

EFFECT OF FIBRE DIET (GUAR) ON CHOLESTEROL, BLOOD GLUCOSE AND BODY WEIGHT

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INTRODUCTION :

About 2-3% of the Indian population suffers from diabetes mellitus. The third commonest disease in the world next to the cardiovascular and oncological disorder. Diabetes mellitus in turn leads to hyperlipidemia and then to cardiovascular morbidity and mortality.

Many epidemiological studies have shown that the prevalence of diabetes is lower in populations with higher fibre intake (rural diet) than those with low fibre intakes (urban diet). This explains the penalty of fast and frozen foods, irregular dietary habits as well as the faulty way of food preparations including instant and ready made foods.

Fibre - Guar has got acute as well as long term effects on carbohydrate metabolism and lowering of cholesterol levels [1] Guar gum is a galactomannan, a storage polysaccharide, obtained from the cluster beans (*Cymposia tetragonoloba*). In normal human beings, it brings about a reduction in blood sugar (2) and serum lipid cholesterol (3, 4, 5). A trial on normal persons was conducted by us and showed similar results.

MATERIALS AND METHODS :

A long term study of the effect of guar gum on post prandial blood sugar, serum cholesterol, urinary sugar and body weight in diabetic patients was conducted by us at the Diabetic and Endocrine Clinic and Laboratory at V. S. Hospital, Ahmedabad. We studied 44 patients of whom 24 were males and 20 were females. All these patients had different dietary habits, different socio-economic status, were of different body weights and were ranging from 33-70 year in age. The duration of diabetes mellitus too varied from a few months, to months, to more than 12 years.

Before starting guar gum in all these subjects, their post-prandial blood sugar (PPBS), serum cholesterol and body weight was checked and recorded. No alteration was made in the mode of therapy that the subjects were taking (whether parenteral insulin or oral hypoglycemic agents). It was ascertained that

all subjects were very regular in their treatment and that nobody suffered from chronic heart failure or any other major disease which may interfere with the study.

At the onset, all patients were given 5 gm, of guar gum in a glass of water orally either before lunch or before dinner. Selected patients were called for PPBS estimation after one week, few after two weeks and four week intervals, and the remaining were called after three months for their PPBS and fasting serum cholesterol estimation. All readings were recorded. All these patients were following the dietary instructions as advised in accordance with their caloric requirements. In this study, blood sugar estimations were carried out by Nelson and Somogyi method, serum cholesterol was estimated by ferric chloride method and urine sugar estimated by Benedict's qualitative method.

OBSERVATIONS :

In spite of continuing the same dosage schedule that the subject were hitherto on, a definite reduction in the post-prandial blood sugar level was noted in patients who were administered guar gum. The PPBS estimations were done after one week, two weeks, four weeks, and 12 weeks and the fall in PPBS was significant at all time intervals (Table 1).

Table 1:

Effect of Guar gum on post prandial blood sugar (PPBS) after 1,2,4 and 12 weeks of therapy.

Weeks	0	1	0	2	0	4	0	12
(n)	(13)	(13)	(14)	(14)	(12)	(12)	(14)	(14)
PPBS	268.7	172.8	253.7	160	257.6	208.4	261.4	167.6
±SD (mg/dl)	±63.8	±69.5	±64.7	±51.2	±46.6	±76.1	±58.3	±68.0
P value	<0.002		<0.001		<0.02		<0.0001	

Figures in parenthesis are number of patients studied.

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Fasting serum cholesterol estimations were carried out after three months during which time the patients stuck to their dietary schedule, treatment schedule and guar gum ingestion, as per our advice. A significant fall in the serum cholesterol levels was noted (Table 2).

Table 2 :

Effect of guar gum on serum cholesterol levels after three months of therapy. (n = 14).

	Basal	3 months	P
S. Cholesterol (mg/dl) \pm SD	287.9 \pm 45.3	217 \pm 28.3	<0.0001

Urine sugar estimations at the end of 3 months, showed a decline from 1.2 \pm 0.6% to 0.27 \pm 0.3% and this was significant (Table 3).

Table 3 :

Effect of gaur gum or urinary glucose excretion (percent) after three months of therapy. (n=15)

	Basal	3 months	Significance
Urine Sugar% \pm SD	1.2 \pm 0.6	27 \pm 0.3	<0.0001

Following three months ingestion of guar gum, a significant fall in body weight was observed. It fell from a mean of 71.7 \pm 10.1 kg to 66.6 \pm 8.8 kg (p < 0.0001) (Table 4).

Table 4:

Effect of guar gum on body weight.

	Basal	3 months	P
Body weight (kg \pm SD)	71.7 \pm 10.1	66 \pm 8.8	<0.0001

Following long term use of guar gum. it was found that those patients, who were on parenteral insulin therapy, the dose of insulin was reduce in 46% of the cases, while 54% of the cases were shifted from insulin to oral hypoglycemic agents. In 64% (of those on oral hypoglycemic agents) the dose was reduced while in 9.6% oral hypoglycemic agents were omitted. In 3.3% of the patients, the same does schedule was continued without any change. 6.7% of the cases were kept on guar gum with satisfactory control.

DISCUSSION ;

Guar test meal studies in human beings showed slow absorption due to slow gastric emptying, retarded small intestinal absorption and more viscosity (1, 6-8). The mixture resulting from this allows physical interaction of the available carbohydrate and the viscous fibre of guar and this may be responsible for this effect. Use of dietary fibre of the guar type in mild diabetics may be associated with an appreciable reduction of post prandial glycosuria and allows an increased carbohydrate intake. It may also protect susceptible individuals from insulin induced hypoglycemia by facilitating slower absorbtion of glucose. this would allow the blood glucose to be maintained therapeutically at more nearly "normal" levels. Findings have also suggested prolongation of mouth to caecum transit time by this storage polysaccharide.

Guar is considered to increase the consistency of the food contents of the gastrointestinal tract and the absorption of sugar from the duodenum is retarded. The flattening of the PPBS level is also due to the increase of absorption area in gut with guar. As fecal sterol excretion increase with guar, serum choresreroi level decreases accordingly.

The best-documented consequences of ingestion of fibre are a reduction in over all intestinal transit time, an increase in fecal weight and a marginal but consistent reduction in nutrient absorption(1, 6-8), Co-ingestion of glucose and fibre blunts the glycemic response. This is apparently related to delayed gastric emptying and slower rate of glucose absorption. There is also limited evidence that some component of the dietary fibre may also lower total serum cholesterol and LDL cholesterol synthesis by altering the balance between portal and lymphatic absorption of fat through enhancing post prandial chylomicronemia.

The most practical ways of including sufficient fibre in the diet (in the Indian context) are;

1. Whole cereals should be preferred to refined (polished) cereals. Wheat flour should not be passed through a sieve prior to making the dough. If sieved, the bran or chaff should be cooked separately and eaten as a salted dish.
2. Whole pulses should be preferred to those from which the husk has been removed.
3. Fruits and vegetables that can be eaten with the skin intact should be so eaten. However, fruits

and vegetables are poorer sources of fibre than cereals and pulses.

SUMMARY :

This study enables us to plan a better treatment of diabetes mellitus, by reducing weight, obesity and serum cholesterol levels and in turn reducing CAD (coronary artery disease) resulting in lowering of CAD morbidity and mortality. Thus fibre diet has got a definite role in the treatment of diabetes mellitus, hypercholesterolemia or hyperlipidemia and obesity. It should be given due importance in such therapies.

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