

Study of The Mediterranean Diet and Its Significance for Hypertension Prevention

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Abstract. The Mediterranean diet is known for its association with reduction in cardiovascular risk, there are some previous studies conducted on the population of this diet that explored and discovered the negative association between several cardiovascular conditions and this diet including hypertension. The issue of hypertension is getting to concern in China because of the unbalanced dietary model and low public awareness. The essential idea of this study is to examine the principle of Mediterranean diet, compare the nutrient intake between the Mediterranean diet population and Chinese diet population to address the differences between the two dietary patterns. The paper also aims to find possible modifications to the Chinese dietary model based on the principle of the Mediterranean diet as potential treatment for hypertension. The result of the study finds the Chinese population generally consumes less fat, vitamins and minerals compared to the Mediterranean diet population. The differences between the urbanization process between the rural and urban area leads to higher dietary lead intake for the urban populations from processed food and therefore increases the risk for hypertension. It is important for the Chinese government to take actions to increase the public awareness of hypertension and provide more educational sources on how to keep a well-balanced diet. Moreover, the Chinese government should also consider making new regulations on processed food to prevent excessive dietary lead intake of the urban populations. More future guidance should be provided in order for the Chinese population to have a better adjusted diet.

Keywords: Mediterranean diet, Hypertension, Nutritional component.

1. Introduction

With the development of society and the increase of urban population, the proportion of patients with hypertension is increasing year by year. Hypertension is a low-grade inflammatory response that has now become a common chronic disease. Hypertension is strongly associated with dietary patterns. It is mainly related to the intake of nutrients such as sodium, potassium, saturated fat, and carbohydrates. The Mediterranean diet (MD) has been shown to be effective in reducing morbidity and mortality from hypertension. The mainstays of the MD are a range of plant-based foods, like grains, fruits, nuts, vegetables. Red meat and dairy goods were less frequently consumed.

In addition to the MD, some comparisons of the effects of the DASH diet with the MD on hypertension were included. The DASH diet is designed to avoid high sodium diets, low intake of salt, and saturated fat is its feature. Increased consumption of plant proteins, whole grains, vegetables, fruits, and low-fat dairy products are also advised by the DASH diet.

Unlike in China, the MD's primary source of fat is extra-virgin olive oil. But there are numerous parallels between the Chinese and MD as well. According to the study, both the Chinese and MD patterns advise a varied diet that primarily consists of whole grains, tubers, and legumes, high intakes of vegetables and fruits, and moderate intakes of fish, red meat, and dairy products. As a result,

China's nutritional structure can be modified in accordance with the MD model, offering a potential strategy for the management of hypertension.

2. Effects of Nutrients on Hypertension

High blood pressure is a common chronic disease that affects people in the form of complications such as heart attacks, chronic kidney disease, heart failure and other heart cerebrovascular disease. Ninety percent of hypertension is essential hypertension and can be prevented and controlled by improving diet. Hypertension is essentially a low-grade inflammatory response [1]. An unbalanced diet may result in excessive intake of some nutrients and a serious deficiency of others. On such a diet, the body may ingest large amounts of components that promote this inflammatory response and/or lack components that combat it. Therefore, we can control the occurrence of hypertension by controlling diet.

2.1. Hypertension and Sodium Content

Sodium is an important part of dietary flavoring and many people rely on it. Because of the effect of sodium on hypertension, high sodium diet is one of the important factors of hypertension. With the increase in salt intake, blood pressure will also have a corresponding increase, mainly reflected in the systolic blood pressure this part. 1-6.0 mm Hg in salt-sensitive individuals, the mechanisms by which excessive sodium intake leads to elevated blood pressure mainly include impaired renal sodium excretion and renal sympathetic nervous system excitation. In addition to rising blood pressure, consuming too much sodium can harm a number of systems, including the vascular endothelium and induce oxidative stress, left ventricular hypertrophy, ventricular fibrosis, and ventricular fibrosis.

