Role of Green Tea on Obesity and Type-II Diabetes Mellitus Male Individuals

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Objective: To evaluate the effects of Green tea on obesity and hyperglycemia.
Methodology: This observational study was carried out at the department of physiology, in affiliation to Medical Research Centre Liaquat University of Medical and Health Sciences Jamshoro. The sample was collected by convenient random sampling. Total 100 participants, 50 controls and 50 obese diabetics were enrolled. Informed written consent was taken from participants. The body mass index (BMI) of the participants was taken at the time of recruitment,

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and later at 16 weeks of consuming green tea. The serum glucose levels were assessed by fasting (FBS) and random blood sugar (RBS) levels, and HbA1C. The levels of serum Blood glucose were obtained with the glucose oxidase method. Data analysis was done on SPSS 21.0, analysis of variables was done by applying student t-test, the p-value of <0.05 was taken as statistically significant.

Results:100 participants recruited out of which 50 controls and 50 obese diabetics men, it was found that the prolong consumption of green tea for 16 weeks with 20-30 minutes' walk had statistically significant declined in FBS, RBS, HbA1c, and BMI in the obese diabetic subjects, as compared to the controls.

Conclusion: This study concludes that the green tea has positive effect in reducing the total body weight and BMI and helps in maintaining the normoglycemic levels in Type 2 DM.

1. INTRODUCTION

Diabetes mellitus (DM) is known as the commonest chronic metabolic disorder around the world, Majority of the world's population is affected by diabetes [1]. The most common diabetes is Diabetes mellitus Type-II (T2DM). Maintaining the levels of Glucose remains the main priority for a better outcome in diabetic patients [2]. If the hyperglycemia is within control the onset and progression of microvascular complications can be inhibited [3]. HbA1c testing is a vital step for the management of active diabetes, it offers a chance for upgrading of diabetes care [4]. Obesity is a serious metabolic disorder that is resultant of a sedentary lifestyle occurs when there is no balance between the amount of food eaten and physical activity to utilize the energy produced [5]. Obesity is related to poor life quality, and enhanced danger of chronic diseases like hypertension, hyperlipidemia and DM [6]. The most obvious reason for the epidemic is an intake of food with more calories on daily basis, which exceed ≥150 kilocalories in growing age and ≥500 kilocalories for the adult population [7] From 1977 to 2006 the population of people with obesity and/or T2DM has increased and has reached epidemic levels in Asia [8]. Tea, a product of Camellia sinensis plant is widely used across the world in different forms as black tea, green tea or Oolong tea [9]. Oolong is the least fermented tea while the black is the highly fermented variety, from all the varieties, green tea (GT) has the greatest cardioprotective effects, [10] decreasing the incidence of stroke and myocardial infarction, [11] and is useful in the treatment of high-fat diet-induced weight gain, [12] and other related health hazards like T2DM [13] These qualities are believed to be attributed to its antioxidant and anti-inflammatory effects, the ability to reduce body fat is because of the bioactive compounds present in GT [14]

Health enhancing properties of GT are mostly related to catechins the epigallocatechin gallate (EGCG), the most important and abundant flavonoid variety present in GT [15]. It helps to regulate the glucose levels in diabetic as well as healthy individuals, [16] studies demonstrate the strong connection between GT consumption and decreasing hyperglycemia [17].

Photo chemicals are chemical compounds produced by plants. They are endocrine distruptors known for ages to affect blood glucose metabolism. Blood glucose homeostasis is a balance between gluconeogenesis, glycogenolysis and glycolysis among others. Gluconeogenesis which is the production of glucose from non carbohydrate source is in luenced by lip genesis. Phyto chemical effects on glucose metabolism may enhance or inhibit these processes. Phyto-chemical enhancing glycolysis results in hypoglycaemia or inducing gluconeogenesis or glycogenolysis causing hyperglycaemia. Tea, a product of Camellia sinensis plant is widely used across the world in different [18]. This study presents the basic science, that links obesity and diabetes, and how GT can be used for treating obesity and T2DM.

The objective of this study is to evaluate role of Green tea (GT) on obese men with Diabetes mellitus Type-II.

2. METHODOLOGY

The study was carried out at Physiology Department, in association with the Medical Research Centre Liaquat University of Medical and Health Sciences Jamshoro. Total 100 individuals were recruited by simple random sampling technique, the volunteers were separated into two groups, 50 normal healthy

adults, 50 obese diabetics aged between 40-50 years, BMI and the body weight (wt) of both groups were taken at the beginning of study and later after (16 weeks) GT consumption. It was made sure that the obese diabetic group must not have consumed any weight control treatment in the last three months, Group A did not receive any test drinks while the obese diabetics group were given green tea (made by infusing (1.5 g tea bag, Lipton) into 250 ml of hot water to the GT, twice daily for 4 months with 20-30 minutes' walk. The serum glucose levels were evaluated at Medical Research Centre LUMHS Jamshoro, by glucose oxidase method, using Micro Lab 300(spectrophotometer) Roche, USA. Readings of HbA1C, fasting blood sugar (FBS) and random blood sugar (RBS) were taken. Participants who were unable to speak and listen properly were excluded from study.

