



EFFECT OF FIBER SUPPLEMENT ON BLOOD GLUCOSE LEVEL OF NIDDM SUBJECTS

Seema V Medhe* and Mangal V Medhe

Shardabai Pawar Mahila Mahavidyalaya, Shardanagar, Baramati, Pune, Maharashtra, India

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Abstract: An investigation was undertaken to assess effect of fiber rich supplement on blood glucose level of type 2 diabetic patients. Fiber rich supplement was tested on eleven type 2 diabetic subjects for blood glucose lowering effect by undertaking an intervention of two months feeding trials. Results with respect to two months supplementation indicated that the fiber rich supplement was helpful in significantly reducing the fasting and postprandial blood glucose level of subjects. The reduction in the fasting blood glucose level after two months supplement intake was 30-70 mg/dl. While, the postprandial blood glucose values of the subjects were reduced by 92-140 mg/dl. There was reduction in the physiological symptoms at the end of the supplementation. It can be concluded from the study that the fiber rich supplement had therapeutic value as it was beneficial for lowering the blood glucose content of type 2 diabetics.

Keywords: Diabetic Patients, Fiber Rich Supplement, Blood Glucose

INTRODUCTION

Diabetes mellitus places a very great burden on individuals, healthcare systems and societies in all countries. Diabetes mellitus is a chronic metabolic disorder that prevents the body to utilize glucose completely or partially genetic predisposition combined with life style changes, associated with urbanization and globalization, contribute to this rapid rise of diabetes in India (Mohan *et.al.* 2007) .

Diet of diabetic person should have more amount of dietary fiber as it plays vital role in the health status of a diabetic person. Dietary fiber is the edible part of plants or analogous carbohydrates that are resistant to digestion and absorption in the human small intestine with complete or partial fermentation in the large intestine. Physical properties of dietary fiber are water holding capacity (WHC), cation binding capacity (CBC) and viscosity, whereas, physiochemical properties include hypoglycemic and hypolipidemic effects. Dietary fiber promotes beneficial physiological effects including laxation and/or blood attenuation, (Hipsley, 1953).

Dietary fiber and complex carbohydrates benefit Type 1 and Type 2 diabetes. Soluble dietary fiber such as pectin, gums, hemicelluloses increase intestinal transit time, delay gastric emptying, slow glucose absorption and lower serum cholesterol (Shrilaxmi, 2006). Soluble dietary fiber binds large quantity of water and becomes viscous in the stomach. There by it delays the secretions of gastrointestinal track which results into reduced digestion of food material and finally delaying the absorption of glucose. Due to

delayed absorption of glucose, secretion of insulin by pancreas will also be delayed. Such condition result in activation of the receptors of the cells in target organs resulting in increased insulin sensitivity for glucose uptake by the cells. Hence, there will be reduction in the blood glucose level. Plant foods are the only sources of dietary fiber. Vegetables (particularly leafy), fruits, condiments, spices and unrefined whole grains are rich in fiber. Foods such as various gums viz. gum karaya, gum acacia, gaur gum, fenugreek seeds and supplements such as bran and psyllium are rich sources of dietary fiber. The suggested intake of total dietary fiber for diabetic person is 25 g/1000 kcal energy (Raghuram *et al.*, 2006).

Many references support that the fiber supplement influences the glucose homeostasis and lower the risk of diabetes. Increased dietary fiber intake may reduce appetite and lower total energy intake, thus reducing the adiposity and improving insulin sensitivity. Therefore, keeping in mind the benefits of fiber supplement the present investigation was undertaken to the benefits of fiber supplement to diabetic patients, its impact was also assessed. The present investigation was planned with following objectives.

MATERIAL AND METHOD

The present study was designed to determine the impact of fiber rich supplement on blood glucose content of selected diabetic patients.

*Corresponding Author:

Dr. Seema V Medhe,

Shardabai Pawar Mahila Mahavidyalaya,

Shardanagar, Baramati,

Pune, India



Selection of subjects:

A local eminent physician was contacted to whom the persons suffering with diabetes mellitus were visiting for treatment and follow-up regularly. After discussion with the physician regarding the fiber rich supplement and intervention programme a one day camp was organized for diabetic patients. For the awareness of the participants informative talks of the nutritionists were arranged. 11 non-insulin dependent diabetic patients were selected for supplementation which comprised of 5 male and 6 females.. Subjects free from added risk factors like hypertension, thyroid, kidney disease, smoking, alcoholism and chewing tobacco were selected. There were two dropouts because of concomitant family problems.

Data collection:

The two anthropometric measurements weight and height were recorded and BMI was calculated. Recent pathological reports of blood glucose levels of the selected subjects were examined to confirm history of diabetes mellitus. Before starting the intervention programme initial fasting and postprandial blood glucose levels were assessed by using Glucometer (Smart care mini make).