2.2. Hypertension and Potassium Content

Blood pressure and potassium consumption were adversely associated. Increased potassium consumption in hypertension individuals was proven to lower systolic blood pressure by 3.5%, according to meta-analysis [2]. In addition, potassium lowers blood pressure by inhibiting sodium reabsorption, reducing sodium-induced sympathetic nervous system, and directly dilating blood vessels.

2.3. Hypertension and Energy Intake

The risk of developing hypertension increases sevenfold when energy intake exceeds the recommended 20%. The explanation may be that an excessive energy intake might trigger an inflammatory reaction in the blood vessels, which in turn causes hypertension [3]. Additionally, consuming too much energy is one of the factors that contributes to obesity, which is a primary and independent cause of hypertension. The prevalence of hypertension increases with each increase in body mass index (BMI) by one standard deviation.

2.4. Hypertension and Free Sugar Content

According to studies, drinking sugar-sweetened beverages (sucrose or sweetener) raises blood pressure, with each additional serving of these drinks posing an 8% higher chance of developing hypertension [4]. This may be related to the inflammatory reaction induced by excessive intake of free sugars. According to the updated WHO recommendations, free sugar should be kept to less than 10% of total calorie intake throughout their lives. It would be advantageous to further reduce intake to less than 5% of total energy.

3. Research Progress of MD

3.1. What is the Mediterranean Diet

The MD, originated in the 1970s, represents the main style of dieting of population who have this kind of diet in some European reigns. its concept of dieting and food source. Unlike certain dietary patterns, the MD does not restrict the calorie intake within a specific range, nor does it exclude any specific food items. The MD consists of fish, vegetables, fruits, grains, and nuts. It also suggests moderate alcohol or wine consumption. This special diet concentrates on the variety of plant foods and reduces the consumption of red meat and dairy products. Because of its focus on plant foods and olive oil. The MD encourages adequate intake of water daily due to water's significant role in keeping the balance inside the body. In addition to the requirement of drinking enough water, the MD also requires taking enough protein and possibly through white and lean meat. The unique and special principles of the MD have shown its effectiveness in helping with lowering the chance of having cardiovascular condition and the development of cancer type of diseases which correlates to the purpose of this paper which is to discover the potential application of the MD as treatment for hypertension.

3.2. The Efficiency of The MD for Hypertension

Both the DASH diet and the MD have been found to lower the risk of hypertension and cardiovascular morbidity and mortality. The DASH diet advises cutting back on salt, saturated fat, while increasing the consumption of plant protein, vegetables, whole grains, fruits, and low-fat dairy products. Designed to avoid high-sodium diets. The DASH diet is similar to the MD in that both emphasize eating foods rich in plant fiber, like vegetables and fruits. However, the focus of the two diets is different. The MD emphasizes the consumption of saturated fatty acids and uses olive oil as a means of avoiding excessive consumption of these acids. The DASH diet places a focus on lowering salt intake.

A study compared 14 popular named meal plans including the DASH diet and MD to lower cardiovascular risk factors and body weight in adults. The study's findings demonstrated that the DASH and MD were not only superior to the least successful dietary strategies for weight loss, but also the second most effective. The DASH diet and the MD still showed to be less successful than the most effective diet, but better than the least effective diet, according to the decreasing figure of systolic blood pressure during 6 months. The MD was found to be the least effective diet, while the diastolic blood pressure study revealed that DASH was superior to the least effective diet while falling short of the most successful diet. However, all of the well-known diets, including the DASH diet, had lower estimates of weight loss and changes in cardiovascular risk factors at the 12-month follow-up, with the exception of the MD [5]. By comparison, the DASH diet appeared to be more effective than the MD in preventing and reducing hypertension in the short term, but the effects of the MD lasted longer. Additionally, the MD provides a superior nutritional framework that does not restrict animal-derived goods like dairy and alcohol.

