The Traditional French Diet and The Mediterranean Diet's Effects on Cardiovascular Disease

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Abstract: Cardiovascular diseases (CVD) are the leading causes of death in many developed countries. It is known to be linked with smoking, sedentary lifestyle, alcohol intake, and food patterns. Food consumption has tremendous influence on CVD risk and protection. Thus, the paper describes two diet patterns—Traditional French diet and the Mediterranean diet—and explains the relationship between characteristics of each diet to CVD risk. Traditional French diet is high in sugar, salt, ultra-processed food, and alcohol intake, and the paper demonstrates the potential risks and mechanisms on CVD. In addition, the Mediterranean diet is proved to reduce CVD risk and can serve as a protective role in CVD prevention.

1. Introduction

Cardiovascular disease is a group of diseases that damage and influence the heart and blood vessels [1]. CVD is highly prevalent in developed countries, leading to consequences such as disability and mortality [1]. In addition, CVD accounts for the majority of death in European countries [1]. CVD is caused by poor diet, alcohol consumption, high blood pressure, diabetes, sedentary lifestyle, obesity, and high blood cholesterol [2]. Since diet plays a role in either CVD prevention or promotion, this paper aims to address the relationships between diet characteristics and CVD in both directions. Specifically, the paper contains two diet patterns and is divided into two parts according to different diet: the traditional French diet and the Mediterranean diet with their corresponding influence on CVD.

2. Characteristics of Traditional French Diet and Its Correlation to CVD

Typical French diet includes cuisines like cheese, truffle, celeriac, red wine, bread, butter, and meat [3]. Research shows that only about 15% of French people eat snacks [3]. However, People in France usually eat dessert after the main course [3]. According to Gazan et al., 16.5% of French still eat akin to the traditional eating habit [4]. As shown in table 1, French population flowing the traditional French diet consume more processed meat, alcohol, sugar, and salt. Compared with other western countries, France has longer life expectancy and lower obesity rate [3]. Having said that, there are several potential negative outcomes of CVD linked with the characteristics of Traditional French diet, for example, diet that is high in sugar, salt, ultra-processed food, and alcohol. This section explains the correlations between CVD and those variables.

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Table.1. Traditional French diet and the Mediterranean diet characteristics among French population [4].

Dietary Patterns	Major food	%	Major food	%
Mediterranean	Vegetables	12.7	Fruit	6.3
	Oil	11.2	Poultry	4.7
	Regular fat (not low fat) condiment and dips	9.8	Eggs	3.9
	Herbs and spices	7.0	Yogurt and cottage cheese (30-40% fat)	3.6
	Tap water	6.6	Tea and herbal teas	3.6
	Unprocessed fish	6.4	Regular honey and jam (not reduced sugar)	2.5
Traditional	Processed meat	9.5	Processed potato products	4.6
	Alcoholic drinks	9	Offal	3.1
	Regular-fat cheese	7.9	Vegetables	3.0
	Red meat	7.0	Mixed dishes with meat	2.9
	Wheat bread or bread product	6.6	Poultry	2.7
	Coffee	6.0		

2.1 Sugar

Total sugar is a term used to describe glucose, galactose, fructose, and disaccharides such as sucrose and lactose [5]. It includes sugars in food or beverages in any form, including those occurring naturally and artificially manufactured (added sugars). The traditional French dietary patterns obtain high amounts of sugar intake, including added sugars, which are high in calories but lacked important nutrients [4, 5]. According to Azaïs-Braesco et al., French adults consume 91.1 grams of sugar per day on average, comprising 16.4% ± 5.4% of daily total caloric intake, since their dietary pattern is characterized by high fat/sugar/salt [4, 6]. Many studies have found correlations in sugar intake and risk factors contributing to cardiovascular disease, but literature regarding direct relationship is sparse.

