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POST-PRANDIAL EFFECT OF BEETROOT (*BETA VULGARIS*) JUICE ON GLUCOSE AND LIPIDS LEVELS OF APPARENTLY HEALTHY SUBJECTS.

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ABSTRACT

Beetroot (*Beta Vulgaris)* is a naturally occurring root vegetable that has attracted much attention as a health promoting functional food. Beetroot is rich in bioactive compounds that may provide health benefits with improved clinical outcomes for several pathologies, such as hypertension, atherosclerosis, type 2 diabetes and dementia. This study evaluates the effect of Beetroot juice on plasma lipids and glucose levels after two hours of carbohydrate intake. Fifty apparently healthy subjects were used for this study, age and sex matched. Glycated haemoglobin (HbA1c) was done on all subjects to rule out diabetics and also none had a history of cardiovascular disease. Thirty subjects were used as test (given 300g of carbohydrate meal and 250ml of beetroot juice) and the other 20 subjects as controls (given 300g of carbohydrate meal and 250ml of water). Beetroot was bought locally, washed, peeled and blended. The juice was sieved and served to test subjects. Glucose was estimated quantitatively using glucose oxidase method as modified by Randox laboratories limited (UK), total cholesterol (TC), triglycerides (TG), high density cholesterol (HDL) were estimated quantitatively using enzymatic method modified by Randox laboratories limited (UK) and low density cholesterol (LDL) was calculated using the Frieldwald equation. The post treatment value (2HPP) was significantly lower than that of pre treatment (FBS) $p<0.05$. There was no significant difference ($p>0.05$) in the pre and post treatment values in the control group. The post treatment TC, TG, and LDL values were significantly lower than the pre treatment values in the test group. In the control group, there was no significant difference between pre and post treatment in TC, TG, HDL and LDL values. Beetroot juice tends to reduced post prandial glucose and lipid levels in apparently healthy subjects. It should be incorporated as part of daily diet and used as nutritional therapy as consumption of beetroot juice is beneficial for maintenance of good health.

KEYWORDS: Beetroot, lipids, postprandial, diabetes, antihyperglycaemia.

1. INTRODUCTION

Beetroot (*Beta Vulgaris)* is a naturally occurring root vegetable that is commonly found in temperate and tropical regions. It is grown in many countries worldwide, where it is consumed as part of the normal diet. It is also commonly used to manufacture food colouring agents (Georgiev *et al*., 2010). In recent years, the root vegetable has attracted much attention as a health promoting functional food. While scientific interest in beetroot has only gained momentum in the past few decades, reports of its use as a natural medicine date back to Roman times (Ninfali and Angelino, 2013).

The recent interest in beetroot is driven by discoveries involving sources of dietary nitrate and its importance in managing cardiovascular health (Lundberg *et al*., 2008). Beetroot is rich in several other bioactive compounds that may provide health benefits, particularly for disorders characterised by chronic inflammation. Also, recent research has provided compelling evidence that beetroot ingestion offers beneficial physiological effects that may translate to improved clinical outcomes for several pathologies, such as hypertension, atherosclerosis, type 2 diabetes and dementia (Gilchrist *et al*., 2014). Studies on hypertension have shown that beetroot delivered acutely as a juice supplement (Jajja *et al*., 2014), or in bread (Hobbs *et al*., 2013) significantly reduce systolic and diastolic blood pressure (Lidder and Webb, 2013).The aim of this study is to determine the effect of Beetroot juice on plasma lipids and glucose levels after two hours of carbohydrate intake.

2. MATERIALS AND METHODS

Fifty apparently healthy subjects were used for this study, age and sex matched. Glycated haemoglobin (HbA1c) was done on all subjects to rule out diabetics and also none had a history of cardiovascular disease. Thirty subjects were used as test (given 300g of

carbohydrate meal and 250ml of beetroot juice) and the other 20 subjects as controls (given 300g of carbohydrate meal and 250ml of water). All subjects were on a 10-14 hour overnight fast prior to feeding and sample collection. Beetroot was bought locally, washed, peeled and blended. The juice was sieved and served to test subjects.

Proper vene puncture technique was employed in the collection of blood samples. All reagents were commercially purchased and manufacturers operating procedures strictly adhered to. Fasting blood sugar (FBS) and 2 hour post-prandial (2HPP) glucose were estimated quantitatively using glucose oxidase method as modified by Randox laboratories limited (UK), total cholesterol (TC), tryglycerides (TG), high density cholesterol (HDL) were estimated quantitatively using enzymatic method modified by Randox laboratories limited (UK) and low density cholesterol (LDL) was calculated using the Frieldwald equation.