3.3. Related Experience of The Effects of The MD on Hypertension

Although there is no direct scientific evidence that states the MD can treat hypertension, the relationship between the MD and low cardiovascular risk including low blood pressure and low hypertension risk has been proven through several series of studies that the more the MD is, the less the risk and blood pressure is. The seven countries' studies assessed the direct relationships and experience between the MD population and their cardiovascular mortality(CV) [6]. The two cohort studies of Corfu and Crete claim the MD's vital role in protecting the population from atherosclerosis due to the population's lower level of blood pressures. Following the two cohort studies, the CARDIO2000 study investigated the experience of 2000 patients and the result comes out that the coronary risk dropped by 7-10% including both the patients with the treatments and the ones without the treatments, in addition, the reduction also applies to the patients with hypertension [7]. Another

cross-sectional study conducted in Spain indicates that the blood pressure level goes down as the consumption of fruit and vegetables increases [8]. Moreover, a study was conducted on hypertensive women and the result of the study discovers that a sizeable drop occurred in SBP and DBP after the researchers put olive oil in use [9]. All the experiences mentioned above can show the significant effect the MD has on hypertension or cardiovascular risk in general, regardless of the high fat consumption of the MD population, one way they avoid having high blood pressure is to take more fruits and leafy vegetables and the intake of Olive oil also helps with lowering the blood pressure in addition to the vegetable and fruit consumption.

3.4. Principles of The Effects of The MD on Hypertension

Olive oil is commonly used in the MD, which is low in saturated fatty acids. Lowering LDL cholesterol in blood by taking in more monounsaturated fatty acids than low saturated fatty acids without lowering HDL cholesterol or increasing triacylglycerol reduces the risk of high blood pressure [10]. Furthermore, dietary polyphenols are plentiful in extra virgin olive oil. The antioxidant properties of polyphenols protect blood vessels by inhibiting the oxidation of LDL cholesterol. It is a water-soluble phenolic compound which has molecular weight ranged from 500 to 3000Da that is commonly found in fruits, vegetables, wine and tea. In addition to polyphenols, fruits and vegetables contain a variety of fiber components. Fiber is divided into soluble and insoluble. Fruits and vegetables are sources of soluble fiber. Furthermore, whole grain goods offered insoluble fiber. The rate of bile excretion can be accelerated by soluble fiber, which lowers serum levels of total cholesterol and low-density lipoprotein cholesterol [11]. Some experiments have proved that insoluble fiber intake is negatively correlated with diastolic blood pressure and systolic . According to the experimental findings, consuming more insoluble fiber can be very beneficial for managing and controlling hypertension [12].

4. The Reference Significance of MD for Treating Hypertension

4.1. Difference of MD and Asian Diet

MD and Asian diets are well-known around the world, which people like their various flavors and healthy ingredients. In order to find whether MD can be a treatment of hypertension for people in China, it is necessary to compare the difference between Mediterranean and Asian diet. Thus, some previous research were found and used, which were about using dietary data accorded from Chinese 24h dietary recalls and Italian third National Food Consumption Survey to compare the intake of nutrients between Asian and MD [13]. The following figures include the average data of different nutrients intakes between Chinese and Italian groups, sorted out from those research, which Italian group represents MD while Chinese group represents Asian diet.

4.1.1 Comparison of Macronutrients Intakes in Chinese and Italian Groups

From Fig 1, for macronutrients, it is obvious that the amount of carbohydrate, protein and fiber intakes in Chinese groups were much smaller than that of Italian groups. Also, Chinese consumed less fat than what Italians did [13]. In addition, Chinese and Italian groups have a similar intake of cholesterol.

