ISSN 2959-409X

The influence of dietary patten on healthy way for fat reduction and its mechanism and suggestions

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Abstract:

With the change in people's diet structure, there is considerable amount of people begin to pay attention on their personal health and physical conditions. Most people search the information in how to lost their weight on the Internet and then followed without do much research and considered more dimensions. Existing studies have compared the effects of different dietary patterns, summarized the benefits and disadvantages of different diets, and investigated the role of different nutrients in human growth, but have not made a comprehensive overview of these diets and nutrients and have not combined them. This article analyzes the three different dietary patterns that are popular on the Internet and include both macronutrients and micronutrients, makes an overall review, and puts forward some suggestions. It provides a reference for the combination of dietary structure and nutrients for future research, but there are still some deficiencies in dietary patterns. Future research can focus on the direction of linking different dietary structure and nutrients.

Keywords: Dietary pattern, nutrients, health.

1. Introduction

Due to the improvement in people's material living standards, the eating habits of young people have a significant change which gradually prefer to eat foods high in oil, fat, salt and sugar, which resulting in a constant increase in the number of obesity patients. Obesity is a chronic complex disease, it is a condition of excessive fat deposits that can impair health. According to the statistics, in 2022, 2.5 billion adults aged 18 years and older were overweight, including over 890 million adults who were living with obesity and it will lead to cardiovascular diseases (CVDs), diabetes, cancers, neurological disorders and digestive disorders [1].

The popularity of media and the improvement of self-awareness, makes more and more young people begin to pay attention to their health and personal posture. Most people will collect information on the internet, and various methods of weight loss have become prevalent among people. The popularity of ketogenic diet pattern, the low carb diet pattern and the Mediterranean diet pattern is particularly widespread. However, most people do not fully understand the advantages and disadvantages of the dietary patterns they follow and whether they are suitable for them before using these diets, but choose to blindly follow the methods on the Internet. In addition, with the prevalence of intermittent fasting and time-restricted diets, and the lack of clear guidance on the best diet for weight loss, most people still have misconceptions about carbohydrate intake. Unreasonable diet structure can lead to physical fatigue, dizziness, constipation and other symptoms and it will also cause cirrhosis of the liver, kidney stones, hypoproteinemia and vitamin deficiency in the long term [2].

Except dietary accidents, people's biological and mental factors can also contribute to obesity. Nevertheless, circumstances are hard to change. Therefore, dietary intervention is still the core of weight loss, and improving nutrient intake also in weight loss [3]. Nutrient intake can be divided into macronutrients and micronutrients. Macronutrients provide the body's main source of energy which include carbohydrates, proteins and fats. On the contrary, micronutrients do not make up a large proportion of calorie intake, but are also crucial for the health and vital functions of the human body. They mainly include vitamins (fat-soluble and water-soluble) and minerals [4].

By analyzing the ketogenic diet pattern, the low carb diet pattern and the Mediterranean diet pattern, this paper will explore the characteristics and consequences of different diet patterns, and integrate and summarize the pros and

cons of too much and too little nutrient intake and the appropriate intake for human body. Reasonable dietary recommendations were put forward to pave the way for subsequent research.

2. The effect of different dietary patterns on human health

2.1 Ketogenic dietary (KD) pattern

The concept of the KD was introduced in 1921. It is characterized by an intake of less than 30 grams of carbohydrates per day and control of protein intake to an ideal body weight of 1.2-1.5 grams/kg or a fat-free amount of 1.0-1.2 grams/kg. This dietary pattern can change the way the body metabolizes, such as glycogenolysis, glycogenesis and increased lipolysis. Since the body mainly relies on carbohydrates to produce energy, when carbohydrates are reduced, the secretion of insulin is reduced. At first, the stored glucose in the form of glycogen can be used as fuel, after three to four days, when the glucose is completely exhausted, the body will start to use fat as fuel. This catabolism produces free fatty acids, which in turn are broken down into acetyl-CoA (CoA) by beta-oxidation in the mitochondria of liver cells. Acetyl- CoA (CoA) is converted to 3-hydroxy-3-methyl-glutamyl-CoA (HMG CoA), resulting in ketone bodies. Ketones are produced when people are hungry and exercise for long periods of time, inducing weight loss [5].

