Classification and criteria of diabetes

Jonathan Shaw
Melbourne, Australia
Classification

• Assists with management decisions
  – E.g. insulin or no insulin

• Informs about disease progress
  – E.g. is there a risk of DKA?

• Keeps committees busy and keeps clinicians on their toes
The Ebers Papyrus: 1550 BCE
First Description of Diabetes
India 600 BCE: Chakrata and Susruta describe two types of diabetes
1936: Himsworth proposed insulin insensitivity as the cause of one type of diabetes

The doses of insulin and of glucose can conveniently be based on the surface area of the patient. The patient's height and weight being known this is determined from the appropriate nomogram. In our tests 30 grammes of glucose and 5 units of insulin per square metre of body surface were allowed. The glucose was given dissolved in half a pint of cold water and flavoured with citric acid and essence of lemon; the insulin used, for which I am indebted to Dr. J. W. Trevenan of the Wellcome Physiological Research Laboratories, was a sterile solution of

In previous publications it has been shown that powerless and the symptoms and signs of hypoglycaemia, clinically recognisable as diabetes mellitus, will appear. This consideration led me to suggest that a type of diabetes mellitus might exist which was due, not to lack of insulin, but rather to lack of this sensitising factor. An investigation of cases of diabetic patients from this point of view was therefore commenced.
1951: Bornstein shows that the presence or absence of insulin in plasma differentiate between the 2 diabetes types

**TWO TYPES OF DIABETES MELLITUS, WITH AND WITHOUT AVAILABLE PLASMA INSULIN**

**BY**

J. BORNSTEIN, M.D., M.R.A.C.P.*

AND

R. D. LAWRENCE, M.D., F.R.C.P.

*(From the Biochemical and Diabetic Departments, King's College Hospital, London)*

The sensitive technique of assay of small amounts of insulin described by Bornstein (1950) was used by Bornstein and Trehella (in press) to investigate the plasma insulin content of 11 diabetics. It was found that those had available insulin and eight had none.

We have now investigated the available plasma insulin content of two different types of human diabetes which have been suggested on clinical grounds to be due to (1) lack of insulin and (2) factors other than lack of insulin (Lawrence, 1951).

The first type is generally young and is characterized not only by hyperglycaemia but by rapidly developing ketosis and severe weight loss, and requires insulin to live. The second type consists largely of middle-aged obese females with similar grades of hyperglycaemia and glycosuria, but with no ketosis and no important loss of weight. Their diabetes is easily controlled by low diets without insulin, particularly if weight is reduced.

<table>
<thead>
<tr>
<th>Group 2: Obese, no Ketosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient:</td>
</tr>
<tr>
<td>Sex and age:</td>
</tr>
<tr>
<td>Weight (kg):</td>
</tr>
<tr>
<td>Blood sugar mg/100 ml:</td>
</tr>
<tr>
<td>Glycosuria:</td>
</tr>
<tr>
<td>Ketonuria:</td>
</tr>
<tr>
<td>Mean change in blood sugar:</td>
</tr>
<tr>
<td>Standard deviation:</td>
</tr>
<tr>
<td>Plasma insulin mill-units/ml:</td>
</tr>
</tbody>
</table>

It seems clear from these results that available plasma insulin is absent and present respectively in these two different types of diabetes. The difference might be due to grades of severity of the same process, but this seems unlikely in view of the widely differing clinical picture. Further tests may show an intermediate content of plasma insulin, but it is to be noted that in the previous series reported no intermediate types were found. The technique opens wide possibilities for research into the nature and aetiology of "diabetes."

We are indebted to Dr. Hallas Møller, of the Novo Terapeutisk Laboratories of Denmark, for crystalline insulin free from the glycoconglyric factor and to Messrs. Boots Pure Drug Company, Ltd., for their research grant for expenses.

**REFERENCES**


Ethylene oxide is being increasingly used commercially as a fumigant, and a recent Home Office pamphlet (Fumi-
WHO and ADA classifications

• 1965
  – 4 types according to age of onset
  – 7 additional classes

• 1979/80
  – IDDM
  – NIDDM
  – other specific aetiological types

• 1997/99
  – Type 1 diabetes
  – Type 2 diabetes
  – other specific aetiological types
### CLASSIFICATION

<table>
<thead>
<tr>
<th>Type 1 process</th>
<th>Type 2 process</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Classical type 1</td>
<td>• Type 2 diabetes</td>
<td>• Specific causes (e.g., monogenic diabetes)</td>
</tr>
<tr>
<td>• LADA (Latent autoimmune diabetes of adults)</td>
<td>• Impaired glucose tolerance</td>
<td>• Secondary diabetes</td>
</tr>
<tr>
<td></td>
<td>• Impaired fasting glucose</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Gestational diabetes</td>
<td></td>
</tr>
</tbody>
</table>
Diabetes types

