

HIGH CARBOHYDRATE VS LOW CARBOHYDRATE: THE EFFECT OF CARBOHYDRATES ON THE GLYCEMIC LEVEL OF PERSONS WITH TYPE 2 DIABETES

The reason for this study is to increase awareness of the effects of foods and knowledge of the glycemic index in the management of type 2 diabetes. The glycemic index measures the effect of a certain food on the blood glucose level of a person.¹ It is hypothesized that not all carbohydrates have the same composition and checking postprandial blood sugars is crucial in any diabetes education program.

Patients with type 2 diabetes were recruited from the City of Laredo Health Department La Familia Program. They were served a lunch meal prepared by nutritionists that consisted of 3 oz. baked chicken breast, 1/3 cup white rice and 1/2 cup broccoli. The recommended serving sizes for each food, according to the *Complete Guide to Carb Counting* by the American Diabetes Association, were followed. The patient's blood glucose readings were taken prior to the meal and at 1 and 2 hours after the meal. The patients were asked to return in a week; the same meal was prepared using brown rice, which, although has 2 more grams of carbohydrate, ranks lower in the glycemic index. The meals were exactly the same with exception of the type of rice served (whole grain vs. white.)

The nine volunteers' blood glucose levels were averaged and graphed. Overall, the results for the brown rice showed a small increase in blood sugar but then a much bigger decrease in blood sugar and ended up in 15 mg/dL lower than the original results. These results show that carbohydrates are not the only factor that affect the blood sugar level and that other factors, such as fiber content, the type of carbohydrate (simple or complex), and how processed the food is can also affect the glycemic index.

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BACKGROUND

Carbohydrates are essential to our daily life; they provide the body with the energy needed to keep all body systems functional. After eating, carbohydrates are broken down by enzymes into sugars and are absorbed into the bloodstream. The sugars are absorbed in the blood so that the blood may transport it to cells where the energy is used. Some carbohydrates cause blood sugar level to rise rapidly. Foods such as white rice, for example, are converted immediately to blood sugar, causing the level to spike rapidly. On the other hand, due to the fiber content, brown rice is digested more slowly, causing a slower change in blood sugar level. Brown rice has a lower glycemic index ranking than that of white rice. The glycemic index ranks foods according to how they affect glucose in the bloodstream. The glycemic index uses the amount of carbohydrates, the fiber content, and serving size to calculate the rise or fall of blood sugar level when the food is consumed. One of the most important factors that determine a food's glycemic index is how highly processed its carbohydrates are. Processing carbohydrate removes the fiber-rich outer bran and the vitamin and mineral rich inner germ and leaves mostly the starchy endosperm. Diets filled with high glycemic index foods will cause quick and strong increases in blood sugar levels which are linked to an increased risk of diabetes and heart disease.² On the other hand, lower glycemic index foods have been shown to help control type 2 diabetes.³

METHODS

The study was open to patients of the City of Laredo Health Department (CLHD) La Familia Program with type 2 diabetes. The test compared the differences in glycemic control with regular white rice (high carbohydrate) and brown rice (low carbohydrate). The volunteers came in one week for a healthy lunch consisting of: 3 oz chicken breast, 1/3 cup white rice, 1/2 cup mixed vegetables, and a light beverage. This food was cooked by the healthiest and easiest method possible. The chicken was baked using only lime juice and Mrs. Dash salt-free seasoning for taste. Before the volunteers ate, their blood sugar levels were checked with an Ascensia Contour glucometer and the readings were recorded on a data sheet. Blood sugar levels were also taken at 1 and 2 hours after the meal and were recorded. Averages of the first, second, and third readings were recorded and compared.

The volunteers returned again for a second meal a week later. The same meal was prepared with the only change being the type of rice. The serving of brown rice contained more carbohydrates than the equally portioned white rice. Blood sugar levels were taken prior to the meal and at 1 and 2 hours after the meal for a total of 3 readings.

RESULTS

Nine volunteers were recruited to participate in the study. The blood glucose levels for initial, 1 hour postprandial and 2 hour postprandial were averaged and evaluated. Overall, based on the results, white rice was found to

have the greatest impact on the blood glucose level. At one hour postprandial, the average rise of blood glucose when white rice was consumed was 23 mg/dL above the original reading, or baseline, in comparison to when brown rice was consumed the average rise of blood glucose was 13 mg/dL above the baseline. During the second hour, the blood glucose level after consumption of white rice fell to 9 mg/dL above the baseline vs 15 mg/dL below the baseline for brown rice.

Consumption of brown rice resulted in significantly lower blood glucose readings than that of white rice. This was unexpected since brown rice is higher in carbohydrates than the white rice (2 g more). As a result, it cannot be assumed that similar foods, which differ in carbohydrate levels, will affect blood glucose in a manner relative to their carbohydrate level. Thus, as these results indicate patients with diabetes should monitor their blood glucose levels

accordingly and look for trends based on the foods they consume.

DISCUSSION

Carbohydrates do not always cause an increase in glycemic levels and the consumption of carbohydrates does not always disturb glycemic control. We speculate that, due to the fiber content of brown rice, the carbohydrates were absorbed at a steadier rate than those of white rice, thus causing a decrease of the glycemic level. The hypothesis was proven. The results imply that not all carbohydrates are broken down similarly. The process depends on several factors such as fiber content, type of starch, physical form (coarsely ground grain) and overall control of the individual's diabetes. Other factors include stress, physical activity, and general health.

LIMITATIONS

Because this project was initiated by students and was not an ongoing project of CLHD, there were a few limitations. First, a timeline of six weeks was not sufficient to recruit a larger sample population. In addition, the project could have been more extensive had a component on medical history (eg medications) been included as an initial screening. This project provided insight for the CLHD La Familia Diabetic Program to place more emphasis on food intake and the effects it has on blood glucose level.

REFERENCES

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