



Classification and Diagnostic Criteria of Diabetes Mellitus

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Introduction & Definition

Diabetes mellitus has been recognised centuries ago. Still it remains an enigma. Definition by different authors vary widely. The historical description and naming of diabetes by Aretaeus of Cappodicia as a disease "being melting down of flesh and limbs in urine" and "life being short, disgusting and painful, thirst unquenchable and death inevitable"⁸ is valid for advanced diabetes with complication only. Diabetes mellitus is a multifactorial disease, presenting in different forms. As an individual etiological mechanism may express in several clinical forms and a given clinical form may owe its origin to a number of pathogenic mechanism, controversies galore. However, a clear definition is essential to avoid controversy. Considering all aspects, WHO expert Committee on diabetes, 1980, has recommended the following lengthy definition: "Diabetes is a state of chronic hyperglycaemia which may result from many environmental and genetic factors often acting jointly. The major regulator of glucose concentration in the blood is insulin, a hormone synthesized in and secreted by the B cells of the islets of Langerhans in the pancreas. Hyperglycaemia may be due to a lack of insulin or to an excess of factors that oppose its action. This imbalance leads to abnormalities of carbohydrate, protein and lipid metabolism. The major effects of diabetes include characteristic symptoms, ketoacidosis, the progressive development of disease of the capillaries of the kidney and retina, damage of the peripheral nerves and excessive arteriosclerosis".²⁰ The difference between this and previous definition in 1965 is that abnormalities of protein and lipid metabolism have been included.

Diabetic state may result from variety of genetic and environmental factors which change homeostasis of insulin and its antagonistic hormones in the body affecting carbohydrate, protein and fat metabolism. Angiopathy is always associated with diabetes but whether it is affect or cause of basic changes, is still unknown. Clinical features vary widely from a markedly obese to a lean emaciated individual presenting dramatically with ketoacidosis and coma or having ketosis as a terminal event with

or without complications such as retinopathy, nephropathy, neuritis or ischaemic heart disease.

Classification

A classification needs to include all possible forms and should be mutually exclusive, that is, not allow a case to occupy more than one class, though individuals might move from class to class or out of a category. As far as possible, each class should be etiologically homogenous and class terminology should be clinically descriptive.^{9, 13} Classification by different authors is inadequate in these terms. The classification recommended by WHO expert Committee in 1965 classified diabetes into potential, latent (borderline), chemical and diabetes clinical into juvenile and adult onset type. This has been considered inadequate and incomplete. Use of the term "diabetes" invokes social, psychologic and economic sanctions that are unjustified in the light of the lack of severity of glucose intolerance and remittance to normal in latent, borderline and chemical group. Differentiation between borderline and chemical diabetes is indistinct. Some adults have juvenile type of diabetes.

WHO expert Committee in diabetes in 1980 has reclassified diabetes. This classification is based mainly on recommendation of National Diabetes Data Group of the National Institute of Health, U.S.A. It was developed by an international workshop group sponsored by NIH and reviewed by the professional members of the American Diabetes Association, British Diabetic Association, the Australian Diabetes Society and the European Association for the study of diabetes.¹³ However, still it is an interim classification as present knowledge has been considered inadequate for correct classification of diabetes. The classification is as follows:

(a) Clinical Classes

(i) 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.

(ii) Impaired Glucose Tolerance

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

(iii) Gestational Diabetes

(b) Statistical Risk Classes

Subject with normal glucose tolerance but substantially increased risk of developing diabetes.

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

Service Importance of this Classification

DGAFMS memoranda on diabetes mellitus published after 1965 have been based on WHO expert Committee report (1965) and experiences in armed forces. So the changes from previous classification should be noted. Stigma of diabetes has been avoided for cases grouped earlier as potential or latent diabetes. These groups and remitted chemical diabetes have been grouped as Statistical Risk Cases who require preventive measures to avoid breakdown to diabetes. New terms have been introduced as Impaired Glucose Tolerance group and Gestational Diabetes Group as their progress and significance is different. Clinical cases have been grouped as per clinical features and treatment required. Instead of infantile and maturity onset diabetes more rational nomenclature as insulin-dependent and non-insulin-dependent have been recommended.

This classification is also more rational for medical categorisation of armed forces personnel. Statistical risk cases or Impaired Glucose Tolerance cases must be observed. But their disability is negligible and chance of incapacitation is much less

than diabetes. This group should be placed in higher medical category than diabetes. Genetic factor is present in a large number of persons. At present this group can be identified by (i) genetic markers as HLA typing (DRW 3 & 4) and Chlorpropamide alcohol flushings⁷. (ii) abnormality of insulin in respect of structure, level and secretion rate or antibody against it, before onset of hyperglycaemia^{8,10,13,17}. Many of this group do not breakdown to clinical diabetes or breakdown at old age only.