Increased blood triglycerides are established risk factors for CVD, and studies have proved that high sugar intake would lead to elevated triglycerides because of fructose metabolism [7]. Participants in a random control trial show 10% increases in triglyceride after regularly consuming more simple sugar, but the cause of the augmentation is ambiguous because participants gained weight which would also lead to an increase in triglyceride [7]. Diets high in simple sugars are also correlated with decreased high-density lipoprotein (HDL), but the result is still in dispute. Same as triglycerides, the relationship between sugar and blood pressure is controversial [5, 7]. In the review of Vos et al., researchers recorded that excessive fructose intake over a period of time causes an augmentation of 7 mmHg in systole and 6 mmHg in diastole, and the opposite outcome occurred after fructose is reduced [5]. Other studies have also supported the linkage [5, 7, 8]. However, many studies yield no significant correlation, and, for those that do, weight gain contributes another variable to the credibility of results [8]. Having said that, the potential effects of simple sugar on blood pressure should not be ignored as

one study shows evidence substantiating the link between sugar intake and increased systolic blood pressure, independent of weight gain and obesity [5].

2.2 Salt

In a survey done from 2006 to 2007, French people with the traditional diet had a mean sodium intake of about 8.9 g/day, which was higher than the maximum of 5 g/day recommended by the World Health Organization [4, 9]. Salt mostly contains sodium and chloride and, by taking an excessive amount of salt, the amount of sodium is also higher than the recommended level. The excessive absorption of salt/sodium causes a loss of potassium in the human body, and the amount of sodium not balanced by potassium leads to contraction of the vascular wall and the inhibition of vasodilation. The long-term result of excessive salt ingestion will very possibly be hypertension [10]. In addition, high salt ingestion is related to left ventricular hypertrophy, the abnormal enlargement of the left ventricle of the heart. This condition can worsen hypertensive patients' condition and increase cardiovascular mortality. Also, there is a positive relation between salt intake and the possibility of experiencing stroke [11]. The high salt intake of French people under the traditional diet increases their risk of CVD, thus it partially explains the leading death of CVD in France.

2.3 Ultra-processed Food

Ultra-processed food group includes industrial bakery products, sweets, desserts, snacks, sweetened beverages, instant food, and meat or fish products preserved with chemicals other than salt. It also includes cosmetic additives and hydrogenated and modified food items [12]. For French people with a traditional diet, processed meat and fish, pastries, and desserts are the possible sources of ultra-processed food [4]. Ingestion of ultra-processed food increased the risk of cardiovascular disease in research done on a sample of 105159 individuals. A 10% increase in the amount of ultra-processed food in the daily diet could increase the risk of cardiovascular disease by 12% [12]. They are often high in trans-fat, salt, and sugar, and these are the risk factors for cardiovascular disease, thus explaining the result of the research [12].

Trans fatty acids are produced industrially by adding hydrogen to unsaturated fats and changing their structures for better preservation. Found in commercial bakery products and deep-fried foods, trans fats are related to an increased amount of low-density lipoprotein (LDL) cholesterol and decreased amount of high-density lipoprotein (HDL) cholesterol in the human body. LDL is a type of cholesterol that contributes to the possibility of CVD, and HDL has the opposite effect compared to LDL. Trans fat also increases the number of triglycerides and damages the elastic property of the endothelium of the vessels [13]. Excessive amounts of triglyceride, which is a kind of lipid, can lead to CVD. As a result, trans fatty acids increase the chance of having CVD and experiencing its conditions, such as coronary heart disease (CHD) and myocardial infarctions/heart attacks. They are also found inside the plaques (accumulation of fat on the vessel wall) of atherosclerosis [14]. Trans fats also promote the increase in the amount of lipoprotein, which is positively related to the risk of CHD [15]. Since the French traditional diet contains mass-produced products that may contain trans-fat, this also contributes to the nation’s leading death caused by CVD.

2.4 Alcohol

Traditional French diet incorporates alcohol, especially wine, as a part of the dietary pattern compared to other food patterns [4]. According to the Dietary Guidelines Advisory Committee, alcohol should be consumed in the moderate amounts [16]. However, even though moderate alcohol consumption may have cardiovascular benefits, there are potential risks even at low alcohol intake [16]. Thus, the relationship between alcohol intake and CVD is confounding, but the literature will address several main consequences of drinking on CVD.