Supplementation:

Daily 40 gram of fiber rich supplement was given to subjects divided in two equal amounts. Supplement was given immediately after breakfast (20 g) and lunch (20 g) by adding it in water. Their daily diet was not altered throughout the study period except for the inclusion of fiber rich supplement. The period of intervention was 60 days. The purpose of giving the supplement immediately after the meal was to fetch the benefit of the property of fiber that it delays the emptying of stomach and helps for slow releasing of glucose in the blood. The fiber rich supplement is having glycaemic index 38.14 and contents 58.65gm fiber.

Estimation of blood glucose:

The blood glucose level of the selected subjects was estimated one day prior to the supplementation, and at the interval of 15 days till the end of the supplementation. The fasting blood glucose was estimated early in the morning before ingestion of any food material and postprandial blood level was estimated 2 hours after lunch.

Physiological symptoms:

The data on physiological symptoms experienced by selected subjects was gathered by asking them about the frequency of symptoms such as polydipsia, polyphagia, polyuria and nocturia in 24 hours. The frequency of the symptoms was noted before and after completion of supplementation.

Statistical analysis:

The data was compiled and analyzed statistically for interpretation of results. The data on blood glucose response was analyzed by applying analysis of variance and the 'F' values were calculated to find out the difference in the blood glucose level initially and at the end of the supplementation (Panse and Sukhatme, 1985).

RESULT**Table.1.** Baseline characteristics of the selected diabetic subjects (n=11)

Parameters	Female (mean)	Male (mean)
No. of patients	5	6
Age (years)	48.6	58.9
Duration of diabetes (years)	4	4.2
Body weight (kg)	53.9	60.67
Height (cm)	155.7	162.3
BMI	22.03	22.46
Oral hypoglycemic drug	No	No

Data regarding the baseline information of selected diabetic subjects is given in Table 1. The impact of fiber rich supplement on the fasting blood glucose content of the selected diabetic subjects is presented in Table 2 and. The initial fasting blood glucose of the subjects ranged between 120 to 178 mg/dl. There was subsequent reduction in the fasting blood glucose of all the subjects as the period of fiber rich supplement intake increased from beginning of the experiment to 60 days with few exceptions. The statistical analysis of the data indicated that there was significant reduction in the fasting blood glucose levels from the within two months after starting the consumption of fiber rich supplement. There was 30 to 70 mg/dl reduction in the blood glucose content due to continuous consumption of fiber rich supplement. The fasting blood glucose content was reduced to 88 to 140 mg/dl at the end of the supplementation. The fiber rich supplement had very high fiber content (58.65%) and very low glycaemic index. Hence, it might have exerted the positive effect on the blood glucose content of the diabetic subjects.

The data regarding the impact of developed supplement on the post meal blood sugar level of selected subjects is depicted in Table 3. The blood glucose values of the diabetic patients indicated that the initial postprandial blood glucose levels of the patients were very high which ranged from 190 to 295 mg/dl. As the patients started taking fiber rich supplement, the blood glucose values of the subjects started declining after 15 days. The reduction in blood glucose level was continued there after till the end of the experiment i.e. up to 60 days. After 60 days period the blood glucose of the patients ranged between 143 to 234 mg/dl, which indicated that there was reduction in the blood glucose content by 24 to 73 mg/dl. The statistical analysis of the data indicated that the

reduction in the postprandial blood glucose of the patient was highly significant.

From the findings of the experiment it can be concluded that the developed fiber rich supplement was having low glycaemic index which would be beneficial for diabetic patients for slow release of glucose from the intestines into blood due to the soluble fiber present in it. The study conducted by Mani *et al.* (1997) revealed that the diet containing higher amount of soluble fiber had lowest glycaemic index. Torengatti and Naik (1999) also observed that, as the fiber content of test meals increased, the glycaemic index values were decreased.

Table.2: Effect of fiber rich supplement on fasting blood glucose levels of selected diabetic subjects (mg / dl)

Subjects	Initial	15 days	30 days	45 days	60 days
1	134	121	132	107	92
2	178	168	156	156	140
3	177	135	128	124	121
4	130	127	128	122	111
5	120	118	105	90	88
6	141	132	131	124	95
7	173	186	168	142	140
8	141	115	120	121	119
9	177	168	163	128	122
10	178	198	183	148	139
11	142	130	123	120	112
Mean	153.73	145.27	139.73	125.64	116.27
	F value-3.90**		SE ± 7.49		CD-20.74

NS- Non significant *Significant at 5 percent
**Significant at 1 percent

Table.3: Effect of fiber rich supplement on postprandial blood glucose levels of selected diabetic subjects (mg / dl)

Subjects	Initial	15 days	30 days	45 days	60 days
1	199	188	174	152	144
2	274	264	244	230	229
3	258	243	249	236	234
4	295	280	257	246	231
5	256	241	273	210	183
6	190	192	177	155	143
7	293	278	268	232	230
8	190	168	176	165	160
9	235	274	224	203	188
10	249	274	232	217	208
11	223	228	209	210	195
Mean	242	239.09	225.73	205.09	195
	F value-2.80*		SE±12.05		CD-33.35

NS- Non significant *Significant at 5 percent
**Significant at 1 percent

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