Effect of Chia Seed Consumption on Blood Pressure

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Abstract

Hypertension is a condition that has increased in prevalence in recent years and is linked with obesity and poor heart health. Medications are often the solution to lowering blood pressure, but diet also plays a role. While the reduction of sodium intake is often focused on, increasing dietary fiber intake has also been shown to reduce blood pressure and promote heart health (3). Chia seeds are a high source of dietary fiber (11 grams of fiber in one ounce), and they are also a growing trend on the health foods market. Chia seeds are whole grain edible seeds that originate from the *Salvia hispanica* plant (1), and they can be easily added to many different foods. Evidence that chia seeds may lower blood pressure would mean that the consumption of chia seeds could potentially be included in the treatment of hypertension. The aim of this study was to determine if the consumption of chia seeds leads to a reduction of blood pressure in healthy women. This study was a double crossover lasting fifteen weeks, including a five week washout period in the middle. When in the treatment group, participants consumed 20% of their daily calorie recommendation in chia seeds for five weeks.

Introduction

Chia seeds are from the *Salvia hispanica* plant in the Lamiaceae family, and are composed of 15-25% protein, 30–33% fats, 26–41% carbohydrates, and 18-30% dietary fiber. On the health market, chia seeds are most known for their high (omega) ω-3 alpha-linolenic acid content, and their potential to improve serum lipid profiles and prevent chronic diseases (1). Less emphasized is the soluble fiber content of chia seeds. Studies have shown that soluble fiber in the diet can play a role in reducing blood pressure, and therefore can be used in the management of hypertension (3, 4). Blood pressure has not yet been found to decrease with the consumption of chia seeds (2).

Previous studies done on chia seeds have mostly focused on studying changes in participant lipid profiles, and been confined to overweight or obese participants. They have also fed relatively small amounts of chia seeds to the participants each day (1). This study included only women between the ages of 18 and 45 with a healthy BMI and no current chronic diseases, as well as a higher daily intake of chia seeds than past studies.

Chia seeds can be eaten raw or they can be incorporated into foods to be cooked. Some examples of foods that chia seeds can be incorporated into include yogurt, smoothies, salads, and baked goods. Chia seeds also form a gel when mixed with liquid, and can be incorporated into drinks for a unique texture.

Methods

There were a total of twelve participants in this study. For the first five weeks of the study, half of the participants received the chia seed treatment, and half of the participants were the control group, receiving no chia seeds. The second five weeks of the study was a washout period, where neither group consumed chia seeds. During the last five weeks of the study, the groups switched. The participants who were in the treatment group for the first five weeks became the control group, and vise versa. Participants were randomly placed in one of the two groups at the beginning of the study.

Blood pressure data was collected (see Figure 1) for all participants the week before the study, week one and week five of the first five weeks, and week one and week five of the last five weeks. No data was collected during the five week washout period. Blood pressure was taken once on the right arm of each participant with a Omicron blood pressure cuff, and then again five minutes later on the same arm to account for any false readings.

Figure 1. Study Design

Lead-In	Treatment #1					Washout		Treatment #2				
1 Week	Wk1	Wk2	Wk3	Wk4	Wk5	5 Weeks		Wk1	Wk2	Wk3	Wk4	Wk5
*	*				*	→	→	*				*
*	*				*	→	→	*				*

* Blood Pressure Taken

Lead-In
Chia Added Diet
Control Diet
Washout

During the treatment period, the participants were given seven bags of chia seeds per week (one for each day), and each bag contained 20% of their daily calorie recommendation in chia seeds. Based on the different calorie recommendations for each participants, the daily amounts ranged roughly from 70 to 100 grams of chia seeds. Participants were educated on how to incorporate the chia seeds into their diets. They were also asked to keep their exercise patterns fairly constant and consume a diet low in nuts and seeds (other than the chia seeds) throughout the study.

While in the control group, participants received no chia seeds, and were asked to maintain a background diet of no chia seeds (also excluding high amounts of other nuts and seeds from the diet), and to keep their physical activity levels fairly constant.

Results

For all analyses, the data was broken down into average systolic blood pressure, average diastolic blood pressure, and average blood pressure ratio for each person each day that blood pressure was measured. A paired t-test was conducted in order to make sure blood pressure values did not change between the lead in week and week one (both were before treatment). There was no difference between the two weeks. Therefore, week one was used as a baseline value for the remainder of the data analyses.

Levene's test for equality of variances was conducted on differences between week one and week five of the treatment period as compared to data from the control period. If there is no significance ($p > .05$), then equal variances are assumed. If there is significance ($p < .05$), then equal variances are not assumed. Equal variances were assumed for systolic ($p = .380$) and diastolic ($p = .327$) data, and equal variances were not assumed for the ratio ($p = .036$) data. This information is then used to read the t-test described below.

The t-test for equality of means (see Figure 2) measured the difference in means between week one and week five of the treatment period and was compared to the control period. Systolic did not significantly change ($p = .910$), diastolic is approaching significance for increasing ($p = .065$), and the ratio is approaching significance for decreasing ($p = .074$). Negative mean differences represent a decrease over the five weeks, and positive mean values represent an increase.

Figure 2. t-test for Equality of Means

	Variance Assumed	Significance (p value)	Mean Differences
Systolic	Equal Variances Assumed	.910	-.625
Diastolic	Equal Variances Assumed	.065	7.375
Ratio	Equal Variances Not Assumed	.074	-.368

Discussion

The paired t-test proved that there was no significant difference between the blood pressure values of the lead in week and week one. This means that the participants did not experience a change in blood pressure without having received the treatment. The paired t-test for equality of means showed clinical significance (not statistical significance) for diastolic blood pressure increasing and the blood pressure ratio decreasing. Since the ratio is calculated by dividing systolic by diastolic, an increase in diastolic easily explains a decrease in the overall ratio. Therefore, the total blood pressure of the participants did not significantly or clinically decrease throughout the study.

There are limitations to this study. Since the treatment portion of each group was only five weeks, it is possible that the benefits of chia seeds on blood pressure did not appear in such a short time. Lengthier studies are needed to determine the long term impact of consuming chia seeds. Future studies may want to look at populations other than healthy women. For example, using individuals with hypertension or pre-hypertension as participants may yield different results because they already have elevated blood pressures, whereas the healthy women in this study all started out with normal to low blood pressures. Using a larger sample size would also be beneficial.

This study started out with 30 participants, but many dropped out due to the large amount of chia seeds they needed to consume every day; another consideration would be to reduce the amount of chia seeds for the participants each day. There were also gaps in the data due to participants not showing up for appointments. Lastly, as blood pressure tends to vary throughout the day based on exercise, caffeine consumption, stress, and many other factors, it is a difficult parameter to study. Potentially, making sure participants do not consume caffeine on the days of testing and having them sit down and relax for fifteen minutes before testing may remove some of the variability.

Conclusion

While the results of this study were not definitive, there are still some interesting results that should be further explored. Results that are approaching statistical significance show a decrease in blood pressure ratio caused by an increase in diastolic blood pressure, which is not an improvement in blood pressure in regards to health status. Overall, more research is needed to determine if chia seeds have any effect on blood pressure and if they could potentially be used in the treatment of hypertension.

References

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