Diagnostic Criteria

Estimation of blood glucose level is the most convenient, economic and reliable single test for diagnosis and treatment of diabetes, at present. This has been accepted by all. Fields where controversies remain are: (a) Cut off point—to separate normal and abnormal blood glucose level, (b) Choice of provocation test—as oral glucose tolerance test (OGTT)/Intravenous Glucose Tolerance test (IV GTT)/GTT with meal/Cortisone augmented GTT and some others such as Caffeine tolerance test and aminoacid tolerance test, (c) Selection of sample and collection site of blood as whole blood vs plasma, venous blood vs Capillary blood, (d) Method of estimation of glucose^{4, 6, 9, 13, 16, 20, 21}. Observation, that blood glucose level is quite variable in similar conditions in the same person, brings in further difficulty for assessment of a case^{10, 14, 16}.

Consequently, WHO expert Committee on diabetes mellitus in 1980 has recommended diagnostic criteria with the following cautions: (a) that the cut off points suggested may not be acceptable universally, (b) the pathological significance of the substantial inter population differences observed in the frequency distribution of plasma glucose values needs further investigation, (c) emphasis should be placed on local diagnostic values (d) many drugs, diseases and states other than diabetes affect glucose tolerance and (e) that in the case of individual with values near limits, there may be influence of individual circumstances²⁰.

The recommendations for diagnostic procedure and criteria are:

(a) If symptoms of diabetes are present, perform random or fasting blood glucose measurements. In adults random venous plasma value 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 (1.0g/l) exclude the diagnosis.

(b) If results are equivocal, measure blood glucose concentration 2 hrs after 75g of glucose taken orally after an overnight fast; 2 hrs venous plasma glucose values of 11 mmol/l (2.0g/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".

(c) In the absence of symptoms of diabetes at least one additional abnormal blood glucose value is needed to confirm the clinical diagnosis (eg, a 2 hour post glucose value of 11 mmol/l (2.0 g/l) or a fasting glucose value on a subsequent occasion).

Diagnostic values for oral glucose tolerance test (OGTT) under standard condition with 75g glucose in 250-350 ml water for adults or 1.75 g/kg body weight (max 75gm) for children, using specific enzymatic glucose assay are:

Diabetes mellitus	Venous Whole blood	Capillary Whole blood	Venous Plasma
Fasting	7.0 mmol/l (1.20 g/l)	7.0 mmol/l (1.2 g/l)	8.0 mmol/l (1.4 g/l)
and/or 2 hrs 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 hrs 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)

An individual should not be diagnosed to be a case of diabetes mellitus on single abnormal blood glucose level. Repeated examination of blood glucose level must be done to confirm Chronic hyperglycaemia. Other causes of hyperglycaemia must be eliminated. For correct diagnosis and assessment, judicious interpretation of clinical findings and laboratory test results is essential. It may be noted that Cortisone augmented GTT has not been recommended. Diabetes mellitus can be diag-

nosed on fasting or random blood glucose level only if persistently high. Oral GTT has been recommended in asymptomatic or controversial cases only.

In DGAFMS memorandum on diabetes mellitus under publication, classification and criteria of diagnosis as recommended by WHO expert Committee on diabetes mellitus, 1980 have been recommended. It must be noted that armed forces personnel are the healthiest population of the country having balanced food and exercise. In armed forces, main emphasis is on prevention of disease and morbidity. Majority of subjects diagnosed earlier as cases of diabetes mellitus will fall in the category of 'Impaired Glucose Tolerance' in the present classification. This group is of little importance to hospitals or clinics which mainly deal with overt diabetes, often with complications. Evaluation of an asymptomatic person for a strenuous mental, physical work, having a borderline disability is peculiar to Armed Forces only, more for aircrew. In case of diabetes, data from other countries are not expected to be fully applicable to our country as factors influencing as genetic factors, diet, toxin and chemicals encountered are different. Natural history of tropical diabetes is different. So, work in other countries can only be of limited help and not a standard for our country. We must have our own standard and Armed Forces can take the lead.

Summary and Conclusions

Diabetes mellitus is a multifactorial disease which may present itself in several clinical and sub-clinical forms. Some of them should not have the stigma of diabetes. Classification and diagnostic criteria recommended by the Expert Committee on diabetes mellitus 1980 are rational and acceptable for the Armed Forces in India. Blood glucose level estimation under standard conditions is the most acceptable method for diagnosis of diabetes mellitus. A person should not be diagnosed to be a case of diabetes mellitus unless he has persistently high blood glucose above recommended value and other causes of elevated blood glucose level have been excluded. Individuals with Impaired Glucose Tolerance and Statistical Risk Group should be under surveillance.

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