

Diabetes:

Diagnosis and Classification

This article on *Diagnostic Criteria and Classification* has been based on the *Second Report of the W.H.O. Expert Committee on Diabetic Mellitus, 1980.*

General Considerations:

Diabetes may present with severe thirst, increased urine volume, rapid weight loss, and sometimes coma. Blood glucose concentration is grossly elevated. Glucose will be excreted in the urine, usually in large amounts. In this situation diagnosis is simply confirmed from blood glucose estimation without formal provocative tests. Random plasma glucose concentrations exceeding 2 g/l are diagnostic. The presence of specific microvascular disease, usually retinopathy, also establishes the diagnosis. When such symptoms and signs are absent and blood glucose levels less markedly elevated, measurements made under standard conditions, such as fasting or after a carbohydrate challenge, may be necessary to confirm or refute the diagnosis. Commonly the oral glucose tolerance test is performed. The importance of this test as a clinical diagnostic tool has been grossly overemphasized. It is useful only in clearly defined situations.

Table I shows diagnostic values for oral glucose tolerance test under standard conditions. Load 75g glucose in 250-350 ml of water for adults or 1.75 g/kg body weight (to a maximum of 75g) for children, using specific enzymatic glucose assay. Two classes of

response are identified - diabetes mellitus and impaired glucose tolerance.

Proposed diagnostic procedure and criteria

The expert Committee recommended the procedure for diagnosis.

1. If symptoms of diabetes are present, perform random or fasting blood glucose measurement. In adults, random venous plasma values of 11 mmol/l (2.0 g/l) or more or fasting values of 8 mmol/l (1.4 g/l) or more are diagnostic. Random values below 8 mmol/l and fasting values below 6 mmol/l (1.0 g/l) exclude the diagnosis).
2. If results are equivocal, measure blood glucose concentration 2 hours after 75g of glucose taken orally after an overnight fast. Two hour venous plasma glucose values of 11 mmol/l (2.0 g/l) or more are diagnostic of diabetes. Values below 8 mmol/l (1.4 g/l) are normal and those in the range 8-11 mmol/l (1.4-2.0 g/l) are termed *impaired glucose tolerance*.

TABLE 1	Glucose concentration		
	Venous Whole blood	Capillary Whole blood	Venous plasma
DIABETES MELLITUS			
Fasting	≥7.0 mmol/l (≥1.2 g/l)	≥7.0 mmol/l (≥1.2 g/l)	≥8.0 mmol/l (≥1.4 g/l)
and/or			
2 hours after glucose load	≥10.0 mmol/l (≥1.8 g/l)	≥11.0 mmol/l (≥2.0 g/l)	≥11.0 mmol/l (≥2.0 g/l)
IMPAIRED GLUCOSE TOLERANCE			
Fasting	<7.0 mmol/l (<1.2 g/l)	<7.0 mmol/l (<1.2 g/l)	<8.0 mmol/l (<1.4 g/l)
and			
2 hours after glucose load	>7.0- <10.0 mmol/l (>1.2- <1.8 g/l)	>8.0- <11.0 mmol/l (>1.4- <2.0 g/l)	>8.0- <11.0 mmol/l (>1.4- <2.0 g/l)

3. In the absence of symptoms of diabetes at least one additional abnormal blood glucose value is needed to confirm the clinical diagnosis (e.g. a 1-hour post glucose value of 11 mmol/l (2.0 g/l) or more during the first test or an elevated 2 hour or fasting glucose value on a subsequent occasion).

The Expert Committee recommended that the criteria outlined above be used as a guide to diagnosis until more detailed information becomes available on different populations, other diagnostic indices, and the development of complications. In the interim it is crucial that subjects with impaired glucose tolerance are not labelled "normal" and returned to the community by default. They have an increased risk of worsening to diabetes and of developing atherosclerosis. Different courses of action will be necessary depending on age, obesity, and the presence of other diseases. During pregnancy, the treatment for impaired glucose tolerance should be the same as for diabetes.

An Interim Classification

As an interim measure, the classification scheme prepared by the Diabetes Data Group of the National Institutes of Health, USA will meet many needs and is recommended for use. A simplified version is given in Table 2.

Measurement of Glucose in Blood

Whole blood or plasma can be used. Whole-blood values are approximately 15% lower than plasma values (except in anaemia). Note must also be

taken of whether samples are capillary or venous. In normal subjects capillary values are an average 7% higher than venous values in specimens from fasting patients and 8% higher 2 hours after a glucose load.

The bedside estimation of blood glucose is now possible using various glucose oxidase methods, which may, however, give false values if the chemicals are not stored dry in airtight containers. The contact time of blood is critical with some versions of the glucose oxidase method. These methods are semi-quantitative. With all strip test and meters, careful attention must be paid to technique.

Oral Glucose Tolerance Tests

Formal dietary preparation is not recommended by most authorities unless the diet prescribes less than 125g of carbohydrate per day. In such subjects at least 3 days' preparation is advisable during which the intake of carbohydrate is limited to 150g per day.

The test should be performed after overnight fasting for 10-14 hours, although water is permitted. The first step is to take a fasting blood sample, after which the patient is given 75g of glucose in 250-350 ml water in 5-15 min. Special testing solutions are available for use instead of glucose. They consist of partial hydrolysates of corn starch and are less likely to cause nausea, but they are more expensive than glucose. Further blood samples are then taken 2 hours after administering the glucose, and some physicians also draw a one-hour sample. Smoking, eating and drinking must not be allowed during the test: It should be borne in mind that many factors (including drugs) can affect glucose tolerance.

TABLE 2

CLASSIFICATION OF DIABETES MELLITUS AND OTHER CATEGORIES OF GLUCOSE INTOLERANCE

A. CLINICAL CLASSES

Diabetes mellitus

- Insulin-dependent type - Type 1
- Non-insulin-dependent type - Type 2
 - (a) non-obese
 - (b) obese

Other types including diabetes mellitus associated with certain conditions and syndromes:

- (1) pancreatic disease, (2) disease of hormonal etiology, (3) drug or chemical-induced condition, (4) insulin receptor abnormalities, (5) certain genetic syndromes, (6) miscellaneous.

Impaired glucose tolerance

- (a) Non-obese
- (b) Obese
- (c) Impaired glucose tolerance associated with certain conditions and syndromes.

Gestational diabetes

B. STATISTICAL RISK CLASSES subjects with normal glucose tolerance but substantially increased risk of developing diabetes.

- Previous abnormality of glucose tolerance
- Potential abnormality of glucose tolerance

