THE HYPOGLYCAEMIC ACTIVITY OF KARELA FRUITS AND FENUGREEK SEEDS IN NON-INSULIN DEPENDENT DIABETIC PATIENTS

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ABSTRACT
The evaluation of hypoglycaemic activity of crude karela fruits powder (Momordica charantia), fenugreek seeds powder (Trigonella foenumgraecuin) and combined karela plus fenugreek powder were studied by estimation of post-prandial blood sugar (PPBS) level in non-insulin dependent diabetic (NIDDM) patients in a cross-over design. After administration of karela fruits powder (4gm/patient) fenugreek seeds powder (50gm/patient) and combined regimen (karela 2gm/patient plus fenugreek 25gm/patient) daily for consecutive 21 days showed that there was reduction in PPBS level significantly (p < 0.001, p < 0.01, p <0.001 respectively).

INTRODUCTION
Diabetes mellitus (DM) is a chronic metabolic disorder which affects large number of people of all social condition throughout the world. This disease is one of the important public health problem in rural and urban areas of Bangladesh (Hosne Ara, et al., 1985). It is not a curable disease and has a costly hazardous control system which is not always accessible to majority of our people (Awal, M.A. et al., 1994).

Regarding the treatment of diabetes, Insulin is the only drug used to control IDDM. The modern oral hypoglycaemic drugs (such as glyburide, glypizide, glimepiride) are greatly accepted throughout the world for the management of NIDDM. But these hypoglycaemic agents have some potential hazards like hypoglycaemia, insulin resistance and may not be able to reach the remote rural areas of Bangladesh (Gin et al., 1987) which inspired many workers to research on different indigenous plants to find out the hypoglycaemic activity as these possessed no deleterious effects comparative to modern synthetic drugs. These indigenous drugs were in great reputation by ancient physicians in producing hypoglycaemic action. In this respect, we are studied on indigenous crude drugs namely, karela and fenugreek which grow abundantly and are available throughout the year in Bangladesh. Karela is a very common vegetable and fenugreek is used as condiment and culinary purposes and a rich source of fibres (Madar, 1984; Sharma, 1986). Recently, karela was shown to have hypoglycaemic effect in diabetic patients (Upadyaya et al., 1985) and studied with fenugreek in case of NJDDM patients and in rats also revealed that it had hypoglycaemic effect (Zacharia, M., 1984; Sharma, R.D. et al., 1990).

This study was, therefore, undertaken to investigate and evaluate the effect of karela, fenugreek and karela plus fenugreek on blood sugar level in NIDDM patients, as these indigenous drugs are everyday habit of our people and reported in this paper.

MATERIALS AND METHODS
Mature karela fruits were collected from the local market, washed thoroughly with tap
water, cut into small pieces, dried sufficiently in an incubator for 4-5 days at 45°C. The dried karela fruits were powdered well. The fenugreek seeds were also collected from the local market. After removing the extraneous matter, the seeds were washed thoroughly, dried in incubator for 4-5 days at 45°C and powdered well in the same way.

Eight non-insulin dependent diabetic patients taking 1/2-1 tablet glibenclamide (glyburide) aged 35-60 years of either sexes (3F, 5M) were selected randomly from the diabetic center. Rajshahi (screened from previously diagnosed patient’s history, clinical features and biochemical tests). The patients were served with same items of breakfast and after two hours of breakfast 5m1 of blood was collected from each patient to estimate blood sugar level. The mean of these were considered as control. Diabetic patients having control blood sugar above 150 mg/dl were included in the study.

For proper evaluation, the patients with ½ tablet glibenclamide were completely withdrawn for 5 days and those with 1 tablet were reduced to half for the same period. The patients were advised on diet control and adequate physical exercise also. Then the control level were estimated again by the procedures mentioned above. The patients were treated on three phases and between each phase, there was 15 days interval. In the first phase, crude karela powder (4gm / patient/day) were administered for consecutive 21 days. In the second phase the patients were treated with crude fenugreek powder (50 gm/patient/day) for the same period. The combined regimen of karela plus fenugreek powder (2 gm/patient/day karela plus 25 gm/patient/day fenugreek) for the same period constitutes the third phase. On 22nd day, 5 ml of blood were collected from each patient two hours after breakfast with fixed items to estimate the blood sugar level. The results were compared to that of control.