According to research, the weight loss of the ketogenic diet is significant in the short term, but it is not superior in the long term. The experiment that have analyzed by Mansoor et al, 1369 participants conducted 11 randomized controlled trials (RCT) for six months, and showed that compared with low-fat diets, KD group lost 2.17kg more. While the experiment conducted by Bueno et al. further confirmed it. 1415 participants joined 13 RCT for at least 12 months and found that participants who kept KD had lost 0.91kg more than low-fat diet. This is partly due to the loss of water in the human body, so in ketogenic diet studies, it is important to look at the duration as early as possible [5].

In addition, the ketogenic diet has a positive effect on dyslipidemia and polycystic ovary syndrome (PCOS). It increases high-density lipoprotein cholesterol (HDL-C) and decreases triglyceride levels, blood sugar, fasting insulin, testosterone, and insulin sensitivity. But the ketogenic diet is also associated with an unsure change in low-density lipoprotein cholesterol (LDL-C) that may influenced by specific dietary patterns of particular person and very low-density lipoprotein (VLDL), which may cause cardiovascular risk [2].

2.2 Low carb dietary (LCD) pattern

Since 1860, the LC has been used as a weight loss strategy for people. The LC is defined as the carbohydrate intake of healthy adults below the lower limit of the daily macro-nutrient distribution range, meaning that the carbohydrate intake is less than 130 grams per day and the total carbohydrate energy is 10% to 45%. The intake of protein is 0.8-1.5 g/kg for the ideal body weight. Studies have shown that macro-nutrient diets lead to weight loss during the first six months, but these symptoms and metabolic changes largely disappear after 12 months [3].

Because of the lower carbohydrate intake, people often increase their protein and fat intake to compensate for the decrease in carbohydrates. Increased protein and fat will lead to stimulated secretion of postpartum peptide YY, this peptide will also reduce appetite or increase satiety, while reducing hypoglycemia, this feeling reduces the body's hunger and overall intake, making calories insufficient, resulting in weight loss [6].

According to epidemiological studies, reducing carbohydrate intake can improve type 2 diabetes (T2DM). It can effectively control blood sugar and reduce people's drug use, while lowering hemoglobin A1C. In addition, it may reduce cardiometabolic risk factors. However, carbohydrate intake below 40% May be associated with an increased risk of death. It is of concern that a healthy LCD may cause a lower mortality rate, while an unhealthy LCD may cause a higher mortality rate [7]. Therefore, although LCD can play a role in the treatment of T2DM and weight loss, it is important to notice the amount of carbohydrate intake.

2.3 Mediterranean dietary (MD) pattern

The MD originated in the Mediterranean region, where it is closely related to the local lifestyle and was created in 1960. As shown in figure 1, the traditional Mediterranean diet is characterized by a high intake of fruits, vegetables, bread, low-refined grains, legumes (seeds and nuts), and olive oil (especially virgin and extra virgin). Low and moderate consumption of poultry, fish, and dairy products, as well as little or no red meat, and moderate consumption of wine [8].

Studies have shown that the Mediterranean diet protects against chronic diseases, such as CVDs, significantly reduces the risk of digestive cancer and mild dementia, while providing better blood sugar control in people with T2DMs and pre-diabetes. Since the MD is rich in fruits and vegetables and other foods rich in dietary fiber, these foods contain a lot of carotene, vitamins C and E, folic acid and other antioxidant nutrients, can prevent DNA damage, not only provide a low glycemic load, but also

may have a stronger impact on the cognitive function of the human body. Pairing red meat with high-quality plant protein instead of fish or low-quality carbohydrates allows the body to get rich in omega-3, the high polyphenol concentration in wine and olive oil, which can also affect cell survival, inflammation and metastasis, thereby slowing cancer development. In addition, changes in blood lipids and lipoproteins were also more favorable, and HDL function was also improved [9].

