

Effects of dietary structure on obesity and following diseases

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Abstract. Due to the quite unhealthy diet that people normally have in recent years, obesity becomes a more and more popular health issue. In recent years, it even becomes a risk factor for deaths. This essay mainly focuses on how the components in diet may cause obesity and other diseases and what components are required to make up of a healthy and balanced diet. To figure out a possible solution for the raising negative consequences brought by obesity, like coronary heart disease and type II diabetes, some investigations have been done. The researchers provided mice with either a diet high in fat or a normal diet to simulate the healthy diet and a quite unhealthy one that humans may take. Some extra tests like glucose tests are taken to show whether the mice have got the symptoms of diabetes. The simulation lasted for two months, an overall higher weight for the mice that were fed with high-fat diet was seen, which indicates that high-fat diet will put more weight on creatures. Also, high-fat diet overall leads to a higher glucose level, which suggests that unhealthy diet may show a decrease in the ability to decompose glucose and therefore causes diabetes. After the data is obtained and the result was drawn, nutritionists may cooperate with doctors and try to figure out the best possible diet for the patients that have very high risk of getting or already suffering from obesity, CHD or type 2 diabetes.

Keywords: diet, coronary heart disease, obesity, type II diabetes.

1. Introduction

Obesity has become one of the major health problems that the world needs to concern. It already has been spanned from rich countries to regions of all income levels [1]. The ranking of obesity in the number of deaths by risk factor increases and has been one of the TOP 5 factors that causes death the most as shown in Figure 1-2.

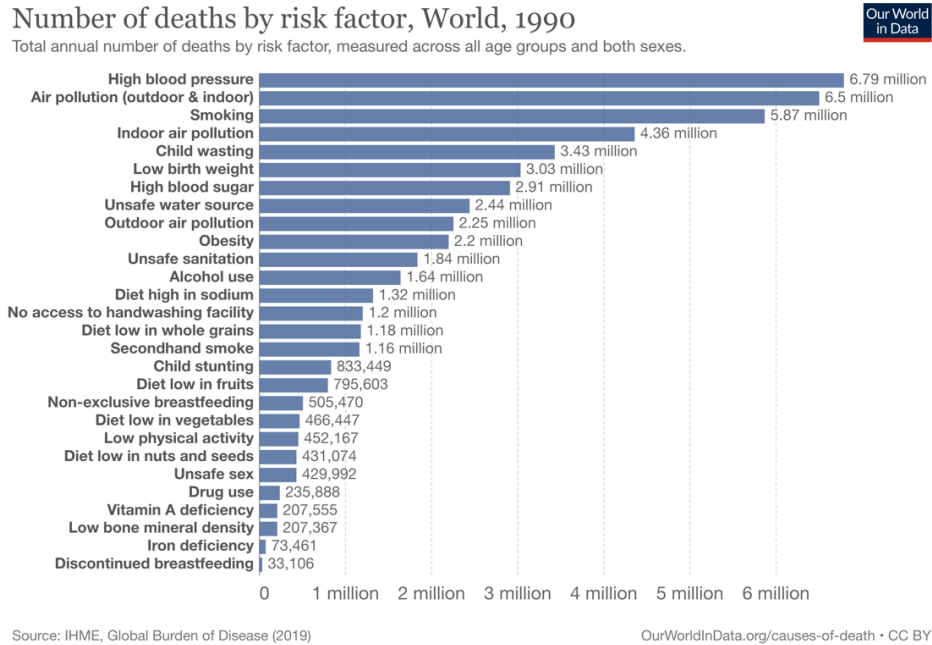


Figure 1. Ranking of the highest risk factors of deaths in the world in 1990 [1].