Data generated were analysed using statistical package for social sciences (SPSS version 22). Comparisons of mean and standard deviation were made for test and control subjects using the student t-test. Results were considered statistically significant at $p< 0.05$.

3. RESULTS

Table: 1. Pre-treatment values of Glucose, TC, TG, HDL and LDL for test and control subjects.

	FBS(mmol/l)	TC(mmol/l)	TG(mmol/l)	HDL(mmol/l)	LDL(mmol/l)
Test	4.52±0.43	4.88±0.64	1.60±0.13	1.14±0.09	3.07±0.80
Control	4.34±0.61	4.79±0.45	1.51±0.05	1.44±0.12	3.19±0.49
p-value	p>0.05	p>0.05	P<0.05	p>0.05	p>0.05

Table 1 above shows the mean FBS, TC, TG, HDL and LDL levels in the test and control subjects prior to treatment. It reveals there are no significant differences between the parameters in the test and control groups only for TG which was significantly higher in the test than controls.

Table: 2. Pre and post treatment values of glucose in test and control subjects.

	Glucose (mmol/l)	
	Test	Control
Pre-treatment (FBS)	4.52±0.43	4.34±0.61
Post-treatment (2HPP)	3.97±0.28	4.19±0.61
p-value	p < 0.05	p > 0.05

Table 2 shows glucose levels in test and control subjects before (FBS) and after treatment (2HPP). It revealed that the post treatment value (2HPP) was significantly lower ($p<0.05$) than that of pre treatment (FBS). Also it showed there was no significant difference ($p>0.05$) in the pre and post treatment values in the control group.

Table: 3 Pre and post treatment values of TC, TG, HDL and LDL in test and control subjects.

	TC		TG		HDL		LDL	
	Test	Control	Test	Control	Test	Control	Test	Control
Pre	4.79±0.64	4.88±0.45	1.60±0.14	1.51±0.06	1.41±0.09	1.44±0.12	3.07±0.80	3.17±0.49
Post	4.29±0.45	4.63±0.54	1.41±0.06	1.48±0.06	1.36±0.12	1.38±0.11	2.35±0.55	2.92±0.68
p-value	p <0.05	p >0.05	p < 0.05	p >0.05	p >0.05	p >0.05	p <0.05	p >0.05

Table 3 shows pre and post treatment values of TC, TG, HDL and LDL in the test and control groups. It shows the post treatment TC, TG, and LDL values are significantly lower than the pre treatment values in the test group, whereas HDL had no significant difference. In the control group it shows there is no significant difference between pre and post treatment in TC, TG, HDL and LDL values.

4. DISCUSSION

The results from this study showed that the test subjects had significantly lower post-treatment glucose levels (2HPP) after the 300g carbohydrate meal and the administered 250ml beetroot juice as compared to their pre-treatment glucose levels (FBS). In the control group, there was no significant difference between pre and post treatment glucose levels. This agrees with the findings of Wooton-Beard *et al*., 2011, in which they discovered an early insulin response in healthy volunteers lowering their glucose levels after ingestion of beetroot juice. It also agrees with the work of Gilchrist *et al*., 2014, in which after beetroot juice supplementation, there was improvement in reaction time in type 2 diabetic individuals. This anti-glycaemic effect could be attributed to one of the many antioxidant compounds contained in beetroot particularly alpha-lipoic acid, which improves insulin sensitivity (Gilchrist *et al*., 2014; Megan, 2015).

Our results also reveal significantly lower lipid levels (TC, TG and HDL) in the test group after ingestion of 300g of carbohydrate meal and 250ml beetroot juice as

compared to the pre-treatment lipid levels. In the control group, there were no significant differences in the pre and post- treatment lipid levels, indicating beetroot juice lowered the lipid levels in the test group. This agrees with the work of Singh *et al*., 2015, in which beetroot juice supplementation decreased LDL cholesterol levels in physically active individuals. Also Rabeh and Ibrahim, 2014, reported anti-lipidemic effect of beetroot extract on hypercholesterolmic rats.

5. CONCLUSSION

Beetroot juice significantly reduced post prandial glucose and lipid levels. Therefore, consumption of beetroot juice may be beneficial for maintenance of good health. It should be incorporated as part of daily diet and used as nutritional therapy. A glass of Beetroot juice a day will not only provide the body with the required nutrient but may also protect and prevent disease.

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