Data were analyzed on SPSS 21.0, and were expressed as mean, SD (standard deviation), Student's t- test was used for comparison between groups analysis of continuous and categorical variables <0.05 was taken as significant p value.

3. RESULTS

Total 100 participants were selected for this study, 50 were normal healthy adults, and 50 were obese Type 2 diabetics males, both groups were of same age and gender. FBS range in healthy controls at beginning was noted as 96.81±9.5 mg/dl, while in obese diabetics it was

noted as 145.5± 14.9 mg/dl. The RBS range in healthy adults at baseline was noted as 124.2±8.13mg/dl whereas in obese diabetics it was noted as 285.2±35.5 mg/dl with significant differences of (p <0.05). The HbA1c range at baseline in controls was 4.52±1.9% whereas, in obese diabetic group it was 9.31±2.4%. BMI in controls at baseline was recorded as 22.7±4.1kg/m^2 while in obese diabetics was noted as 29.7±3.16 with significant difference of (p <0.05), as shown in Table 1.

After intervention with GT, the value of all the variables shown significant decline as compared with baseline levels. FBS in obese diabetics after GT consumption of 16 weeks was reduce and noted as 102.5± 19.2 mg/dl versus obese diabetics 145.5± 14.9 mg/dl. RBS in obese diabetics after GT consumption was declined to 210.3±25.5mg/dl. The HbA1c in obese diabetic group after GT consumption stands out to be was 7.12±3.3%, and the BMI also decrease after GT consumption in obese diabetics was noted as 27.5±2.6 with significant difference of (p <0.05), as shown in Table 2.

4. DISCUSSION

GT has proven effects on the overall health, which is because of the catechins present in GT, which are polyphenols in nature in present study we analysed the GT effect as a potent hypoglycemic agent, as well as marked effect on the weight and BMI was observed after 16 weeks GT consumption.

Table 1. Baseline Readings of Controls and Obese Type 2 Diabetics men by applying t-Test

Variables	Healthy Subjects n=50	Obese T2DM n=50	p- value
	Mean ± Standard deviation		
Fasting Blood Sugar (mg/dl)	96.8±9.5	145.5± 14.9	<0.05
Random Blood Sugar (mg/dl)	124.2±8.13	285.2±35.5	<0.05
HbA1c (%)	4.52±1.9	9.31±2.4	<0.05
BMI (kg/m^2)	22.7±4.1	29.7±3.16	<0.05

Table 2. Role of green tea after 16 week of consumption by obese diabetic group

Variables	Obese T2DM n=50	Observational group n=50	p- value
	Mean ± Standard deviation		
Fasting Blood Sugar (mg/dl)	145.5± 14.9	102.5± 19.2	<0.05
Random Blood Sugar (mg/dl)	285.2±35.5	210.3±25.5	<0.05
HbA1c (%)	9.31±2.4	7.12±3.3	<0.05
BMI (kg/m^2)	29.7±3.16	27.5±2.71	<0.05

Bae et al. [19] suggested that prolong usage of green tea and diallyl disulfide reduces the accumulation of triglyceride in liver, by mechanism that involve suppression of high fat diet upregulation of fatty acid. In our study we also found the decrease in weight as the total BMI changes from 29.7±2.6kg/m2 to 28.5±2.6kg/m^2.According to I -Ju chen [20] significant weight loss, from 76.8 ± 11.3 kg to 75.7 ± 11.5 kg (p = 0.025), and decrease in BMI (p = 0.018) and waist circumference (p = 0.023) was seen in the study group after 12 weeks GT consumption. This study corresponds to our finding of BMI decline after GT consumption. A study suggests significant decline in BMI after GT consumption and intermittent sprinting exercise group [21]. This research favors our findings as we also observed decline in BMI after 16 weeks of extended use of green tea. A meta-analysis [22] recommended that GT, decrease FBG levels, compared with water (−2.10 mg/dL; 95% confidence interval (CI), −3.96 to −0.24 mg/dL; *p* = 0.03; moderate quality of evidence). In our study found significant effect of GT consumption for 16 weeks on FBS from 145.5± 4.2 mg/dl to 98.5± 4.2mg/dl, the findings are inconsistent to our study. Another study by Jinyue et al. [23] the results found GT/GTE had no effect on HbA1c, in T2DM risk patients. whereas in the study by Renfan et al. [24] there is significant decrease in HbA1c which is consistent to our study showing HbA1c decline from 9.31±2.4 to 6.12±2.4%.

5. CONCLUSION

Intake of green tea up to 16 weeks results in weight loss and decrease in HbA1c and levels of fasting as well as random blood sugars. All the components of GT have significant role to enhance weight loss, either by decreasing calorie utilization, dropping serum triglycerides, or preventing the fatty acid absorption.

6. RECOMMENDATIONS

Well-designed and controlled clinical studies should be encouraged in the field of herbal medicine, as flavonoids is viewed as the active constituent of GT, its particular impact on obesity and hyperglycemia should be observed in humans.

CONSENT

Informed written consent was obtained from all the volunteers taking part in the study.

ETHICAL APPROVAL

Study was conducted after approval from the ethical committee LUMHS.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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