Furthermore, the MD has many positive effects on the environment. As the MD is mainly plant-based and requires less animal farming, it is a sustainable way of life with lower greenhouse gas emissions than other dietary patterns [8].

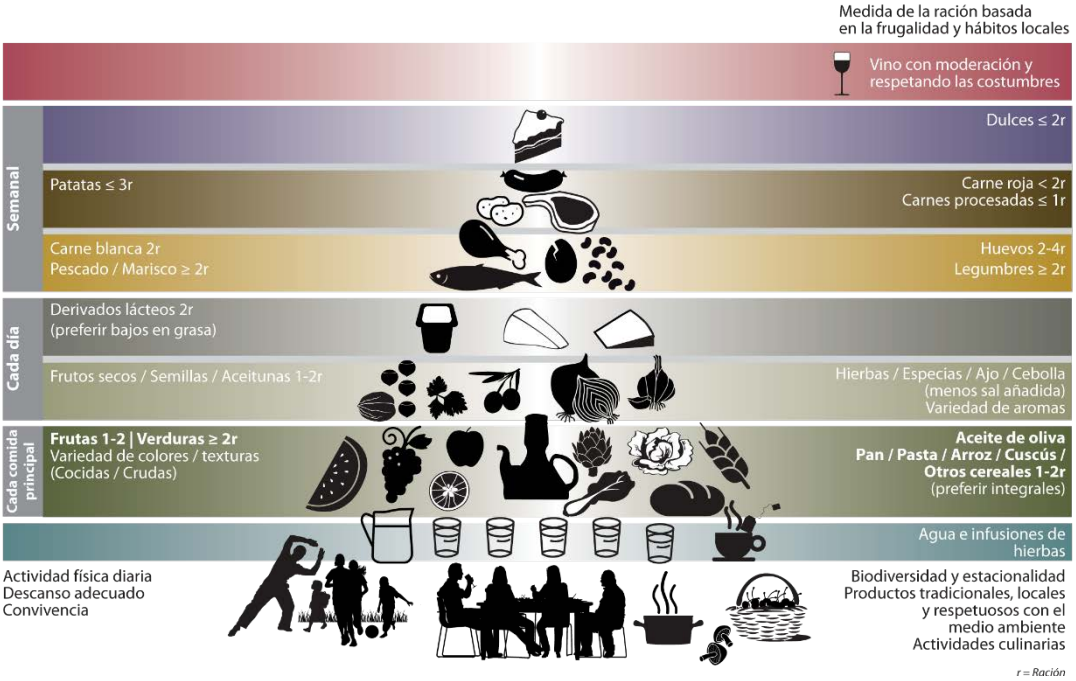

Figure 1. Mediterranean diet pyramid [10].

3. Nutrient analysis

3.1 Macronutrients

Macronutrients are the main energy source of the human body, which accounts for the majority of caloric intake. Carbohydrates, fats and proteins, are the basic components that provide human energy, which are indispensable energy sources among the macronutrients.

Macronutrients play a crucial role in the growth of the human body. According to research, for children aged 0-6 months, their main food - breast milk, meet the intake of macro-nutrients needs. Breast milk can provide amino acids, promote baby growth, enhance immune function. Meanwhile, lipids contain arachidonic acid (ARA) and eicossahexaenoic acid (DHA), which absorb fat-soluble vitamins and regulate inflammation. The carbohydrates in breast milk, especially breast milk oligosaccharides (HMOS), can promote the growth of beneficial probiotics and inhibit pathogens. For children aged 6 months to 2 years, protein intake can improve the development of the brain and immune system. The amount of fat consumed is also important, they should increase the amount of cold sea fish consumed to promote visual development. Carbohydrate intake can also boost the metabolism of the kidneys and brain. From age 3 to puberty, the protein can support muscle mass and myoglobin, reducing the risk of growth retardation. Lipid intake should be controlled between 20% and 35% to reduce the occurrence of chronic degenerative diseases in adulthood. Carbohydrates should be moderately controlled at 45% to 60% of total intake to reduce the risk of obesity and diabetes [4].

