

Research Article

Effect of Whey Water Supplementation on the Anthropometric measurements, selected Biochemical Parameters and Blood Pressure Levels in Type 2 Diabetic Subjects

R. Pratheepa and D. Annette Beatrice

Women's Christian College, College Road, Chennai, Tamil Nadu, India.

ABSTRACT

Whey is a watery component removed after the setting of the curd in cheese manufacture. Whey proteins are well known for their high nutritional value and versatile functional properties in food products. Whey proteins have insulinotropic effects and reduce the post prandial glycemia in type 2 diabetic subjects. It is suggested that higher protein levels can stimulate insulin production from pancreas. The aim of the study was to develop idli using whey water and to study the effect of supplementation of whey incorporated idli on selected biochemical parameters (TC, HDL cholesterol, LDL cholesterol, TGL, VLDL and serum insulin) on selected type 2 diabetic subjects. Results showed that after supplementation for 30 days the post prandial plasma glucose level decreased ($p < 0.01$), and biochemical parameters such as TC ($p < 0.05$), LDL ($p < 0.01$), TGL ($p < 0.01$) reduced significantly in type 2 diabetic subjects. After 30 days of supplementation the serum insulin levels also increased significantly ($p < 0.01$). After the withdrawal period of 15 days the post prandial plasma glucose level increased significantly ($p < 0.01$). The TC ($p < 0.01$), the LDL ($p < 0.01$), TG ($p < 0.01$), VLDL ($p < 0.01$) also showed a significant increase. The serum insulin levels also decreased significantly ($p < 0.05$). This whey water incorporated idli can be best used in the dietary management of type 2 diabetic subjects.

Keywords: whey water, post prandial plasma glucose level, serum insulin, serum lipid profile.

INTRODUCTION

Diabetes Mellitus is a chronic metabolic disorder of multiple etiologies characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action or both. Management concentrates on keeping blood sugar as close to normal in order to prevent the major complications associated with type 2 diabetes mellitus (Mahan and Stump, 2008). Dietary Management with a calorie restriction and a nutritionally adequate meal plan with a reduction of total fat especially saturated fat, accompanied by an increase in physical activity should be recommended (ADA, 2000). Incorporating naturally occurring plants that have hypoglycemic effect have found potential use in subjects with type 2 diabetes mellitus in the early stages of the disease (Mukherjee et al., 2006). Among the various products whey plays an important role in bringing down the blood sugar levels. Whey was discovered about 3000 years ago. Apart from being valued as a medicinal agent in the 17th and 18th centuries,

whey has primarily been considered a waste by the dairy industry, and thus destined for the 'cheapest gutter' (Geoffery 2008). Collectively whey proteins have all the essential amino acids and in higher concentrations compared to various vegetable protein sources such as soy, corn and wheat gluten. In addition to having a full spectrum of amino acids found in whey are efficiently absorbed and utilized. Relative to other protein sources, whey has a high concentration of branched amino acids (leucine, isoleucine and valine). Whey proteins are also rich in sulphur containing amino acids cysteine and methionine (Keri Marshall 2004).

MATERIALS AND METHODS

The present study was designed to determine the glycemic response of whey water incorporated idli, its effect on selected biochemical parameters with the supplementation in female subjects with type 2 Diabetes Mellitus. The sample size consisted of 12 female type 2 diabetic subjects within the age group of 25-55 years. These subjects were

registered as outpatients in Dr. Anand Moses Clinic, Purasawalkam, Chennai. This study is a pre-test, post-test experimental design. The study was designed to determine the effect of whey water incorporated idli on the anthropometric measurements and selected biochemical parameters on type 2 diabetic subjects before and after supplementation and after the withdrawal period. The subjects were selected based on purposive sampling technique. The subjects were supplemented with four whey water incorporated idlis for a period of 30 days. Thereafter for 15 days the subjects were requested to consume their standard rice idli for 15 days. The anthropometric measurements were assessed on the first day, 30th day and 45th day

RESULTS

The mean fasting plasma glucose level and post prandial plasma glucose level of the subjects decreased from 125.35±34.10mg/dl to 95.75±21.86mg/dl and 97.08±57.11mg/dl to 188.75±71.26mg/dl respectively. Whereas, after the withdrawal period both fasting and post prandial plasma glucose levels increased significantly ($p<0.01$). This shows that withdrawal of whey water incorporated idli has brought about increase in the plasma glucose levels.

The mean serum insulin levels of the subjects increased significantly ($p<0.01$) after the supplementation period from 12.089±5.26mU/L to 14.846±4.068mU/L which shows that whey water has insulinotropic effect in diabetic

subjects. The mean serum insulin levels decreased significantly ($p<0.05$) after the withdrawal period from 14.846±4.068mU/L to 12.67±5.63mU/L, indicating the positive effect of whey water on serum insulin.