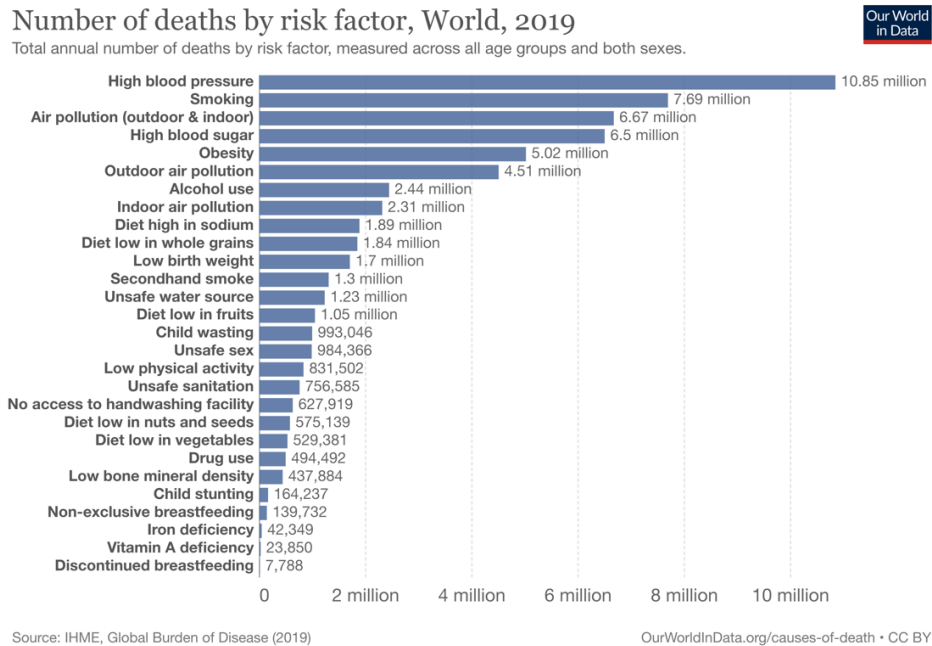


Figure 2. Ranking of the highest risk factors of deaths in the world in 2019 [1].

Additionally, obesity is very likely to cause or co-exist with other diseases like CHD, high blood pressure, type II diabetes etc. These will do great harm to people’s health, but human beings should still try hard to figure out methods to weaken the threats brought by these diseases. Controlling a daily diet can be a possible method to minimize the negative effects of obesity and those diseases.

Diet in humans often refers to the types of food and drinks that a human being regularly takes in. A well-balanced diet is essential for keeping good health conditions as well as preventing the spread of chronic diseases. Diet structure is the composition of a person’s daily diet, including the amount and different types of micronutrients and macronutrients consumed. Micronutrients are minerals and

vitamins, while macro nutrients include carbohydrates, fats and proteins [2]. The case is analyzed in the main body mainly focuses on the effect that high-fat diet may bring to creatures and the potential risks it may have by doing a simulated experiment first on mice [3]. The researchers use various tests to show whether the test-taker has got the disease or not. For example, by doing glucose test before and after the diet control on both groups of mice, researchers may figure out whether the mice got the diabetes or not. Plus, this experiment provides solid evidence to show that having high-fat diet for a long term is very likely to cause an overall increase in body weight and may further develop to obesity. Currently, researchers have already figure out the probable causes of diseases like obesity, coronary heart disease and diabetes, which all may contribute to an unhealthy diet. Therefore, the importance of controlling the dietary structure and having a healthy one is highlighted. However, scientists only have figured out a quite broad healthy diet plan like telling people what to eat and what is not recommended to eat. Although they are trying hard to deliver the correct knowledge on eating healthily, the diet they provide are usually not quite acceptable to the majority of people in the public. It is quite hard for them to get rid of the addictive unhealthy diet and convert to this eating plan. As a result, researchers still need to pay more efforts on figuring out a diet plan that fits people's requirement of not only healthy, but also tasty, which may be more acceptable to them.

The motivation for author to write this review is mainly because author's family members are suffering from coronary heart diseases and type II diabetes and author had noticed the unhealthy eating habits that they had before. After author's family members got the doctor's advice, they started to make some changes on their diet. Admittedly, some positive results were seen, but not for long. Therefore, the author wants to figure out what type of diet can truly prevent or reduce the risk of getting these diseases and the diet structure that is beneficial to help those patients recover. The following research will first focus on the case description and analysis mentioned before, explain why keeping a healthy diet is essential and figuring out the components in the diet will cause these diseases.

2. Main body

2.1. Case description

From this study, the researchers want to emphasize the importance of maintaining a normal diet to reduce the risk of getting a stroke, especially when the patient already has or has a high risk of type II diabetes. The significance of carrying out this study is that stroke will probably lead to disabilities in the long-term and even death, while the several major risk factors of stroke include diabetes, poor quality of diet, and obesity. In industrialized countries, the rate of obesity has sharply increased and reached an epidemic level. The study aims to figure out whether a high-fat diet (HFD) would have a more severe negative impact on stroke because of type II diabetes, the researchers use mice to create a model for the result of this experiment. For the control group, the mice are fed on a normal diet (ND), while the experiment group has HFD instead. Both are fed on the corresponding diet for 2 months. Pre-diabetic status can be simulated and assessed through Oral Glucose Tolerance Test (OGTT) and Insulin Tolerance Test (ITT). From the experiment, the researchers concluded that after taking HFD for 2 months, the situation of hyperlipidemia and high blood glucose in adult mice can be more severe. The researchers used several graphs to interpret the data they obtained from two groups of mice (Figure 3-5) [3].