Exceeding the appropriate range of macronutrient intake can have a significant impact on human health. Some macronutrients increase which may indirectly increase saturated fat, trans, and omega-6 fatty acids and cholesterol, that positively associated with Gastric cancer (GC) risk. Excessive intake of cholesterol can cause damage to lipoproteins and lipids [11]. In carbohydrates, the intake more dietary sugar and fructose can lead to insulin resistance, impair the immune system and promote inflammation [12].

3.2 Micronutrients

Micronutrients contribute less to overall caloric intake

than macronutrients, but they are also important for human health. It includes fat-soluble vitamins, water-soluble vitamins and minerals.

According to the research, for children aged 0-6 months, breast milk can provide vitamins and minerals, however breast milk lacks iron (Fe) (to synthesize hemoglobin and new tissue), zinc (Zn) (to promote cell differentiation), vitamin D (to promote calcium absorption and bone tissue synthesis), vitamin K (to activate clotting molecules), thus babies should be supplemented from the outside world for better growth. For children from 6 months to 2 years of age, different micronutrients can meet their different needs for growth. For vitamin supplements, vitamin D ensures bone growth; Vitamin A prevents night blindness; Vitamin K can promote blood clotting; Vitamin C can synthesize collagen and carnitine, avoid bad blood; Folic acid can divide cells and synthesize DNA during rapid growth. Minerals such as calcium (Ca) can promote bone mass development in young children; Phosphorus (P) prevents them from developing hunch disease; Iodine (I) promotes the synthesis of thyroid hormones. For children from the age of three to puberty, they should have a varied diet that is supplemented with a full range of micronutrients, especially Ca, Fe, Zn and folic acid, which can avoid osteoporosis, iron deficiency anemia, growth retardation and increased plasma homocysteine. Furthermore, for adults, in order to reduce the risk of high blood pressure, adults should consume less salt [4].

Both micronutrients and macronutrients are crucial for human growth and development, and people should supplement the nutrients they need at different ages, and a balanced intake is important.

4. Suggestions

Each diet has its own benefits and drawbacks. In the case of the KD, it can achieve the goal of weight loss in the short term, and improve HDL-C and triglycerides. For people with T2DM, it can reduce the use of medications. But in the long term, the KD has little effect, and it is difficult to predict changes in LDL-C, which can lead to an increased risk of CVDs [2]. LCD are similar to KD in that their effects decrease over time, and LCD can improve blood sugar control, however if people consume unhealthy carbohydrates, although they intake less, it can also lead to higher mortality rates [7]. As for the MD, it is good dietary pattern for the environment and can prevent chronic diseases [8]. In addition, since a large number of foods recommended by the MD have antioxidant and anti-inflammatory properties, they can prevent cancer, but the high intake of fruits and vegetables may also cause estradiol damage to the immune system [9].

Macronutrients and micronutrients ensure the body's energy supply. Each nutrient plays a different role in the human body, but people should control their intake, as a single nutrient may lead to delayed growth and damage to certain organs. As the result, people should eat a balanced intake of different types of food. Before trying a new diet, people should investigate this type of diet, to know whether this dietary structure is suitable for their health conditions. Weight loss is also affected by many factors, such as mood, environment, and rest and so on, people should not only focus on the change of diet strategy, but also consider the impact of other factors on weight.

5. Conclusion

This article analyzes the characteristics and consequences of three different dietary patterns that are popular on the Internet. It includes the KD, the LCD and the MD pattern, and the paper not only comprehensively summarizes the appropriate nutrient intake for the human body, but also analyzes the impact (including both merits and demerits) of too much and too little nutrient intake on the human body. At the same time, the paper puts forward reasonable dietary suggestions for people's reference, notices the importance for people search the information on dietary patterns before using it, and summarizes the dietary methods and the role of nutrients that are more suitable for people of different ages or people with different diseases, lays a foundation for the subsequent research on the combination of nutrients and diet patterns of different groups, and provides some new ideas. However, the article lacks consideration of other factors for weight loss, and there may be biological and environmental factors that influence weight management. It is expected that there will be more elements that can be considered in future studies and combined with nutrients and dietary structure which can help more people achieve the goal of healthy weight loss.

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