than those before intervention, with statistically significant differences ($P < 0.05$). The results of control group and experimental group before and after intervention are shown in table 1.

Table 1. Indicators of control group and experimental group before and after intervention (table credit: original)

Item	Unit	Control group		Experimental group		P value
		Before intervention	After intervention	Before intervention	After intervention	
Systolic pressure	mmHg	143.72±15.67	141.12±13.17	145.83±12.96	141.03±11.16	<0.05
Diastolic pressure	mmHg	87.62±10.41	85.12±9.71	88.96±11.12	82.36±9.51	<0.05
BMI	kg/m ³	25.74±3.23	26.14±2.79	25.47±5.26	25.26±4.31	<0.05
TC	mmol/L	4.25±1.89	4.15±0.99	4.15±3.97	3.98±2.87	<0.05
TG	mmol/L	1.82±0.65	1.79±1.01	1.65±0.62	1.61±0.69	<0.05
LDL-C	mmol/L	3.45±0.43	3.98±0.21	3.48±0.51	2.11±0.61	<0.05
HDL-C	mmol/L	1.05±0.31	1.06±0.41	1.02±0.23	1.21±0.33	<0.05
FPG	mmol/L	8.72±1.24	8.55±1.12	8.12±1.15	6.28±1.28	<0.05

3.2 Analysis

Coronary heart disease is a disease that seriously endangers individual health and causes heavy burden. It can be used as one of the important risk factors to induce cardiovascular and cerebrovascular accidents. In addition to genetic factors, the occurrence of coronary heart disease is also closely related to obesity, hypertension, dyslipidemia, unhealthy lifestyle, unhealthy diet and other factors [9]. Promoting the change and progress of their lifestyle is one of the basic treatment methods to prevent and control coronary heart disease, and the composition and improvement of dietary structure can be considered as a key point. Studies have shown that carbohydrate can effectively reduce the content of blood lipids in the body by replacing fat diet. At the same time, 5% weight loss can improve the situation of steatosis and insulin resistance. When an individual loses 7%~9% weight, it can reduce the risk of vascular inflammation and other

histological diseases. This study conducted a randomized controlled trial on coronary heart disease patients in the hospital, and found that the weight of patients in the intervention group was significantly lower than that before the intervention. Although there was no significant difference between the intervention group and the control group, it also suggested that dietary intervention could be one of the reference ways to help patients with coronary heart disease effectively control their weight and reduce the risk of recurrence. In addition, dietary intervention in this study can significantly reduce the systolic blood pressure, TG and TC of patients, and play a better risk control role in the development of coronary heart disease. There is a close relationship between diet and coronary heart disease. When individuals consume too much animal fat, cholesterol, sugar and salt, the risk of coronary heart disease will be significantly increased. The dietary intervention plan of this study is mainly to limit carbohydrate diet, and appropriately add plant lipids in the design of dietary structure. Although the effect on

controlling body weight, BMI and lipoprotein cholesterol level is not significant, it has a positive performance on controlling patients' systolic blood pressure and blood lipids, which has obvious advantages over the ordinary diet [10].

4. DIETARY RECOMMENDATIONS FOR PATIENTS WITH CORONARY HEART DISEASE

4.1 Grain and beans

It is a traditional dietary pattern in China to take cereals as the main body of diet. The survey shows that the average daily intake of cereals per standard person is 378g, which is in line with the recommended intake of dietary pagoda. The intake of different gender and age groups was relatively balanced, with no statistically significant difference. Among the types of grains and cereals, the intake of rice and its products in female patients and the elderly group is lower than that in male and middle-aged and elderly groups, which may be related to the older age of women in this survey. It is suggested that targeted education should be carried out for men. Increasing the amount of coarse and miscellaneous grains can not only increase the intake of B vitamins, but also contain rich dietary fiber, which has a positive significance in reducing blood lipids. Beans have a low glycemic index and are rich in high-quality protein and unsaturated fatty acids. They are a high-quality food for elderly patients with coronary heart disease. The survey shows that the average daily intake of beans per standard person is 195g, which is significantly less than the recommended 5-35g intake of diet pagoda [11]. It was found in the survey that patients with beans and their products are more likely to accept them, but the frequency and amount of consumption are less, which suggests that we should continue to promote the importance of balanced diet in the diet pagoda. Eating more beans and their products is of positive significance for protecting cardiovascular health. While advocating to eat more vegetables and fruits, patients are also encouraged to eat more whole grain food and increase dietary fiber intake from different food categories to prevent coronary heart disease.