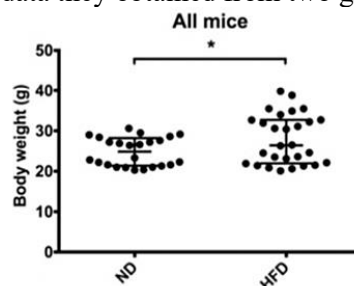


Figure 3. Body weight of all mice, Range of HFD overall has a higher value than range of ND [3].

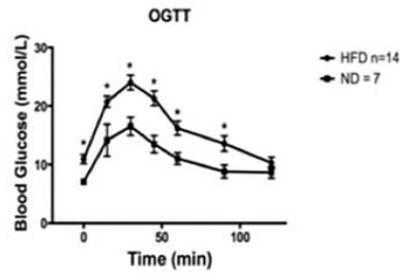


Figure 4. Results of OGTT, HFD has higher blood glucose level than ND [3].

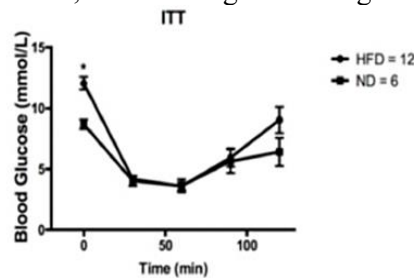


Figure 5. Results of ITT for both groups of mice, No significant difference in trend [3].

2.2. Analysis

2.2.1. Nutrients required for every day's diet. There are various nutrients required to be taken in to meet the need of the body and also believed to have impacts on all physiopathology processes [4], which includes carbohydrates, proteins, fats, vitamins, and minerals. But the amount of intake for each nutrient varies among people as each person is of different age, sex, activity level and other factors related to health [5]. The World Health Organization has emphasized the importance of having a balanced diet, they advocate a diet rich in foods from all food categories to ensure that body obtains all of the nutrients it requires for optimum health [6]. The Dietary Guidelines for Americans also promote a nutrient-dense eating pattern that contains all fruits, whole grains, vegetables, lean proteins, and healthy fats [7]. To decrease the risk of these chronic diseases, it highlights the significance of reducing the intake of added sugar, saturated and trans fats, and salt. Studies have also shown that the quality of the diet, rather than just the quantity of nutrients consumed, is crucial for optimal health. For example, research discovered that a diet rich in whole plant foods as mentioned above, has been related to a lower risk of chronic diseases [8]. Another study suggested that eating a Mediterranean-style diet that is rich in those nutrients mentioned above, was connected with a decreased probability of getting heart disease [9].

2.2.2. Components that will cause disease by overtaking it. Reduced consumption of saturated and trans fats has been demonstrated in studies to significantly lower the risk of CHD. In the Trail of WHI's Dietary Modification, women were randomly allocated to one of the two types of diet, a low-fat diet or a typical diet. After eight years, the low-fat diet was related with a substantial decrease in the incidence of CHD [10]. In addition to limiting saturated and trans fats, boosting unsaturated fat consumption has been demonstrated to lower the risk of CHD. Unsaturated fats, which may be found in foods such as nuts and fatty fish, have been demonstrated to lower the LDL cholesterol, while an increase in high-density lipoprotein (HDL) cholesterol level is seen as well, popularly known as "good" cholesterol, in the blood.

Fiber is another dietary factor that has been related to a decreased risk of CHD. Fiber, included in wholegrains, vegetables and fruits, has been shown to lower cholesterol levels and inflammation, both of which are risk factors for CHD. A 10-gram increase in dietary fiber intake per day will lead to a 14% reduction in the risk of CHD in a meta-analysis of 22 prospective cohort investigations. Type II diabetes develops when the body develops resistance to the hormone insulin, which regulates blood sugar levels.

This causes an excessive amount of glucose exists in the blood, which can lead to bunch of health problems [11-12].

One of the most important dietary factors that contribute to type II diabetes is the intake of added sugars. Added sugars, which are found in many processed foods and beverages, have been shown to raise the risk of type II diabetes by causing insulin resistance and inflammation. A high intake of sugar-sweetened beverages was related with a 26% increased risk of type II diabetes in a meta-analysis of 11 prospective cohort investigations. In addition to added sugars, refined carbohydrates consumption has also been related to an increased risk of type II diabetes. Refined carbohydrates, such as white bread, rice, and pasta, are rapidly digested and absorbed, causing a surge in blood sugar levels. This can result in insulin resistance and the onset of type II diabetes. On the other hand, taking in more whole grains has been proved to lower the risk of type II diabetes. Whole grains, which include brown rice, oatmeal, and whole wheat bread, contain fiber and other nutrients that aid with blood sugar regulation and insulin sensitivity [13].

