



Effects of Chromium and Dietary Fiber Nutritional Supplement in Type 2 Diabetic Patients



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Introduction

The global epidemic of diabetes mellitus is rapidly increasing and has been suggested to be attributable to the synergistic effects of the growing prevalence of obesity, westernized dietary patterns as well as the inactive lifestyle (International Diabetes Federation, 2006). The type 2 diabetic patients with abnormalities in the metabolism of carbohydrates and lipids are predisposed to hyperglycemia and higher risk of multiple complications. Many previous studies have demonstrated the beneficial effects of dietary fiber and chromium in patients with type 2 diabetes mellitus. The dietary fiber serves the function of delaying glycemic rise and improving blood lipid profile of total cholesterol and low density lipoprotein cholesterol while the chromium acts significantly in the action of insulin. The purpose of the study was to investigate the effects of chromium and dietary fiber nutritional supplement on physiological functions and nutritional status of type 2 diabetic patients.

Materials and methods

Participants

A total sample of 76 participants (male:34, female:42) diagnosed with type 2 diabetes mellitus, aged 30–70 yr, were recruited from hospital setting in Taipei city between 2005 and 2007.

Formulas

The participants were divided into 2 treatment groups receiving 2 chromium and dietary fiber supplements daily throughout a 3-month intervention study; [chromium yeast group] (N = 30) 50g of chromium yeast and fiber nutritional supplement containing 200 μ g of chromium and 7.25g of dietary fiber and [low fat high fiber group] (N = 46) 90g of low fat and high fiber supplement with the chromium and dietary fiber content of 90 μ g and 9.7g respectively.

Anthropometric, blood sample and dietary records

The anthropometric measurement, blood, and dietary analyses were performed at the baseline, the end, the follow-up period of the study.

Statistical analysis

Obtained study results were assessed with student's t test for within group comparisons and all values were displayed as mean \pm SD. All statistical analyses were carried out using SAS 8.2 software package with $p < 0.05$ suggesting statistical significance.

Results and discussion

Low fat high fiber group

In the follow-up period, the serum concentration of LDL-C lowered significantly but the serum concentration of TG, TC as well as HDL-C showed no significant differences compared to the baseline data. The serum biochemical markers such as AST, ALT, BUN, and creatinine for evaluating the renal and liver status were found to be within the suggested normal range during the entire study session. While the test results demonstrated no significant improvement on serum glucose and glycated hemoglobin, the body fat percentage increased.

Table 1. Characteristics of participants

	Chromium yeast group		Low fat high fiber group	
	Male (N = 12)	Female (N = 18)	Male (N = 22)	Female (N = 24)
	Total (N = 30)		Total (N = 46)	
Age (yr)	66.36 \pm 10.64		55.7 \pm 8.2	
Height (cm)	157.8 \pm 9.55		159.2 \pm 8.5	
Body weight (kg)	63.8 \pm 10.30		70.3 \pm 12.8	
BMI b (kg/m ²)	25.7 \pm 4.22		27.8 \pm 4.6	
Body Fat (%)	30.2 \pm 10.28		33.7 \pm 11.6	

^a Values are displayed as mean \pm SD

^b BMI: body mass index

Table 2. The serum biochemical data of participants in low fat high fiber group

	Total (n=46)		
	Baseline	Intervention period	Follow-up
Fasting Blood Glucose (mg/dL)	174.4 \pm 52.9	177.3 \pm 39.2	174.7 \pm 46.6
HbA1c (%)	8.3 \pm 1.5	8.6 \pm 1.4 *	8.5 \pm 1.4
Triglyceride (mg/dL)	210.4 \pm 139.4	210.8 \pm 124.9	190.1 \pm 117.9
Total cholesterol (mg/dL)	208.6 \pm 36.5	193.7 \pm 30.1	206.5 \pm 31.3
LDL-C ^b (mg/dL)	139.0 \pm 31.6	125.9 \pm 32.6 *	129.2 \pm 25.2 *
HDL-C ^c (mg/dL)	54.6 \pm 14.2	49.5 \pm 14.8	53.3 \pm 13.5
AST ^d (IU/L)	33.9 \pm 18.4	32.1 \pm 20.1	29.6 \pm 13.7 *
ALT ^e (IU/L)	38.1 \pm 22.3	36.0 \pm 17.7	34.1 \pm 18.0 *
Albumin (g/dL)	4.4 \pm 0.3	4.5 \pm 0.3 *	4.5 \pm 0.4
Creatinine (mg/dL)	0.8 \pm 0.2	0.9 \pm 0.2	0.9 \pm 0.2
BUN ^f (mg/dL)	16.1 \pm 5.4	16.9 \pm 5.1	15.9 \pm 3.9

^a Values are displayed as mean \pm SD

^b LDL-C: Low density lipoprotein cholesterol

^c HDL-C: High density lipoprotein cholesterol

^d AST: Aspartate aminotransferase

^e ALT: Alanine aminotransferase

^f BUN: Blood urea nitrogen

* Significantly different at $p < 0.05$ by t test

Chromium yeast group

The serum concentration of TC and TG in the follow-up period increased significantly compared to baseline data and no significant improvement was found for serum lipid profile. The renal and liver status remained unaffected with the serum biochemical markers of AST, ALT, BUN, and creatinine stayed within the normal concentration during the study. While the test results demonstrated no significant improvement on serum glucose and glycated hemoglobin in type 2 diabetic participants, the serum concentration of albumin was significantly raised by 2.29% suggesting a better nutritional status.

Table 3. The serum biochemical data of participants in chromium yeast group

	Total (N = 30)		
	Baseline	Intervention period	Follow-up
Fasting Blood Glucose (mg/dL)	139.4 \pm 35.1	154.7 \pm 52.7	157.0 \pm 39.5 *
HbA1c (%)	7.7 \pm 1.3	7.8 \pm 1.7	8.0 \pm 1.5
Triglyceride (mg/dL)	130.1 \pm 38.9	133.6 \pm 73.9	148.0 \pm 83.6 *
Total cholesterol (mg/dL)	198.7 \pm 38.9	217.7 \pm 49.8 *	213.4 \pm 44.4 *
LDL-C (mg/dL)	128.0 \pm 34.8	122.1 \pm 40.9	121.0 \pm 35.8
HDL-C (mg/dL)	51.1 \pm 9.8	50.4 \pm 9.4	50.7 \pm 10.4
AST ^d (IU/L)	22.90 \pm 11.00	25.56 \pm 12.13	24.60 \pm 14.94
ALT ^e (IU/L)	22.73 \pm 13.31	25.83 \pm 19.07	26.90 \pm 24.04
Albumin (g/dL)	4.36 \pm 0.35	4.41 \pm 0.27 *	4.46 \pm 0.41 *
Creatinine (mg/dL)	1.03 \pm 0.23	1.08 \pm 0.24	1.09 \pm 0.31 *
BUN (mg/dL)	16.28 \pm 4.43	17.72 \pm 6.29	18.47 \pm 7.63

^a Values are displayed as mean \pm SD

^b LDL-C: Low density lipoprotein cholesterol

^c HDL-C: High density lipoprotein cholesterol

^d AST: Aspartate aminotransferase

^e ALT: Alanine aminotransferase

^f BUN: Blood urea nitrogen

* Significantly different at $p < 0.05$ by t test

Conclusion

The use of both chromium and dietary fiber nutritional supplements in type 2 diabetic patients had no negative effects on liver and renal status and no significant improvement on serum glucose, glycated hemoglobin as well as the lipid profile of total cholesterol, triglyceride, and HDL-C was observed.