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INVESTIGATING THE LONG-TERM EFFECTS OF DIFFERENT DIETARY PATTERNS ON CARDIOVASCULAR HEALTH

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Abstract

The correlation between dietary patterns and cardiovascular disease has been extensively studied. However, it is crucial to evaluate the interrelationship between the nutritional makeup of foods and the identification of healthy dietary patterns while doing research in this area. This paper examines the difficulties associated with studying food trends and their relevance to public health campaigns. Several statistical techniques have been developed to analyze dietary patterns using data on the eating habits of a community. The assumptions behind food categorization have some limits. However, this study has the ability to consistently identify foods and dietary patterns that have a favorable correlation with health. The continual development of food composition databases is closely related to this activity. However, it has some limits, such as the challenge of staying up to date with changes in foods and newly discovered components, as well as the need to sample foods and keep up with advancements in chemical analysis procedures. Ultimately, dietary patterns serve as the foundation for existing dietary standards and public health initiatives. However, the research challenges that arise, such as the categorization of food and the impact of different cuisines on dietary patterns, may also be applicable in these contexts. The investigation of dietary patterns in the prevention of cardiovascular disease is faced with many methodological obstacles with the formation of food groups and the constraints of food composition databases. In addition, there are additional factors to consider about the environmental consequences of suggested food habits. Future research should focus on developing more precise approaches in many analytical domains across the full knowledge chain.

Keywords: Dietary supplement, healthy nutrition, cardiovascular disease, review.

1. Introduction

The scientific community has been interested in studying the correlation between dietary patterns and cardiovascular health for a considerable period of time [1]. Ancel Keys' research in the previous century established a connection between cholesterol levels and saturated fat in the diet, namely in the setting of a Mediterranean diet [2]. The intricate nature of this condition has been a significant challenge to scientists over the course of many years. However, the focused efforts on studying cardiovascular illness have shown to be beneficial. Although there have been some conceptual challenges, we have developed a comprehensive knowledge of how nutrients, foods, and complete diets are interconnected and how they impact disease outcomes and biomarkers. This scenario is based on a paradigm that helps us understand nutrition, specifically how eating food may either improve or worsen the course of cardiovascular disease.

Nutrition, in essence, pertains to the provision of biological substances (nutrients) that impact the organization and operation of the human body. Dietary patterns provide consistent selections of certain foods that, in turn, provide these nutrients in a synergistic manner [2]. The food and nutrition distribution profile will inevitably affect human biology, and this influence might be either advantageous or harmful. Due to the intricate nature of illnesses, the impact of nutrition is likely to be influenced by several other variables, and noticeable symptoms may only manifest after prolonged exposure.

Extended disparities in dietary consumption, such as excessive calories, saturated fat, salt, and added sugar, are linked to a greater occurrence of chronic illness [3]. Elevated levels of cholesterol in the blood continue to be a major risk factor for cardiovascular disease [4]. However, the relationship between saturated fat, which is linked to this biomarker, has grown more complex [5, 6, 7]. The amount of research that supports the impact of saturated fat is diverse in terms of study types (e.g. observational cohort studies vs randomized controlled trials) and design factors (such as test foods or replacement nutrients). Some argue that the saturated fat included in dairy products may have a lower likelihood of causing atherosclerosis. However, others emphasize the significance of substituting saturated fats with polyunsaturated fats instead of carbs [8]. Studying the influence of saturated fat on diet and cardiovascular disease requires considering the whole diet and food patterns, since they are interconnected. Therefore, investigating foods and dietary patterns is crucial in understanding the evolutionary element of this study.

Conducting research on food habits is not devoid of challenges. Assessing one's diet may be challenging due to inaccurate reporting, and categorizing food choices involves making important judgments. This paper examines the difficulties associated with studying dietary trends in order to get a deeper understanding of the link between food and illness.

2. Methods for Establishing Dietary Patterns

Various techniques are available in the literature for evaluating food habits [9]. The a priori method involves the establishment of dietary patterns by using predetermined criteria, such as a dietary index or score. The method delineates the categories, amounts, and frequencies of

food intake that constitute an optimal dietary pattern. Several indices are available, including the Healthy Eating Index [10•], the Mediterranean Diet score [11], the Dietary Approaches to Hypertension (DASH) score [12], and the Dietary Inflammatory Index [13]. Specific diet indicators, such as the Diet Quality Tracker [14], might be created for certain contexts. Our research team created the meal Quality Tracker to investigate the variations in meal quality across the duration of a clinical trial. The tool is an a priori method that evaluates the quality of a diet by analyzing the intake of 10 food categories, including eight essential groups and two optional groups.

In the Dietary Patterns Methods Project, Liese et al. [15] utilized four widely used dietary indices, namely the Healthy Eating Index 2010 (HEI-2010), the Alternate Healthy Eating Index 2010 (AHEI-2010), the alternate Mediterranean Diet (aMED) score, and the DASH score, in their analysis of three extensive population cohorts. A significant amount of coherence was seen among the indices in categorizing the nutritional value of an individual's diet. Significantly, a greater level of food quality, as evaluated by all scoring methods, was shown to be related with a decrease in mortality. The findings demonstrated that, while there were slight differences in the composition and quantity of foods in each index, they were able to consistently identify those who had a superior diet quality. This, in turn, was associated with a decreased likelihood of developing chronic diseases.