2.2.3. Importance of adjusting diet structure. Dietary structure is critical in the development of chronic diseases, including CHD and type II diabetes. Both diseases are highly associated with poor dietary habits, particularly those diets high in both saturated and unsaturated trans fats, processed carbohydrates, and added sugars. The author will highlight the impacts of dietary structure on CHD and type II diabetes, as well as suggestions for altering dietary habits to lower the possibility of developing these disorders. Coronary heart disease (CHD) is defined by plaque formation in the arteries where blood is supposed to be delivered to the heart. This can cause artery constriction, limiting blood flow to the heart and raising the risk of heart attack or stroke. While several variables contribute to the development of CHD, dietary structure is a major modifiable risk factor. High saturated and trans fats dietary habits have been firmly linked to an elevated risk of CHD. Saturated fats are typically present in animal products such as meat and eggs, as well as plant-based oils such as coconut oil. Trans fats, which are produced by a process known as hydrogenation, can be found in a wide variety of processed foods, including margarine, baked and fried goods. These fats can increase cholesterol levels in the blood, leading to the formation of plaque in the arteries.

Diets high in unsaturated fats, particularly polyunsaturated and monounsaturated fats, on the other hand, have been found to lower the risk of CHD. These fats may be found in nuts, seeds, avocados, and fatty seafood like salmon and tuna. They can aid in cholesterol reduction and general heart health. Consumption of refined carbohydrates and added sugars is another dietary component significantly associated to CHD. White bread, spaghetti, and rice are examples, as well as sugary beverages and sweets. These foods can cause blood sugar surges, which can damage the artery walls and lead to plaque formation. Furthermore, diets heavy in refined carbs and added sugars can cause weight gain and obesity, both of which are risk factors for CHD. To lower the risk of CHD, it is crucial to follow a diet rich in nutrients mentioned before, while minimizing intake of saturated and trans fats, refined carbohydrates, and added sugars. The Mediterranean diet, which stresses whole foods and healthy fats, has been demonstrated to be very helpful in lowering the risk of coronary artery disease. Other measures for lowering the risk of CHD include keeping a healthy weight, getting regular exercise, and not smoking.

Type II diabetes is defined by raised blood sugar levels as a result of the body's inability to manufacture or use insulin efficiently. This can result in a variety of consequences, including nerve damage, renal disease, and heart disease. Dietary structure, like coronary artery disease, is a key modifiable risk factor for type II diabetes. High-refined-carbohydrate and added-sugar diets have been firmly associated to an elevated risk of type II diabetes. These foods can cause blood sugar increases, which can lead to insulin resistance, a major precursor to type II diabetes. Furthermore, high-fat diets can lead to gaining weight and becoming obese, both of which are risk factors for type II diabetes. Diets rich in fiber, particularly whole grains, fruits, and vegetables, on the other hand, have been demonstrated to lower the incidence of type II diabetes. Fiber can help control blood sugar levels and enhance insulin sensitivity, lowering the risk of developing type II diabetes [13-14].

3. Conclusion

High-fat diet and unhealthy diet structure can truly bring health issues like obesity, CHD and type 2 diabetes. According to the experiment done by researchers, if mice take a high-fat diet for a quite long term, they will show a gain in body weight as well as a lack of the ability to digest glucose to some extent. Simulate that into the condition of human beings, as the diseases are caused by diet, some scientists believe that the symptoms of these diseases may be reduced by adjusting dietary structure. Although what should be included in a daily diet has already been figured out, it is hard for most people in the society to determine for how much of each component that they may take for a daily diet, the balanced diet is always hard to reach. The importance of adjusting diet to minimize the negative effects that those diseases brought to human beings are also emphasized and proved how the overtaking of some components that people must have in daily diets, like fats and fibers, may lead to a result of increased risks for obesity and CHD in some journals. Because of the significance of adapting to a balanced diet and understanding of the vital nutrients that the human body demands, it provides solid and useful data and background for further investigating a more specific and detailed diet which is much easier for people to follow and therefore generally change their diet structure to a healthier and balanced one. The limitation of this review is that the research is done on mice, there might be some deviations when it is adapted to the situation of human beings. Also, the suggestions provided for adjustment of dietary structure are not that in detailed enough to directly conclude a specific diet plan that can be recommended to all people in the public. The author hopes that more researches and investigations could be done that can help nutritionists to figure out a much more detailed diet plan that can be shared with the whole public and therefore the new diet plan may be able to lower the risk of leading to death because of diseases like obesity, CHD and type 2 diabetes.

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