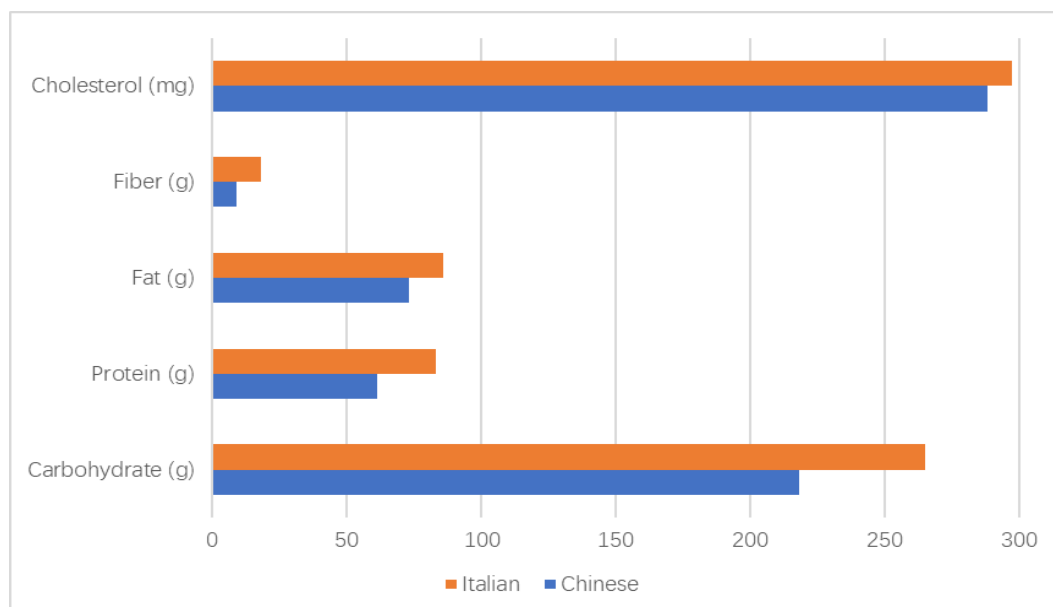


Fig. 1 Comparison of macronutrients intakes between Chinese and Italian groups [13]

4.1.2 Comparison of Minerals Intakes Between Chinese and Italian Groups

Start with macro-minerals, Chinese daily intake of calcium, phosphorus, potassium and magnesium were generally much lower than Italian did, especially the amount of potassium intakes, which Italians consumed almost twice as much as Chinese people did (Fig 2).

As zinc was the only micro-minerals recorded in Fig 2, it is obvious that zinc intakes in Chinese groups was a bit lower than that of Italian groups, even though the gap was small.

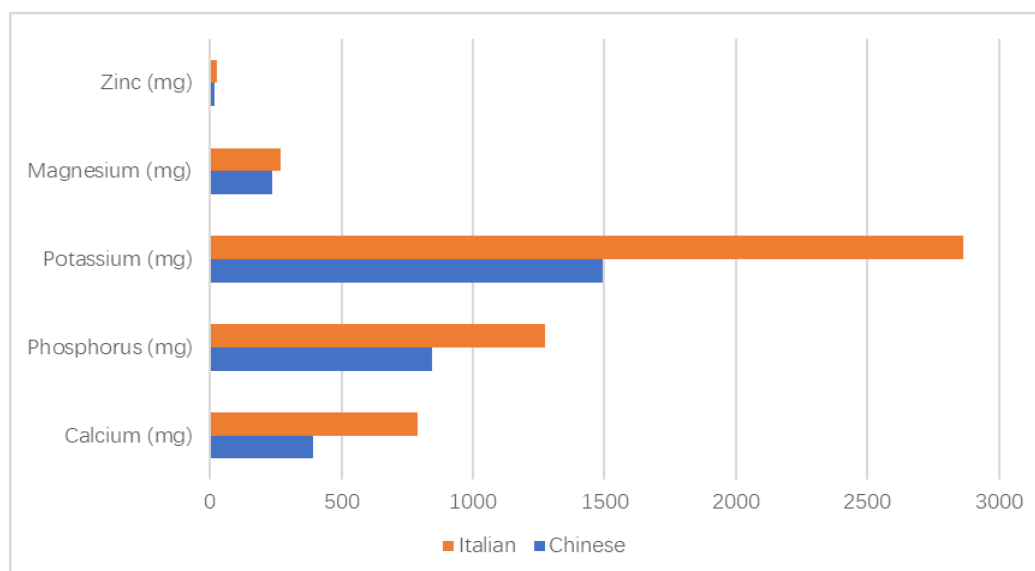


Fig. 2 Minerals intakes between Chinese and Italian groups [13]