Although a priori techniques may accurately categorize people in a community, they rely on a predetermined 'ideal diet'. Therefore, there are inherent constraints in using certain instruments for populations with a distinct dietary pattern that they were not originally intended for (such as applying a Mediterranean dietary score to an area with a different culinary pattern) [16]. Although the use of a priori scores can still rank individuals based on the quality of their diets, using a score that is based on a different dietary pattern and different foods may result in individuals not meeting the predetermined nutrient or food thresholds within the tool. However, their diet may still be of high quality [16]. On the other hand, the a posteriori technique determines dietary patterns by analyzing the eating habits of the population. Dietary patterns are derived using statistical approaches such as principle components analysis and factor analysis, which identify items reported in dietary evaluations that are connected with each other [17]. Cluster analysis is a technique that classifies people with comparable nutritional consumption into clusters. The a posteriori technique is used to discover prevalent dietary patterns, such as 'traditional' or 'prudent' diets, that are linked to a lower risk of illness. On the other hand, 'Western' diets are connected with an increased risk [18].

3. Identification of Key Foods Consistently Found in Healthy Dietary Patterns

Although several methods have been used to define dietary patterns, they consistently indicate a certain set of foods that are associated with health benefits, including the prevention of cardiovascular disease. Liese et al. [15] shown that whole grains, fruit, vegetables, and plant-based protein were consistently present in all four dietary indices when applied to three different

population cohorts in the Dietary Patterns Methods Project. In a meta-analysis of prospective cohort studies, it was found that dietary patterns characterized by increased consumption of fish and poultry, low-fat dairy, fruit, nuts, seeds, and whole grains were associated with a reduced risk of coronary heart disease [19]. The consistent nature of these data indicates that there are certain items that form a diet to effectively avoid cardiovascular disease, however the exact composition of healthy diets may differ according on cuisines and dietary preferences.

There is comparable data indicating that food patterns might enhance risk factors or biomarkers associated with cardiovascular disease. Ndanuko et al. [22] conducted a meta-analysis of randomised controlled trials and found that dietary patterns linked to lower blood pressure were characterized by higher consumption of vegetables, fruit, whole grains, legumes, nuts and seeds, fish, and dairy, while having lower intake of meat, sweets, and alcohol. The recent clinical studies consistently found that dietary patterns including nuts, seeds, fruit, and fish were related with reduced blood pressure in overweight and obese individuals. These findings were uncovered by a posteriori exploration of dietary patterns. In addition, two meta-analyses have shown that dietary patterns consisting of plant-based foods, such as fruits, vegetables, and whole grains, are negatively correlated with levels of C-reactive protein, which is a marker for chronic inflammation [25, 26].

4. Using food groups as the primary units of analysis

The classification and description of foods play a crucial role in determining whether dietary pattern studies follow a priori or posteriori approaches. Grouping food items is a complex process that demands a deep understanding of food composition, food preparation practices, cuisines, and consumption patterns. Although more often associated with a priori approaches, this process takes significant knowledge and expertise. Across several nations, foods are categorized into 'core' food categories at a fundamental level, based on commonalities in their concepts and compositions. However, these similarities are based on unspoken assumptions and guided by many guidelines, which might lead to complications if the study topic is not well aligned.

As an example, in the context of researching nutrition and cardiovascular disease, foods might be grouped together depending on their macronutrient makeup, particularly focusing on dietary fat. Statistical techniques, such as cluster analysis [33, 34], can group a cereal food like pasta together with a dairy food like custard based on their carbohydrate profiles [35]. However, this categorization may be incorrect when the purpose of the study is to examine foods that can be substituted for one another in meals. Factors such as consumer comprehension of food classifications or adherence to dietary recommendations must often be taken into account [36]. Additional concerns include plant taxonomy, culinary techniques, and the hue of the meal, all of which may be linked to specific dietary constituents relevant to cardiovascular health. Some dietary recommendations use the categorization of vegetables based on their color to promote diversity and take into account the substances responsible for their distinct colors. The color

variation from red to blue in fruits and vegetables is mostly due to the presence of anthocyanin chemicals. These compounds should be taken into account when categorizing meals [29, 30].

Continual progress in the creation of food composition databases
Food composition analysis research is the foundation for the creation and examination of dietary patterns. Food composition analysis investigates various aspects of food, such as the proportion of edible parts, the range of nutrients present, and the extent to which nutrients are retained when cooked in different ways. It also enables the conversion of food intake data into nutrient consumption data [28]. Food composition databases are essential for studying dietary trends in research, whether with small or large samples of the population. Each nation and area has its own specific data on food composition, according to their environmental and food handling requirements.

Food composition analysis has a long history, with its roots in measuring the energy contributions of different components of food, such as macronutrients. Although there are variations among regions, there are also similar features in this study. The fundamental Atwater conversion factors enabled the evaluation of the proportional contributions of macronutrients to the overall energy (calorie) content of the diet [31]. Although the numbers may vary (calories versus kilojoules) in different locations, the fundamental concept of equating the energy content of a foodstuff has remained consistent.

5. Summary

Over the last 70 years, the investigation into the connection between diet and cardiovascular disease has undergone many changes, with the emphasis alternating between dietary patterns, individual nutrients, and particular foods. Currently, there is recognition that nutrients, foods, and dietary patterns are interconnected concepts, and this must be taken into account in research endeavors. In light of the increasing focus on food-based research, there has been a development of statistical techniques to evaluate dietary patterns. These techniques may be categorized into two approaches: a priori methods, which rely on a predetermined value system, and a posteriori methods, which take a more flexible and open-ended approach. Regardless, the process of identifying comparable items and comparing their nutritional contents has been significant in revealing the quality of diets in various cultures. However, in every instance, the technique has necessitated an examination of the connection between nutrients, food, and diet, especially when categorizing food categories.

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