Carbohydrate Tolerance, Plasma Insulin, Growth Hormone and Lipid Levels in Indian and Black Diabetics

A. C. ASMAL, W. P. LEARY

SUMMARY

Glucose tolerance tests were carried out on 35 recently discovered Indian and Black maturity-onset diabetic patients. Differences were found between the two ethnic groups although they were of comparable age, body weight, and probable duration of diabetes at the time of investigation. Glucose tolerance was worse among Blacks and was associated with low plasma insulin levels. Blacks also had lower plasma triglyceride and cholesterol values than Indian diabetics. Plasma growth hormone response was similar in both groups. The possible role of these factors in determining the relative frequency of ischaemic heart disease in the two racial groups is discussed.


Diabetes mellitus is a common disease in the Indian, and one of increasing frequency in the Black population of South Africa. Whereas ischaemic heart disease is widespread among Indians, the Black population is relatively free of this complication, and this apparent immunity has been related to lower plasma lipid levels and to an attenuated insulin response to oral glucose. The significance of hyperlipidaemia and hyperinsulinaemia as coronary risk factors in the Indian population is not known. Nor is there direct evidence to substantiate an earlier claim that diabetes mellitus in this population may be associated with diminished growth hormone levels.

This study represents a preliminary report of observations made in comparable groups of Black and Indian diabetics in whom the biochemical parameters mentioned above were measured.

PATIENTS AND METHODS

Thirty-five newly diagnosed diabetic patients referred to the King Edward VIII Hospital diabetic clinic over a period of 12 months are reported. The diagnosis was based either on a fasting venous plasma glucose level greater than 150 mg/100 ml or on a value in excess of 140 mg/100 ml 2 hours after glucose loading. The only therapy prescribed between diagnosis and referral to the clinic was a diet low in carbohydrates.

Clinical details are shown in Table I. The racial groups are well matched for age, although the Blacks are slightly heavier. Ponderal indices less than 12.0 confirm obesity in all but the Indian male group. Of the total of 35 patients, 9 (representative of both populations and sexes) had diastolic pressures in excess of 100 mmHg, 2 had clinical angina pectoris (Indians) and 3 had evidence of exudative retinopathy. The mean duration from the onset of symptoms and attendance at the clinic was 3 months (Indians 12 weeks, Blacks 11 weeks).

Glucose tolerance tests (GTTs) were carried out, using 50 g glucose in 200 ml water, on patients who had fasted overnight for 12 hours. Patients remained seated during

---

TABLE I. CLINICAL DETAILS OF 35 DIABETICS

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>Age (yrs)</th>
<th>Weight (kg)</th>
<th>Height (cm)</th>
<th>PI*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean Range</td>
<td>Mean Range</td>
<td>Mean Range</td>
<td></td>
</tr>
<tr>
<td>Blacks</td>
<td>21</td>
<td>41,5</td>
<td>77</td>
<td>157,4</td>
<td>11,3</td>
</tr>
<tr>
<td>Males</td>
<td>4</td>
<td>44,3 - 53</td>
<td>84,8 - 89</td>
<td>165,5</td>
<td>11,6</td>
</tr>
<tr>
<td>Females</td>
<td>17</td>
<td>40,9 - 58</td>
<td>75,1 - 92</td>
<td>155,5</td>
<td>11,3</td>
</tr>
<tr>
<td>Indians</td>
<td>14</td>
<td>43,9</td>
<td>70,1</td>
<td>157,4</td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>9</td>
<td>42,3 - 56</td>
<td>69,2 - 80</td>
<td>164,9</td>
<td>12,3</td>
</tr>
<tr>
<td>Females</td>
<td>5</td>
<td>46,8 - 53</td>
<td>71,7 - 95</td>
<td>144,0</td>
<td>10,7</td>
</tr>
</tbody>
</table>

* Pl = ponderal index = \( \sqrt{\frac{\text{Weight} \times 100}{\text{height}}} \)
the tests and blood samples were taken by venipuncture before and 60 and 120 minutes after the glucose load. All specimens of blood were refrigerated on collection, and those for insulin and growth hormone assays were separated and stored at 0°C until analysed.