4.1.3 Comparison of Vitamins Intakes in Chinese and Italian Groups

Compared with Italians, the ingestion of both VB1 and VB2 were in a lower level among Chinese groups (Fig 3). Also, it needs to be mentioned that Chinese consumed nearly half amount of vitamin C than what Italian did. Nonetheless, Chinese had much more vitamin E intakes than that of Italian, which reveals that they consumed more nuts, fruits and vegetables as these kinds of food contain lots of vitamin E.

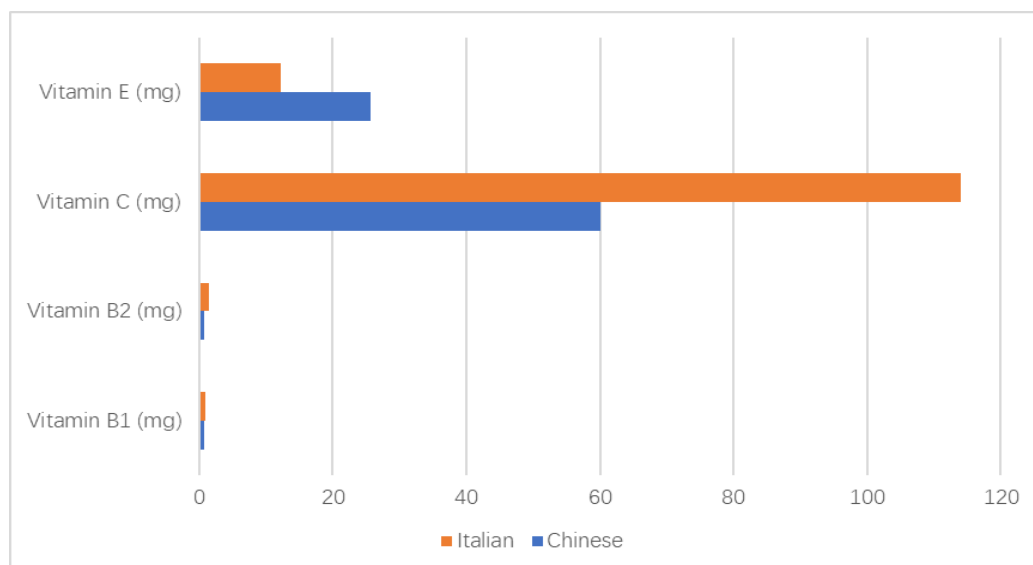


Fig. 3 Vitamins intakes between Chinese and Italian groups [13]

4.2. The Current Dietary Problem Exists Towards The Treatment of Hypertension in China

Because of the unbalanced development of China's productive forces, huge differences are existed in urban and rural dietary patterns, however, these dietary patterns are all unbalanced. These unbalanced dietary patterns result in excess or insufficient nutrient intake, such as sodium, potassium, fat and protein. The high consumption of sodium and low ingestion of potassium from Chinese diet become the risk factors for essential hypertension [14]. Therefore, Chinese diet needs to reduce the amount of sodium intakes and increase the ingestion of calcium.

Nowadays, in China, having salt is still the main way for daily sodium intakes, followed by soy sauce and monosodium glutamate [15]. As a result, it is feasible to replace sodium with potassium in order to control hypertension [15].

4.3. The Advantage of MD in The Treatment of Hypertension

A few research confirms that MD can lower blood pressure. For instance, a study in Spain followed 9408 observers for six years and found that MD can reduce the increasing blood pressure, which systolic blood pressure decreased most in patients who were having MD (3.1mm Hg and 1.9mm Hg respectively) [16]. Moreover, the PREDIMED study found that when hypertensive patients who followed MD for 1 year, their systolic and diastolic blood pressure would decrease by 4.0mm Hg and 1.3mm Hg respectively [17]. The MD mostly contains plant-derived food, including a large number of grains, vegetables and fruits, which is similar to Chinese traditional dietary pattern. Thus, Chinese can learn from the advantages of MD to prevent and treat hypertension.

