Amy Harris
Lorena Ferchaud
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Oolong Tea and Type 2 Diabetes

Type 2 diabetes has become a rapidly growing epidemic affecting millions of people worldwide. Currently, over 240 million people around the world live with the disease and this number is not likely to decrease any time soon. It is estimated that in 2025, more than 380 million people will be living with type 2 diabetes which causes approximately 5% of all deaths globally each year (Merin). This disease can be controlled with proper diet, physical activity and oral hypoglycemic agents but researchers are also looking at oolong tea to study its potentially beneficial effects on blood glucose levels in type 2 diabetic patients. However, the benefit of oolong tea to help reduce the risk of acquiring or decreasing the severity of type 2 diabetes is a controversial subject that requires further research.

Some studies that have been conducted show an inverse relationship between oolong tea and blood glucose levels. However, other studies show that there is no association between oolong tea and glucose levels. This controversy is important in terms of nutrition and health because if oolong tea proves to be beneficial it may increase longevity and decrease the chance of serious health complications among type 2 diabetic patients. After researching both sides of the argument, we have concluded that oolong tea taken in conjunction with oral hypoglycemic drugs does seem to have a beneficial effect on blood glucose levels among type 2 diabetic patients.

The first study entitled “Antihyperglycemic Effect of Oolong Tea in Type 2 Diabetes” attempted to determine the efficacy of oolong tea in lowering plasma glucose levels in type 2 diabetic patients in Taiwan. A total of 20 subjects, 10 men and 10 women who had type 2 diabetes and were currently taking hypoglycemic drugs were enrolled in the study. Subjects consumed oolong tea (1,500 ml) or water for 30 days each in a randomized crossover design study.

Subjects were randomly assigned to the order in which they would be given treatment. There was an initial washout period of two weeks where all participants consumed only water. During the next four weeks, participants either drank oolong tea or water. After that, there was a second washout period of two weeks where drinking only water was permitted. Since it was a crossover design, the subjects who originally drank tea were assigned to drink only water and those who drank only water were assigned to drink tea for the next four weeks. During the tea treatment, subjects consumed 1,500 ml of oolong tea per day which contained a total of 353 mg of caffeine. For the water treatment, subjects drank 1,500 ml of water but no tea.

Confounding factors such as BMI, blood pressure, physical activity, dietary intake and antihyperglycemic drugs were all controlled for and measured periodically throughout the study. All of these confounding factors were found to be constant throughout the study which means that the results were most likely not skewed by these factors in any way. Blood was collected five times during the study and there was no bias by the technicians who analyzed the plasma samples because the identity and treatment regimen of the subjects was blinded to them.

Two parameters, glucose concentration and plasma fructosamine were measured to assess short-term and long-term glucose status. Glucose represents the short-term parameter as it shows the plasma glucose concentration at the time of measurement. Fructosamine reflects plasma glucose concentrations over the last 1-2 weeks. It was found that oolong tea significantly decreases both plasma glucose as well as the fructosamine concentration while water did not significantly affect either of these values. While the mechanism by which oolong tea decreases these values is not clear, it's been shown that tea polyphenols may have insulin-like activity in rats while also delaying glucose absorption in rats and rabbits. And even though caffeine has been found to decrease insulin sensitivity by increasing the concentration of serum epinephrine, it's also been found to substantially lower the risk of clinical type 2 diabetes in previous studies. However, human studies need to be conducted in order to see exactly what compounds in oolong tea are beneficial and how they work to decrease plasma glucose levels.

The conclusion of this study supports the fact that oolong tea is effective in lowering the plasma glucose levels of type 2 diabetics who take antihyperglycemic agents. It was also concluded that oolong tea, in conjunction with these antihyperglycemic drugs, was more effective in lowering plasma glucose levels than just taking the drugs alone. This study supports the "pro" side of the controversy in that it concluded that oolong tea may be an effective adjunct to oral hypoglycemic agents in the treatment of type 2 diabetes.