4.2 Vegetables and fruits

Vegetables and fruits are an important part of human balanced diet and play an important role in protecting cardiovascular health. Vitamins, minerals, polyphenols, and other bioactive substances contained in them can reduce the risk of atherosclerosis. The recommended intake of vegetables and fruits in Chinese diet pagoda is 300-500g and 200-350g respectively [12]. The survey showed that the average daily intake of vegetables and fruits for patients with coronary heart disease was 3087g and 157g, respectively. The intake of fruits was significantly less than the recommended amount. The intake of vegetables and fruits in men is significantly less than that in women between different genders, which may

be related to the fact that men like to eat animal food and the relatively low intake of vegetables and fruits. In different ages, the intake of fruit in the elderly group is higher than that in the middle-aged and elderly group, which may be related to the fact that older patients pay more attention to balanced diet and consciously increase the intake of fruit. For the choice of vegetables and fruits, the National Academy of Sciences recommends that each person eat 5 portions (about 80g each) of different kinds of vegetables and fruits every day, especially green and yellow vegetables, and citrus fruits [13]. The average intake of melons and fruits in this survey was the largest, 159g, which was higher in women than in men. The second is leafy vegetables, 1007g; The rhizomes are the least, only 388g. The average intake of pickled vegetables is 101g, which may be related to the salt preference and taste preference of residents in Tianjin. The salt content of pickled vegetables is high, and long-term consumption will increase the risk of chronic diseases such as hypertension. For patients with coronary heart disease, we should not only encourage them to increase the intake of vegetables and fruits, but also suggest them to choose dark green vegetables, yellow and red fruits, and try to reduce the consumption of pickled vegetables, which has a more positive significance in preventing coronary heart disease.

4.3 Animal foods

Animal food, including livestock and poultry meat, fish and shrimp, eggs, milk, and its products, mainly provides protein, fat, minerals, vitamins, etc. for the human body, and is also the main source of high-quality protein. The results of this survey show that the animal food intake of patients with coronary heart disease is relatively rich, but the consumption of different types is significantly different. The average daily intake of livestock and poultry meat per standard person is 891g, which is 40-75g higher than the recommended amount of diet pagoda. The average daily intake of male meat per standard person is significantly higher than that of female meat, which is 1114g; The intake of the middle-aged and elderly group was also significantly higher than that of the elderly group, suggesting that the middle-aged and elderly men preferred meat. The consumption of pork in livestock and poultry meat is the highest, with an average of 51g, among which the highest consumption of male is 48g. Excessive meat intake of livestock and poultry will increase fat intake and increase the risk of obesity, coronary heart disease and hypertension [14]. Fish and shrimp are rich in unsaturated fatty acids, which can reduce blood viscosity, improve blood microcirculation, lipoify cholesterol, and reduce cholesterol in blood. The fish and shrimp intake of the patients in this survey was significantly lower than the recommended 40-75g/day, the average daily intake per standard person was only 311g, and the fish and shrimp intake of women was lower, which was 9g. It is suggested that the intake of livestock and poultry meat, fish, and shrimp in patients with coronary heart disease is not balanced. The intake of red meat should be reduced appropriately, the benefits of fish and shrimp should be vigorously publicized, and the intake of fish and shrimp

should be encouraged to increase. Eggs are easy to digest and absorb, and the yolk is rich in cholesterol. Excessive cholesterol intake will increase the risk of cardiovascular disease. The intake of eggs in this survey exceeded the recommended amount of diet pagoda, and the intake was relatively average among different genders and ages, suggesting that the intake of other high-quality proteins can be increased while ensuring adequate egg intake to avoid excessive cholesterol intake [15].

4.4 Salt and grease

The salt intake of patients with coronary heart disease is still higher than the recommended intake, with an average intake of 108g per standard person day, and 115g for women than men; The increase of salt intake with age may be related to the deterioration of taste function in elderly patients. Excessive sodium intake is one of the main risk factors for hypertension. Hypertension is an important risk factor for cardiovascular disease. For patients with coronary heart disease, it is necessary to continue to publicize the benefits of low salt diet, reduce the intake of high salt foods (pickles, soy sauce, etc.), and reduce the sodium intake of patients by encouraging the selection of low sodium salt and distributing salt spoons, which will play a positive role in reducing the occurrence and development of disease. The average oil intake of the patients was 337g, of which the female intake was the most, which exceeded the recommended amount of dietary pagoda less than 30g. In this survey, high-fat diet still exists in patients with coronary heart disease. Many patients live with their children, and too much oil intake is easy to be ignored, while too much oil intake will increase the risk of overweight/obesity. It suggests that our families of coronary heart disease patients are also educators of healthy diet, encourage them to cook food in different ways, continue to distribute oil control kettles, and widely carry out nutritional diet guidance in grass-roots communities.

5. CONCLUSION

In this study, targeted measures based on the individual differences of patients were formulated by using optimal dietary intervention, which can maximally correct the bad dietary structure and bad eating habits, effectively avoid the persistence of high-risk factors for disease occurrence to improve the effect of interventional surgery and improve the overall prognosis. The results of this study showed that after intervention, the indexes of blood pressure, plasma lipid and blood glucose were lower than those before intervention and in the control group. This shows that the optimized diet intervention can effectively control the physique of patients with coronary heart disease after interventional therapy. Dietary intervention can effectively control the blood pressure, plasma lipid and blood glucose of patients with coronary heart disease. Hospitals and communities should strengthen the scientific popularization of dietary intervention among patients and high-risk groups, do a good job in health education, advocate adhering to healthy eating habits, and

constantly optimize the clinical treatment and community prevention and control of coronary heart disease.

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