Moderate alcohol consumption decreases chronic inflammation by modulating water-soluble inflammatory molecules such as the interleukin-10 and intercellular adhesion molecule-1 [16]. Moreover, according to table 2, moderate consumption is also correlated with decreased risk of heart failure, coronary heart diseases, and reduction in stroke risks [16]. For patients with coronary heart

disease, those who consume alcohol moderately developed the disease in lower severity, and moderate alcohol consumers showed a 25% reduction in CVD risks [16]. However, despite the positive influence on CVD, there are many potential risks in moderate alcohol consumption. Studies show that moderate alcohol intake is related to an increased risk of atrial fibrillation [16]. In addition, table 2 shows that moderate and heavy alcohol intake cause high blood pressure: isolated diastolic hypertension (high pressure during heart refilling time) and hypertension [16]. In fact, the risk for CVD is positively correlated with the amount of alcohol consumed [16]. Given the controversial effects of alcohol on CVD, alcohol may not be a safe choice in preventing CVD as another study conducted on patients with diabetes also supports the claim: reduction in alcohol consumption decreased CVD risk by 44% compared with patients who did not reduce alcohol intake and maintained moderate alcohol consumption [16].

Table.2. Alcohol intake and its influence on cardiovascular biomarkers and major events [16].

Cardiovascular Parameter	**Low/Moderate Alcohol Consumption**	**Heavy/Binge Drinking**
Intermediate biomarkers		
Inflammation	+	−
Oxidation	±	−
Thrombosis	+	±
Classical risk factors		
Lipid profile	+	−
Glucose metabolism	+	±
Blood pressure	−	−
Major adverse cardiovascular events		
Acute myocardial infarction	+	±
Stroke	+	−
Cardiovascular mortality	+	−

"+" indicates protective effects (inverse association); "-" denotes detrimental effects (positive association); and "±" signifies neutral effects (lack of association) or inconclusive/contradictory results.

3. Characteristics of Mediterranean Diet and Its Correlation to CVD

A study found that farmers of Crete consumed large amounts of fat while had the lowest CVD mortality rate compared to other regions [17]. Their diet contains plant foods, olive oil, limited dairy products, fish, poultry, fruits, and moderate amount of wine [17]. Thus, Mediterranean diet is linked to reduced CVD risk, and this section is responsible for illustrating the connection between aspects of Mediterranean diets and cardiovascular disease.

3.1 Fruits and Vegetables

Fruits and vegetable consumption are correlated with decreased risks for cardiovascular diseases. Since food processing causes change and damage to chemical structures, fresh fruits and vegetables are considered to be the priority, but servings of fruits and vegetables include all fresh, cooked, and processed items, as well as juice [18]. Research shows that participants with higher fruit and vegetable intake had a lower risk for CVD. Specifically, 5 or more servings per day are associated with a 17% reduction in CVD risk regardless of gender [19]. In addition, another study illustrates that participants who consumed more than 8 servings of fruits and vegetables per day had a 22% reduction in fatal ischemic heart diseases (IHD), and, for women, each 80 g increase in consumption was associated

with a risk reduction in IHD mortality of 15% [20]. Fruits and vegetables contain vitamin C, vitamin E, carotenoids, and antioxidant minerals such as selenium and zinc, which contribute to the protective antioxidant function of fruits and vegetables [18]. Besides, diets that contain fruits and vegetables have a higher total antioxidant capacity (TAC) that is inversely related to high-sensitivity C-reactive proteins (hs-CRP), a marker for inflammation, suggesting that fruits and vegetables serve a role in preventing atherosclerosis [18]. Having said that, despite data supporting fruits and vegetables' role in CVD prevention, respective studies on carotenoids and vitamin C have failed to illustrate a relationship in CVD prevention [18]. Thus, supplements might not work as well as whole food.