There were many strengths that this study exhibited. This was a randomized crossover design study that was controlled and the subjects were very closely monitored. This type of study gets an "A" grade on the ADA classification system scale because it's

such a strong study design. Cause and effect can be established from this type of study instead of just an association. The confounding factors, such as BMI, blood pressure, dietary intake, physical activity, other sources of caffeine such as soda, and oral hypoglycemic drugs were controlled which makes the findings of this study more valid. Also, all subjects regularly received doctor examinations, dietary intervention by a registered dietitian and patient instructions every week throughout the examination period. The subjects were closely monitored and guided through the study which decreased the likelihood of recall bias.

Even though this was a strong study, there were limitations to it. The biggest limitation seemed to be the sample size. Because only 20 people were participants in this study, it may be hard to form a solid conclusion from it. A large scale study should be conducted in the future to test the efficacy of oolong tea on diabetes. Another limitation was the length of the study. The study period of each drink (either water or tea) was only one month. If a longer study was conducted, HbA_{1c} could be measured which would give the researchers a better idea of glucose levels over a span of three months. No real long-term effect of oolong tea on glucose levels is able to be established based on a one month study period. Another limitation is the age and population that was examined in this study. The mean age of the participants was 61 so further research is needed among younger subjects to see if these results could be reproduced. Also, only men and women from Taiwan were studied so more experiments need to be conducted within a more diverse population. In addition, this study required that a large amount of tea, five cups, be consumed daily. This is an unrealistically large quantity of tea for the normal

population to consume so even if the results were promising, a limitation is that people might not be able to follow the recommendations to improve their diabetes.

All in all, we do support the conclusion that the authors of this first study made. Oolong tea seems to be an independent factor in lowering plasma fructosamine and glucose levels. Because of the strength of the study, we feel that oolong tea may be beneficial for type 2 diabetic patients.

The second study, entitled "The Relationship between Green Tea and Total Caffeine Intake and Risk for Self-Reported Type 2 Diabetes among Japanese Adults" included oolong tea along with three other caffeine containing beverages commonly consumed in Japan. The study attempted to determine a connection between the consumption of these caffeinated beverages and the risk for type 2 diabetes. Oolong tea is considered one of the major sources of caffeine in Asian countries, and is included as a variable in this study. Forty five communities across Japan encompassing 110,792 individuals completed self-administered questionnaires at baseline as part of the Japan Collaborative Cohort Study for Evaluation of Cancer Risk. From these 45 communities, participants from 25 of them completed 5 year follow up questionnaires. At baseline 35,690 of the 110,792 participants reported no history of major disease such as stroke, CHD, cancer, or type 2 diabetes. After five years, only 17,413 individuals completed the follow up questionnaire which examined their coffee and tea consumption and history of type 2 diabetes. The data from these 17,413 individuals, 6,727 men and 10,686 women, was that which was used for this retrospective cohort study. Answers were compared from the baseline questionnaire to the questionnaire that the participants filled out five

years later to see if an association could be made between caffeinated drinks and type 2 diabetes.

The dietary questionnaire asked participants to state the frequency of their average consumption of caffeine containing beverages which included oolong tea. A study participant that selected consumption of oolong tea "almost every day" was then asked to state the number of cups consumed per day. Only 5.0-8.9% of the participants consumed more than 1 cup of oolong tea per day which was estimated to contain 38mg of caffeine in a 190mL cup of tea.

The researcher's conclusion states that oolong tea was not associated with risk for diabetes for all participants of either sex, but that the caffeine intake from oolong tea was, along with the 3 other study beverages, associated with a lower risk for type 2 diabetes.