With regard to serum lipid profile the values of the total cholesterol, LDL-C, VLDL-C, HDL-C, triglycerides, at the beginning and end of the supplementation period were found to be 173.75±28.46 and 156.75±32.75mg/dL; 111±37.69 and 99.00±47.96 mg/dL; 37.58±9.43 and 36.58±5.33 mg/dL; 42.08±3.99 and 50.50±9.88 mg/dL; 185.92±47.15 and 176.83±60.25 mg/dL respectively. There was a statistically significant decrease in total cholesterol ($P<0.05$), LDL-C ($P<0.01$), VLDL-C ($P<0.01$), triglycerides ($P<0.01$), and a non-significant increase in HDL-C at the end of the supplementation period. The present study indicated that whey have a beneficial effect on the serum total cholesterol, LDL-C levels; HDL-C and VLDL and triglycerides

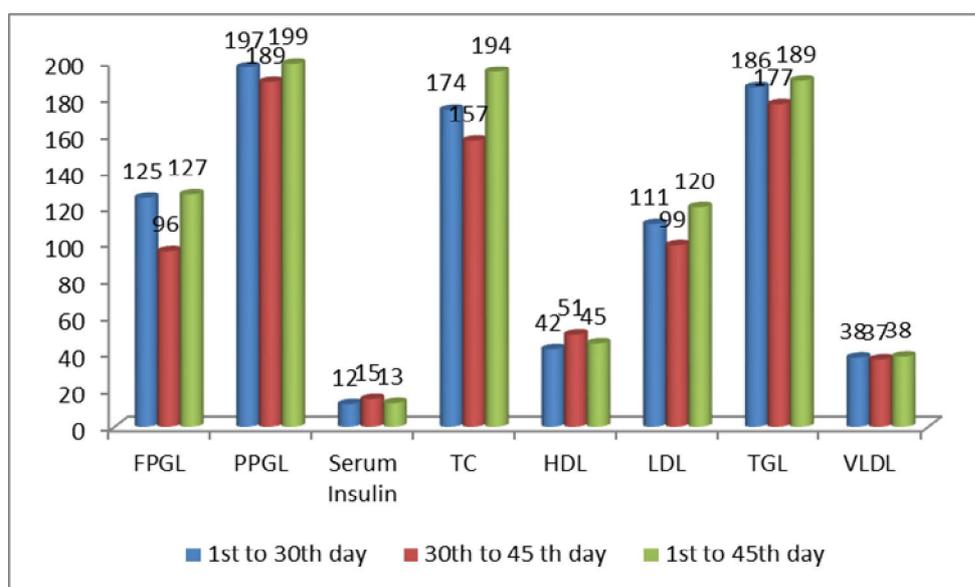
At the end of the withdrawal period the values of total cholesterol, LDL-C, VLDL-C, HDL-C and triglycerides were found to be 194.42±32.74 mg/dL, 120.21±47.95 mg/dL, 38.13±6.09mg/dL, 45.22±2.85 mg/dL and 189.44±60.67mg/dL respectively. There was a statistically significant increase in total cholesterol ($p<0.01$), LDL-C ($p<0.01$) and triglyceride levels ($p<0.01$). There was a non-significant increase in HDL-C and decrease in HDL-C levels at the end of the withdrawal period.

Comparison of Selected Biochemical Parameters before and after Supplementation and Withdrawal Period

Parameter	Mean ± SD		
	Day 1	Day 30	Day 45
Fasting Plasma Glucose Level(mg/dL)	125.35±34.10	95.75±21.86	127.20±35.00
Post Prandial Plasma Glucose Level(mg/dL)	197.08±57.11	188.75±71.26	199.01±66.12
Serum Insulin(mg/dL)	12.089±5.26	14.846±4.068	12.67±5.63
Total cholesterol (mg/dL)	173.75±28.46	156.75±32.75	194.42±32.74
LDL-C (mg/dL)	111±37.69	99.00±47.96	120.21±47.95
VLDL-C (mg/dL)	37.58±9.43	36.58±5.33	38.13±6.09
HDL-C (mg/dL)	42.08±3.99	50.50±9.88	45.22±2.85
Triglycerides (mg/dL)	185.92±47.15	176.83±60.25	189.44±60.67

Test of Significance

Parameter	Comparison of mean difference			
	Day 1 vs. Day 30		Day 30 vs. Day 45	
	't' value	'p' value	't' value	'p' value
Fasting Plasma Glucose Level(mg/dL)	3.530	P<0.01	3.646	P<0.01
Post Prandial Plasma Glucose Level(mg/dL)	4.206	P<0.01	0.427	P<0.01
Serum Insulin(mg/dL)	5.485	P<0.01	0.296	P<0.05
Total cholesterol (mg/dL)	2.857	P<0.05	2.653	P<0.01
LDL-C (mg/dL)	4.943	P<0.01	1.141	P<0.01
VLDL-C (mg/dL)	3.768	P<0.01	0.692	NS
HDL-C (mg/dL)	0.078	NS	2.972	NS
Triglycerides (mg/dL)	5.507	P<0.01	2.916	P<0.01



DISCUSSION

Milk protein, in particular the whey fraction, has been shown to display insulinotropic properties in persons with type 2 diabetes (Michael 2007). Whey has the greatest impact on glucose metabolism by increasing both insulin secretion and glucose-dependent insulinotropic polypeptide (GIP) (Nilsson et al., 2004). Whey appears to stimulate an increase in postprandial insulin response with a corresponding reduction in postprandial blood glucose levels (Ostman et al., 2007). Studies exploring the insulinotropic effect of the dairy protein have found that the whey fraction seems to contain the predominating insulinotropic secretagogue (Zawadzki et al., 2009). Whey is one of the most rapidly digested protein resulting in high postprandial concentrations of amino acids. Individual amino acids may act as potent insulin secretagogues (Brehm et al., 2003) and in particular, leucine, isoleucine, valine, lysine and

threonine present in whey have been proposed as the most likely amino acids responsible for the increase seen in insulin concentrations which may account for the results seen in this study.

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