



THE EFFECTS OF LOW CARBOHYDRATE DIET ON BODY MASS INDEX AND BODY FAT PERCENTAGE IN OVERWEIGHT INDIVIDUALS

Sahad T

MD Scholar, Department of Kriyasareera, Government Ayurveda College, Kannur, Kerala, India

ABSTRACT Low carbohydrate diet is the term used for the dieting practice, in which the amount of carbohydrate intake is restricted, which could reduce the total calorie intake. In this diet pattern, proteins and fats acts as the main source of energy. Nowadays, people following these kinds of diets are increasing, and majority of this population is either over weight or obese individuals since it is considered as a weight reduction tool. So, present study is aimed at looking into the effects of low carbohydrate diet on the body in the form of body mass index and body fat percentage. The study was conducted as an observational study, study setting being the nutrition centre located at Naripparambu, Malappuram, Kerala. Participants were enrolled based on inclusion criteria. A two-time assessment was done to assess the pre and post status of body mass index and body fat percentage upon taking the low carb diet. First assessment was done before beginning of the low carbohydrate diet and second assessment on completion of thirty days of the same. The results were shown that low carbohydrate diet can be considered righteous for reducing both body mass index and body fat percentage.

KEYWORDS : low carbohydrate diet, body mass index

INTRODUCTION

Dieting is the practice of eating food in a regulated and supervised fashion to decrease, maintain or increase body weight or to prevent diseases such as diabetes and obesity¹. A restricted diet is more often pursued by those wanting to lose weight like overweight and obese individuals. In general, the most effective diet is any, which reduces caloric consumption. Nowadays, people following diet plans have increased as the prevalence of obesity is increasing in the current scenario² and many of them choose low carbohydrate diet as their diet plan. A low carbohydrate diet limits intake of carbohydrates and emphasizes on food high in protein and fat. Even though all low carbohydrate approaches reduce the overall intake of carbohydrate in the diet, there is no clear consensus on what defines a low carbohydrate diet based on daily calorie intake and exact percentage of each type of macronutrients. So, it is difficult to give a clear-cut definition.

The body mass index (BMI) is defined as the body mass in kilogram divided by the square of height in meter and is expressed in kg/m^2 . It is a parameter used to categorize a person as underweight, normal weight, overweight or obese based on its value. It is a good indicator of the health condition of an individual. A BMI value of $18.5\text{-}24.9 \text{ kg}/\text{m}^2$ is considered as healthy, below which is said to be under weight and above as overweight. A body mass index value of $30 \text{ kg}/\text{m}^2$ or above is called as obesity. Body fat percentage is defined as the amount of body fat mass in regards to the total body weight expressed as percentage. So, it can be calculated as $\text{body fat mass}/\text{body weight} \times 100$. Since the fat distribution in males and females are different, the basis for classifying body fat percentage in both genders are different. A body fat percentage of 10-20 is considered as ideal in men whereas the normal level for female is 20-30%. Just like BMI, any variations from these levels are considered unhealthy.

MATERIALS AND METHODS

The present study was an observational study. So, the idea was to observe the individuals who are taking a low carbohydrate diet. The study centre was the Nutrition centre, located at Naripparambu, Malappuram, Kerala. Individuals taking a low carbohydrate diet plan from the nutrition centre were enrolled for the study in a consecutive fashion. The study demands a two-time assessment of the individuals which was done just before starting the diet plan and after the completion of one month of the same. This helps to measure the exact changes occurring in the body because of the change in diet. Every individual coming afresh to the nutrition centre was interviewed to check whether they satisfy the inclusion criteria. A total of 100 individuals were enrolled for the study based on inclusion and exclusion criteria.

Inclusion criteria

- Individuals with BMI value $\geq 25 \text{ kg}/\text{m}^2$
- Individuals following low carbohydrate diet for a minimum period of 30 days irrespective of gender
- Age: 20-50 years

Exclusion criteria

- Pregnant women and lactating mothers

- Individuals taking medications that affects body weight like steroids, anti-depressants, anti-psychotics etc.
- Individuals on insulin therapy
- Individuals doing additional activities like exercise for accelerating weight loss

Body weight, body mass index (BMI) and body fat percentage were measured using body composition monitor. For the present study, Omron body composition monitor with scale was used, model type being HBF-375 Karada scan. The height of the individuals was noted using a stature meter. All the values were noted. Every individual coming to the nutrition centre was assigned a nutritional coach to ensure that they are following the diet plan strictly, which made the study more accurate. After a period of one month, all the values were again assessed using the body composition monitor to look for the changes.