The strengths of this study are limited. The number of participants in the study was very large which contributed to both the strengths and weaknesses of the study. It is always good to have a large sample size to determine if the outcome is consistent within a large population. This study originally numbered over 110,000 Japanese people. A 5 year follow up showed a decrease in the number of participants from the original 110,000 down to 17,413 people which was still much larger than the sample size in the first study. Another strength was that statistical analyses was conducted to look for associations between caffeine intake and the risk for diabetes by age, sex, family history, smoking, alcohol consumption, and exercise. This allowed for multiple confounding factors to be taken into consideration in order to focus on caffeine consumption and type 2 diabetes.

There were many limitations to this study. The retrospective nature of this cohort study makes it a weaker study due to recall biases, especially over a five year period. A

retrospective study of this magnitude is expensive in comparison to other studies, series and reports, due to the number of people needed to record the data gathered and conduct the statistical analysis. A study size of this magnitude is impossible to control for multiple confounding factors and recall biases. The follow up loss was over 93,000 people. In addition to this being a retrospective cohort study, they relied on self administered questionnaires about tea consumption and an estimation of the volume consumed. There was no monitoring of cup size, caffeine content of the oolong tea or additional consumption of caffeinated carbonated beverages. Due to some of the categories reporting small numbers of data, the consumption categories were combined. Another limitation was that oolong tea was not the focus of this study. In fact, very few people consumed oolong tea on a regular basis and when they did, they did not drink much of it. This makes it harder to form a conclusion on whether or not oolong tea has anything to do with type 2 diabetes. Though the diagnosis of new cases of type 2 diabetes were physician diagnosed, the laboratory values themselves were self reported. It was also noted that 20-30% of participants who had diabetes did not report it which reinforces the fact that these kinds of studies are subject to under or over-reporting of information. This retrospective cohort study receives a B- grade on the ADA classification system scale due to a combination of the strength of a cohort study and the weakness of a retrospective study.

The authors of the second study conclude that consumption of oolong tea was not associated with reduced risk for diabetes for all participants of this study. They further clarify their conclusion by stating that the low consumption of oolong tea among the participants may have contributed in part to the lack of association with type 2 diabetes,

and that clinical trials would be necessary to confirm the protective effect. We support the conclusion of the second study in that we realize an association between oolong tea and type 2 diabetes could not be established for many reasons. Multiple factors, such as study design, lower consumption of oolong tea, and misclassification of exposure may have contributed to the lack of association between oolong tea and type 2 diabetes.

Understanding the strengths and weaknesses of a study design can give one the insight on how well a study has been conducted. A rigorous study that has had all possible confounding factors controlled so as not to skew the results and has had biochemical markers regularly recorded, thereby tracking the progress of the study, is in itself a stronger study design. The results are not left to chance reporting, recall bias, unaccounted for confounding factors and researcher overload. Less rigorous studies are beneficial for the insight they give to the possibility of conducting more in depth scientific research on an aspect of the original study, but the results are much too weak to make any concrete conclusions pertaining to the outcome of such a study. The best that can be extracted from a weak study is an association with a disease, but without control of confounding factors, the association between the variables and the disease can only be assumed.

Monitoring of study participants through the use of medical professionals and ongoing biochemical markers add to the strength of a study. Therefore scientific research shows through the use of studies utilizing strong randomized crossover designs and the establishment of cause and effect that the addition of oolong tea as an independent factor in lowering the glucose concentration and plasma fructosamine may have insulin-like activity. This will consequently help control blood glucose levels in patients with type 2

diabetes. In the future, it would be beneficial to have a more comprehensive study which includes a wider, more diverse population. This will help show the effects of oolong tea in type 2 diabetic patients of varying ethnicities. This study should also include type 2 diabetic patients who don't take hypoglycemic drugs so that it can provide a more solid conclusion for oolong tea's beneficial properties in diabetic patients. More randomized control trials containing a larger sample size and conducted for a longer period of time would also be beneficial to determine oolong tea's efficacy in diabetic patients. Even though the first study we analyzed could be improved upon, we found strong enough evidence to firmly conclude that oolong tea can be beneficial for type 2 diabetic patients.

Works Cited:

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