5. The Possibility of Implementing MD for The Treatment of Hypertension in China

5.1. Chinese Balanced Diet Made from Mediterrean Diet for The Treatment of Hypertension

In 2016, the people's Dietary Guide has been revised for the third time, which clearly presents the latest graph of balanced diet, named Balanced Dietary Treasure. From the graph, this balanced diet covers most characteristics of MD, which emphasizes a diversified diet. According to China's national conditions, it is difficult to prevent hypertension by just copying foreign dietary patterns, especially for the rural areas . So, it will be more suitable for China to adjust a balanced diet pattern based on the dietary characteristics of rural and urban residents.

For rural residents, their diet is mainly made up of rice, noodles and pickles, which lacks vegetables, fruits and protein foods. This brings them too much sodium and lacks protein, calcium, phosphorus,

magnesium and some other nutrients. For urban residents, besides staple food like rice and noodles, they have excessive intake of fat, red meat and eggs, which lead to excessive energy intake. This makes them have too much trans-fat, saturated fat, cholesterol and refined sugar. In order to improve this, for example, in rural areas, in addition to increasing the amount of whole grains having, they can also eat more soybeans and dried fruits, which will increase the intake of protein, minerals and fiber. For urban residents, on the basis of increasing whole grains, they should reduce the ingestion of foods rich in TFA and SFA, as well as limiting the intake of western fast food, red meat and eggs. This will lead to the reduction of intake of fat, free sugar, trans fatty acids and cholesterol. In general, by viewing the characteristics of Chinese Balanced Diet, this diet will play a vital role in preventing and treating hypertension.

6. Future Directions

In order for the Chinese diet population to improve and have a healthier dietary pattern, the Chinese government has to take action on the hypertension issue. First thing the Chinese government should do is to help the public have more awareness of the hypertension issue, the significant low awareness of hypertension among the Chinese population is concerning. According to the result of the study, only 26.2% of people who have hypertension are aware of their disorders in Shandong province and this situation can be concerning as it can deteriorate the situation of hypertension. It will be effective and helpful for the government to employ policies and regulations that promote or encourage use of natural sources of healthy food in all regions instead of heavy reliance on processed food and also conduct more strict rules on processed food regulations in order for better hypertension prevention. In addition, a more thorough education on hypertension awareness is needed so people who have hypertension can start taking actions early for better hypertension control to prevent severe development of the condition. Based on the principle and effects the MD has on hypertension, in addition to the traditional Chinese diet, people from Chinese communities should also increase the intake of olive oil, reduce the intake of red meat and increase seafood consumption like fish as those shown to be linked with reduction in hypertension risk. Last but not least, the Chinese diet population should retain their current intake of fruits and vegetables for the vitamin and mineral intake, they should also increase the consumption of low sugar dairy products but keep the consumption at moderate level.

7. Conclusion

To sum up, the MD is characterized by low sodium, high potassium, less red meat, less saturated fat, less free sugar, etc. In comparison to the DASH diet and other dietary patterns, the MD was not the most successful at lowering blood pressure, but it had a longer-lasting effect on lowering hypertension. It also had the effect of lowering body weight and the risk of cardiovascular disease. The MD has a wide range of food sources and many plant-derived foods, which is basically consistent with the Chinese diet. With the high salt, low potassium, and consumption of saturated fat in the Chinese diet, hypertension has emerged as a prevalent chronic condition. Additionally, the East Asian diet frequently includes salt and soy sauce to flavor foods; this high sodium intake raises the risk of high blood pressure. Chinese individuals should consume more fish, fruit, and vegetables as well as less sodium, red meat, and animal fat as part of the traditional Chinese diet and the MD, respectively, to minimize their risk of high blood pressure. To lessen sodium intake, you can also utilize spices and other herbs and spices that are frequently used in the MD, such as vanilla and garlic.

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