Statistical Analysis

For all parameters, normality test was done using Kolmogorov-Smirnov test, which revealed that, only body weight was following a normal distribution. So, paired t test was used for the analysis of body weight. Body mass index and body fat percentage were analysed using its non-parametric counterpart; Wilcoxon signed rank test. In all analyses significance level was taken to be 0.05 (i.e., if the p-value is less than 0.05, it can be concluded that the hypothesis is statistically significant). Statistical Analysis was carried out using statistical package, SPSS (version 22.0.0.0).

RESULT

The mean age of the study participants was 36.4 ± 8.09 years. The mean body weight of individuals before taking low carb diet was $83.06 \pm 11.06 \text{ kg}$, after taking the low carb diet, it was $79.60 \pm 10.33 \text{ kg}$. The mean body mass index (BMI) before and after were $32.13 \pm 3.91 \text{ kg}/\text{m}^2$ and $30.77 \pm 3.70 \text{ kg}/\text{m}^2$. The mean value of body fat percentage was reduced from $35.01 \pm 5.72 \%$ to $33.91 \pm 5.67 \%$ after taking low carbohydrate diet for a period of one month. All the results were found to be statistically significant.

DISCUSSION

Discussion on Body mass index

In the present study, analysis showed that all the participants had a reduced body mass index after taking the low carbohydrate diet for a period of one month. The mean BMI of the participants, which was 32.13 before, became 30.77 after taking the diet. It is due to nothing but the loss of body weight as there is no chance for variation in height of the subjects. BMI is defined as the body mass in kilogram divided by the square of height in metre. The mean body weight, which was 83.06 kg before the study was reduced to 79.60 kg after taking the diet. This might be due to the restrictions in the caloric intake in low carbohydrate diet. In low carbohydrate diet, the major carbohydrate food articles like rice and starchy vegetables are restricted, so that body cannot meet its needs for carbohydrates. In such a situation, first the body start to use glucose stored in the liver and break down the glucose stored in muscles. But, as this process continues, body has to use the fat

repositories, which lead to reduction in fat content in the body and it is ultimately reflected as reduction in body weight.

Among alternate diet plans, low carbohydrate diets are preferred over other diets for weight loss. A meta-analysis published in PubMed titled 'The effect of low fat and low carbohydrate diets on weight loss and lipid levels: A systematic review and meta-analyses' suggests that, when compared with low fat diet, low carbohydrate diets are more effective at improving weight loss². Another observation to be discussed is that, no participant was showing increased weight after taking the diet. It can draw a conclusion that, for the purpose of weight reduction, low carbohydrate diets are very effective.

Many studies also suggest that, low carbohydrate diets which provide 1000-1200 calories per day, are indicated in the treatment of obesity as they promote a reduction in insulin and an increase in glucagon, which generates greater oxidation of fat². In such conditions, ketone bodies are produced much and they act as the further substrate for energy, that is why these diets are also called ketogenic diet.

Many studies have shown similar results regarding the body weight of individuals on low carbohydrate diets. A study titled 'Short term effects of a low carbohydrate diet in over-weight and obese subjects with low HDL-C levels' conducted in Turkey has analysed the effects of low carbohydrate diet in 25 women and 18 men for a period of 4 weeks. After the study, they had concluded that, in men, the mean body weight was decreased to 83.0 kg, which was 87.7 kg before taking the diet. In women the mean body weight reduced from 73.2 to 70.8 kg³. These observations are supportive to the findings obtained in the present study.

DISCUSSION ON BODY FAT PERCENTAGE

Similar to body weight and BMI, body fat percentage of the individuals were also shown a drop in body fat percentage. Majority (89%) of the participants had their body fat percentage decreased after taking the low carbohydrate diet. The mean value went down to 33.9 from 35. This can be justified by the fact that, low carbohydrate diet is effective at lowering insulin secretion and increasing fat burning, resulting in significant body fat loss. To backup this, a study conducted by Hall KD et al. can be cited, which was done to assess the body fat loss in carbohydrate restricted diet. The study was conducted in 19 adults with obesity, and the scientists found that, when participants ate reduced carbohydrate diet, they lowered production of the hormone insulin. This diet caused a shift in metabolism, that there is an increase in fat oxidation and a decrease in carbohydrate oxidation. On the reduced carb diet, they lost about 53g of body fat per day. The body fat loss was calculated as the difference between daily fat intake and net fat oxidation measured while residing in a metabolic chamber⁴.

CONCLUSION

In conclusion, the present study conducted in overweight individuals who follows a low carbohydrate diet for a period of one month showed significant decrease in body mass index and body fat percentage level. These results are suggestive of the fact that low carbohydrate diets are good at reducing the body weight and body fat, but its effects on health and metabolism must be studied further to establish it as a treatment for obesity.

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