Plasma glucose was measured using a modification of the ferricyanide technique, triglycerides with a Dade (Dade Division, American Supply Corp., Miami, USA) kit and cholesterol by the method of Pearson et al. Insulin and growth hormone were measured by radio-immunoassay using the double antibody technique. Kits for the estimation of insulin were obtained from the Radiochemical Centre, Amersham, UK, and those for growth hormone from CEA-Ire-Sorin, Italy. All assays were carried out in duplicate and the accuracy checked with the use of quality control serum for insulin and pooled plasma for growth hormone. The precision of the assay procedures given by the formula

$$SD = \sqrt{\frac{2d^2}{2n}}$$

where SD = standard deviation, d = difference between duplicates, n = number of estimates, was 3.55 for insulin, and 0.42 for growth hormone.

RESULTS

These are shown in Fig. 1 and Tables II and III. Plasma glucose levels at all points of the GTT are higher in Blacks than in Indians, and significantly so in the fasting state (P<0.05). The differences between the races are marked in females, the values in Black females exceeding those in Indian females both basally (P<0.05) and 2 hours after glucose (P<0.025).

Plasma insulin concentrations are greater in the Indian than in the Black population. The differences in the fasting state and 1 hour after glucose are significant (P<0.01 and P<0.05, respectively). Indian females have significantly higher insulin values than Black females at all intervals of the GTT. The insulin response pattern in the Black group is a markedly attenuated one, with the peak value at 60 min of only 22 μU/ml.

Plasma growth hormone concentrations are not significantly different between the two races and sexes, either in the fasting state or after oral glucose. Basal values are the highest, they decrease at 60 min after glucose administration and show a secondary rise at 120 min.

Plasma triglyceride and cholesterol concentrations are higher in Indians than in Blacks, and in males compared with females. Although the differences between the racial groups are wide they do not attain statistical significance. However, the postglucose triglyceride values are significantly higher in Indian than in Black females.

### DISCUSSION

Despite similarities in age and probable duration of diabetes mellitus, glucose tolerance is distinctly worse in the Black than in the Indian subjects. This may simply reflect the lower insulin response. The paucity of the insulinemic response is accentuated by the greater mean weight of Blacks than of Indians. Hypo-insulinaemia has been previously noted in another Black population. It provides a sharp contrast with the equally well-documented hyperinsulinaemic pattern in Indian diabetics and non-diabetics alike.

The absolute growth hormone levels are similar in the two groups and are comparable to those reported in a White diabetic population. They demonstrate a normal suppression after oral glucose and dispel any misconceptions about the existence of a distinctive form of growth hormone-deficient diabetes in the Notal Indian.

Mean fasting triglyceride levels in Indian diabetics are higher than those in the Blacks and exceed values reported in a White diabetic group. The fasting triglyceride concentrations in Blacks (mean 126 mg/100 ml) are lower than those reported. To some extent this may be due to the analytical method used. Comparable data on Indian diabetics are not available. In this study the glucose load produced no constant change in the plasma triglyceride levels.

The higher plasma cholesterol concentrations in the Indian relative to the Black diabetics confirm earlier data. Despite the differences in triglyceride levels between the Black diabetics in this study and the one previously cited, the plasma cholesterol values in the two groups are similar.

No significant correlation coefficients were established in either race group between fasting plasma concentrations of insulin and triglycerides; insulin and blood glucose; triglycerides and blood glucose; and body weight and plasma insulin.
Despite the absence of correlations, it is well recognised that obesity, hyperinsulinaemia, hypertriglyceridaemia and diabetes all carry an added risk of ischaemic heart disease. All these risk factors are in operation in Indian diabetics, and may account for their inordinately high and premature mortality from ischaemic heart disease. While one cannot extrapolate from the data of this study, the relative immunity of Blacks from ischaemic heart disease certainly would not appear to be related to hyperglycaemia per se, which was more severe in this particular sample of Blacks than in Indian diabetics. The absence of two of the risk factors, viz. hyperinsulinaemia and hypertriglyceridaemia, may be of greater importance. Whether the development of these two risk factors is governed by purely dietary factors or by individual life-styles needs further investigation.

We wish to thank Sister B. Bima, Mr C. J. Lockett and Mrs Y. Potgieter for their assistance, Professor S. M. Joubert for facilities and Dr H. R. J. Wannenburg, Medical Superintendent of King Edward VIII Hospital, for permission to publish.

REFERENCES