Blood glucose level were estimated by GOD-PAP method using kits purchased from Human diagnostica (Barham, D., 1972).

**Glucose estimation pipetting scheme:**
Standard or Sample - 20µl and reagent

Table 1
Effect of Karela, fenugreek and karela plus fenugreek on post-prandial blood sugar in diabetic patients

<table>
<thead>
<tr>
<th>No. of Patients</th>
<th>Post-prandial blood sugar (PPBS) mg/dl</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
</tr>
<tr>
<td>1</td>
<td>193</td>
</tr>
<tr>
<td>2</td>
<td>185</td>
</tr>
<tr>
<td>3</td>
<td>182</td>
</tr>
<tr>
<td>4</td>
<td>230</td>
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<tr>
<td>5</td>
<td>190</td>
</tr>
<tr>
<td>6</td>
<td>210</td>
</tr>
<tr>
<td>7</td>
<td>235</td>
</tr>
<tr>
<td>8</td>
<td>176</td>
</tr>
<tr>
<td>Mean ± SEM</td>
<td>2001.1</td>
</tr>
<tr>
<td></td>
<td>7.9</td>
</tr>
<tr>
<td></td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>
2000µl. Mix and incubate for 5 minutes at 37°C. Measure the optical density (O.D) of standard and sample against the reagent blank within 1 hour. Wave length 500 nm. Hg.

**Calculation of the glucose concentration:**

\[
C = 100 \times \frac{\Delta A_{\text{sample}}}{\Delta A_{\text{standard}}} \text{ mg/dl}
\]

The data were analysed by paired student’s t test.

**Ethical implication:**

Karela and fenugreek are consumed as food. Therefore, ethical clearance may not be required. Even then, I have applied for ethical clearance to Ethical Review Committee.

**RESULTS**

The results and statistical analysis of the effect of karela, fenugreek and combined karela plus fenugreek on post-prandial blood sugar (PPBS) in diabetic patients are shown in Figure 1 and Table I. The control PPBS was 200.1±7.9 mg/dl which was decreased to 187.1±7.6mg/dl for karela (p < 0.001), 189±6.3mg/dl for fenugreek (p < 0.01) and 180.9±7.7mg/dl for karela plus fenugreek (p < 0.00 1) treatment respectively. The reduction of blood sugar levels were statistically highly significant in karela (p < 0.001), karela plus fenugreek (p < 0.001) and only statistically significant in fenugreek (p<0.01) respectively when compared to that of control.

![Fig. 1: Histogram showing the hypoglycaemic effect of karela, fenugreek and combined karela plus fenugreek in NIDDM patients.](image-url)
DISCUSSION

Results of the present study showed that karela, fenugreek and combined karela plus fenugreek treatment (Table 1) produced significant fall of blood sugar level. The figure 1 showed in one hand, with individual treatment karela produced better result than fenugreek in controlling DM. On the other hand, combined regimen (Fig. 1) was found to be more effective in producing hypoglycaemic effect illustrating synergistic effect.

We could not investigate the mechanism of hypoglycaemic effects of these natural diets. But several hypotheses have been put forward in this respect. Dietary methods have an important role in controlling diabetes mellitus. A recent study of patients with N1DDM showed that partial replacement of complex carbohydrates with mono-unsaturated fatty acids improved glycaemic control. Hence, foods with high fibre contents are recommended (Clark et al., 1992). Madar (1984) showed that fenugreek contains 60% of dietary fibres which forms colloidal suspension when hydrated; thus decreases the rate of gastric emptying and delayed carbohydrate absorption. Ribes et al., 1986 showed that the antidiabetic property of fenugreek is also due to presence of high fibres. Yaqub et al., 1980 have showed that the active principle of karela is alkaloid which is responsible for hypoglycaemic effect but the structure of the alkaloid could not be identified. Hence, further studies are going on to find out the active fractions of these indigenous agents.

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