CHAPTER 2
CLASSIFICATION OF DIABETES

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Abstract: Diabetes mellitus (DM) represents a heterogeneous group of conditions that share certain characteristics with hyperglycemia as a common feature. The first worldwide accepted classification scheme for DM was published in 1979 by the National Diabetes Data Group (NDDG) and classified DM based on the pharmacologic therapy applied into two major groups: Insulin-dependent diabetes mellitus (IDDM) and non-insulin-dependent diabetes mellitus (NIDDM). The terms coined by the NDDG became popular during the 1980s and 1990s, but with time, the misclassification of patients became evident. Since the correct classification of DM allows a more adequate treatment, the new classification proposed by the American Diabetes Association in 1997 was based in the pathogenesis of the disease and comprises four categories: Type 1 DM, Type 2 DM, other types and gestational diabetes. Despite significant advances in diabetes understanding, some gray areas still remain and new studies are necessary to further improve diabetes classification.

INTRODUCTION

Diabetes mellitus (DM) represents a heterogeneous group of conditions that share certain characteristics with hyperglycemia as a common feature. The hyperglycemia results from the lack of insulin secretion, insulin action or both. The chronic hyperglycemia of DM is associated with long-term damage to organs, their dysfunction, and subsequent failures; especially the eyes, kidneys, nerves, heart, and blood vessels known as micro and macrovascular complications. These damages result, in part, from glycation of tissue proteins known as glycation end products (AGEs), increased activity of the polyol pathway and probably other mechanisms not yet recognized. Due to the length of time these complications develop, and because individual patient’s predisposition varies, the complications of diabetes cannot be used for its classification or diagnosis.
DM is increasing worldwide, reaching to epidemic proportions.\textsuperscript{4,5} Its prevalence in adults worldwide was accounted to be 4.0\% in 1995 and estimated to rise to 5.4\% by the year 2025. This in term of number of patients worldwide was 135 million in 1995 and to rise to 300 million by the year 2025. Further estimation shows that there will be a 42\% increase (from 51 to 72 million) in the developed countries and a 170\% increase (from 84 to 228 million) in the developing countries. The countries with the largest number of diabetics are and will be by the years 2025 and 2030: India, China, and the United States.\textsuperscript{4,5}

Correct diagnosis of DM can lead to the successful treatment, meaning controlled levels of glycated hemoglobin (HbA\textsubscript{1c}), which reduces the risk of microvascular complications\textsuperscript{6-10} in both Type 1 and Type 2 diabetes. Although recent randomized clinical trials have not demonstrated reduced incidence of macrovascular events with intensive glycaemic control,\textsuperscript{8-10} long-term studies indeed suggest the benefits.\textsuperscript{11-13} Both the American Diabetes Association (ADA) and the American Heart Association (AHA) recommend HbA\textsubscript{1c} below 7\%.\textsuperscript{14,15}

CLASSIFICATION OF DIABETES MELLITUS

The first classification of diabetes was published in 1979 by the National Diabetes Data Group (NDDG).\textsuperscript{15} This recommendation was endorsed by the World Health Organization (WHO) in 1980 and modified in 1985.\textsuperscript{16} This NDDG classification of DM was based on the pharmacologic therapy applied, and divided in two major groups: Insulin-dependent diabetes mellitus (IDDM) and non-insulin-dependent diabetes mellitus (NIDDM). The NDDG also sub-classified DM in (a) gestational diabetes (b) malnutrition-related diabetes mellitus and (3) some other types (see below). The term IDDM described lean patients at presentation, prone to ketosis and required essentially insulin for treatment. The term NIDDM referred to obese patients at presentation, were not prone to ketosis and did not require insulin for treatment, but other measures such as weight control, exercise and/or drugs.

The terms coined in 1979 by the NDDG became popular during the 1980s and 1990s. With the widespread use, some problems became evident, but the main one was that, with time, several patients with NIDDM needed insulin to control disease which lead to misclassifying these patients as either IDDM or insulin requiring NIDDM. Another problem was that more information about the other types of diabetes became available and a growing knowledge of diabetes pathogenesis rendered the NDDG classification redundant.

The current diabetes classification was coined and published in 1997 by ADA expert panel.\textsuperscript{2} This revised classification was again endorsed by WHO in 1998,\textsuperscript{16} and modified by ADA in 2003\textsuperscript{17} and again by WHO in 2006.\textsuperscript{18} The new classification is based on the pathogenesis of the disease and not its treatment. Four major categories were proposed, Type 1 diabetes mellitus (T1DM), Type 2 diabetes mellitus (T2DM), other specific types of diabetes (see below) and gestational diabetes (Table 1).

TYPE 1 DIABETES

In this type of diabetes there is a complete insulin deficiency. Patients may also develop ketoacidosis and may enter in coma and finally die if deprived from insulin. Biochemical tests reveal hyperglycemia and low levels of C-peptide (a insulin secretion marker).The disease is most common during childhood and adolescence, but can occur at