3.2 Whole-Grain food (Fiber)

Whole plant food contains more fiber, or functional groups, than refined plant food, and the "fiber hypothesis" claims that fiber intake is inversely related to incidences of cardiovascular diseases [21]. Compared to refined grain products, whole grains have an intact carbohydrate-rich endosperm component, which contains minerals, fiber, antioxidants, and other compounds [21]. A meta-analysis on the relationship between whole-grain food and CVD shows that the consumption of 2.5 servings of whole grains, compared to 0.2 servings per day, correlated with a 21% lowered risk of CVD, while another meta-analysis shows a 26% reduction in CVD risks [21, 22]. Specifically, whole grain consumption is inversely related to atherosclerosis, one of the causes of ischemic heart disease [21]. Whole-grain food affects cardiovascular risks in several mechanisms on glucose homeostasis and lipids [21-23]. It can also improve glucose tolerance, the inability of the body the maintain normal blood glucose levels and reduce insulin resistance, the need for higher insulin secretion in order to meet with the same reaction on cells [23]. These symptoms are related to diabetes and CVD indirectly [23]. In addition, whole-grain food decreases blood LDL and triglycerides, serving a protective role for cardiovascular health [22]. Coupled with other functional groups in all plant food, whole grain products may reduce the risk for heart diseases.

3.3 Fish

For French people with a Mediterranean diet, unprocessed fish contributes about 6.4% of their daily food intake [4]. Daily consumption of fish, it has been found in research, lowers blood pressure [24]. In eight studies, an average of about 20 g/day increased consumption of fish led to a dramatic decrease in mortality due to CVD [25]. The consumption of fish can positively affect CVD due to the taurine and the polyunsaturated fats contained.

Taurine is a type of amino acid found in shellfish, fish, poultry, and meat. It decreases the risk of atherosclerosis, suppresses inflammation, and lowers blood pressure [26]. Inflammation can lead to plaque forming on the artery wall, so suppressing inflammation can decrease the risk of plaque formation.

Polyunsaturated fats (PUFA), such as omega-3 fatty acids, can encourage adipose tissue to express higher amounts of adiponectin, a type of hormone that can normalize blood pressure under hypertensive conditions and reduce the risk of cardiovascular disease [27]. Cold-water fish oils, specifically, are rich in omega-3 fatty acids such as eicosatetraenoic acid (EPA) and docosahexaenoic acid (DHA). The omega-3 fatty acids have anti-inflammatory effects on the human body, and they achieve that by lowering the expression of pro-inflammatory genes. As a result, they can inhibit vascular calcification [28]. Omega-3 fatty acids prevent cardiac arrhythmia (irregular heartbeat) by normalizing heart rate faster after exercise and help with dysfunction of the endothelium [13, 29]. They can also reduce the level of triglyceride [26]. In addition, omega-3 fatty acids also have a crucial influence on secondary prevention of CVD. For hypertensive patients, supplementing the diet with omega-3 fatty acids can increase the number of antioxidants in the body and decrease blood pressure [15, 27]. For patients with CHD, 1.5 g/day of fish oil has resulted in a 29% less mortality rate in two years. A daily supplement of EPA and DHA in 1 g/day has resulted in a 45% decrease in sudden death from CHD [13]. Omega-3 fatty acids not only reduce the number of sudden deaths from CVD significantly but also seem to reduce the progression of atherosclerosis and stabilize plaque development to prevent rupture. They also increase vascular relaxation [30].

4. Conclusions

As expected, Mediterranean diet, which contains high content of fruits and vegetables, unsaturated fat source, and dietary fiber, is considerably beneficial to and can act protectively for cardiovascular diseases. Literatures are supportive and consistent in the protective function of the Mediterranean diet, and it is generally recommended to people to adhere to the Mediterranean dietary pattern. Compared the Mediterranean diet, the traditional French diet pattern exhibits certain factors that can potentially cause adverse effect on CVD. High intake of (added) sugar, salt, trans fatty acid sources, and (moderate) alcohol are linked with increased CVD risk. However, studies explaining the direct relationship between sugar and alcohol to CVD are sparse and relative inconsistent in results. Future studies can discover the direct influence on CVD of sugar and alcohol and give absolute advise on dietary choices.

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