- Type 1
- Type 2
Diabetes types

- **Type 1**
  - Autoimmune destruction of pancreatic beta cells
  - Prone to keto-acidosis
  - Commonest in children and teenagers
  - Can occur at any age

- **Type 2**
  - Require insulin for survival
Diabetes types

• Type 1
  - Combination of insulin resistance and secretory defect
  - Unusual before the age of 30
  - Symptoms often minor or absent
  - May be treated with diet, tablets or insulin

• Type 2
Diagnostic criteria for diabetes

- FPG $\geq 7.0$ mmol/l
- $2hPG \geq 11.1$ mmol/l
- RPG $\geq 11.1$ mmol/l

Clinical diagnosis requires abnormal tests on 2 separate days.
Diagnostic criteria for diabetes

• FPG ≥7.0 mmol/l
  OR
• 2hPG ≥11.1 mmol/l
  OR
• RPG ≥11.1 mmol/l
  OR
• HbA1c ≥6.5%

Clinical diagnosis requires abnormal tests on 2 separate days
Potential advantages of HbA1c

- No fasting required
- It is a test of chronic glycaemia, not instantaneous glucose
- It is used to dictate treatment changes
- Much more reproducible than blood glucose measurements
Potential problems for HbA1c in diagnosing diabetes

- Some people have conditions that interfere with HbA1c measurement
  - Renal or liver disease
  - Haemoglobinopathies
  - Abnormalities of red cell turnover
  - Iron deficiency

- Ethnic/age differences in glucose-A1c relationship
Diabetes in pregnancy

• High risk mothers – OGTT at 1st visit

• Diagnosis
  – Fasting glucose $\geq 5.1$mmol/L
  – 1-hr glucose $\geq 10.0$mmol/L
  – 2-hr glucose $\geq 8.5$mmol/L
Screening – essential for early diagnosis

• Step 1 – non-invasive assessment
  – AUSDRISK questionnaire

• Step 2 – blood test for those found to be at high risk

• Step 3 – confirmatory blood test for diagnosis
1. Your age group

- Under 35 years
- 35 – 44 years
- 45 – 54 years
- 55 – 64 years
- 65 years or over

2. Your gender

- Female
- Male

3. Your ethnicity/country of birth

3a. Are you of Aboriginal, Torres Strait Islander, Pacific Islander or Māori descent?

- No
- Yes

3b. Where were you born?

- Australia
- Asia (excluding the Indian sub-continent), Middle East, North Africa, Southern Europe
- Other

4. Have either of your parents, or any of your brothers or sisters been diagnosed with diabetes (type 1 or type 2)?

- No
- Yes

5. Have you ever been found to have high blood glucose (sugar) (for example, in a health examination, during an illness, during pregnancy)?

- No
- Yes

6. Are you currently taking medication for high blood pressure?

- No
- Yes

7. Do you currently smoke cigarettes or any other tobacco products on a daily basis?

- No
- Yes

8. How often do you eat vegetables or fruit?

- Every day
- Not every day

9. On average, would you say you do at least 2.5 hours of physical activity per week (for example, 30 minutes a day on 5 or more days a week)?

- Yes
- No

10. Your waist measurement taken below the ribs (usually at the level of the navel, and while standing)

[Empty field]

Waist measurement(cm)

For those of Asian or Aboriginal or Torres Strait Islander descent:

- Men
- Women

- Less than 90 cm
- Less than 80 cm
- 90 – 100 cm
- 80 – 90 cm
- More than 100 cm
- More than 90 cm

- 2 points
- 4 points
- 7 points

For all others:

- Men
- Women

- Less than 102 cm
- Less than 88 cm
- 102 – 110 cm
- 88 – 100 cm
- More than 110 cm
- More than 102 cm

- 7 points
- 4 points
- 2 points

Add up your points

Your risk of developing type 2 diabetes within 5 years*:

- 5 or less: Low risk
  
  Approximately one person in every 100 will develop diabetes.

- 6 – 11: Intermediate risk
  
  For scores of 6 – 8, approximately one person in every 50 will develop diabetes. For scores of 9 – 11, approximately one person in every 20 will develop diabetes.

- 12 or more: High risk
  
  For scores of 12-15, approximately one person in every 14 will develop diabetes. For scores of 16-18, approximately one person in every 7 will develop diabetes. For scores of 19 and above, approximately one person in every 5 will develop diabetes.

*The overall score may underestimate the risk of diabetes in those aged less than 25 years.

If you scored 6-11 points in the AUSTRISK you may be at increased risk of type 2 diabetes. Discuss your score and your individual risk with your doctor. Improving your lifestyle may help reduce your risk of developing type 2 diabetes.

If you scored 12 points of more in the AUSTRISK you may have undiagnosed type 2 diabetes or be at high risk of developing the disease. See your doctor about having a fasting blood glucose test. Act now to prevent type 2 diabetes.