suggested that lengthening of electrical systole could predispose diabetic patients to cardiac arrhythmias and sudden death (2). Recently, Bravenboer et al. (3) found no correlation between the corrected QT (QTc) interval and cardiovascular autonomic function tests. On the contrary, Kempler et al. (4) provided further data about the relationship between CAN and QTc interval in a letter. Because the results have been inconsistent, it would be of interest to mention further evidences of a relationship between CAN and QTc interval in diabetic patients. Most of the clinical studies available have been cross-sectional in nature (5,6), as was the study of Bravenboer et al. (3). Moreover, their data have been derived from a small, selected group (n = 41) of diabetic patients. We presume that results of larger cross-sectional studies or even those of prospective investigations could be regarded as superior to small cross-sectional studies.

The prevalence of QTc interval prolongation in a large random sample (n = 379) of insulin-dependent diabetic patients living in Piemonte (Italy) was recently published (7), and the results confirmed the association between CAN and QTc interval prolongation. As for follow-up studies, results of two different investigations (with smaller groups of patients) have been published (8,9) so far, documenting that worsening of autonomic function tests has been linked to further prolongation of QTc interval in diabetic patients. Undoubtedly, correct determination of QTc interval on electrocardiogram records could imply technical difficulties in some cases. Nevertheless, strong evidence has now accumulated that QTc interval prolongation could be regarded as a further sign of CAN, and recommendation for measuring it (10) is still valid in diabetic patients.

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Malnutrition-Related Diabetes Mellitus (MRDM), Not Diabetes-Related Malnutrition

A report on genuine MRDM

Protein energy malnutrition (PEM) has been reported to cause persistent insulin deficiency and glucose intolerance (1) as well as insulin resistance (2). In 1985, the World Health Organization (WHO) thus incorporated the category of malnutrition-related diabetes mellitus (MRDM) in the classification of diabetes (3). The criteria proposed for identification of MRDM are blood glucose >200 mg/dl (11.1 mmol/l), onset before 30 years of age, body mass index <19 kg/m^2, absence of ketosis on insulin withdrawal, poor socioeconomic status, history of childhood malnutrition, and insulin requirements >2 U · kg^{-1} · day^{-1} (suggesting insulin resistance). If, in addition, the patient has a history of recurrent abdominal pain from an early age, pancreatic calculi in plain X ray of abdomen, and/or typical changes in ultrasonogram of pancreas, in the absence of alcoholism, gallstones, or hyperparathyroidism, then the patient is subclassified as having fibrocalculous pancreatic diabetes (FCPD) (4). Otherwise, he/she is subclassified as having protein-deficient diabetes mellitus (PDDM) (5). However, despite the criteria proposed for its diagnosis, MRDM continues to be an elusive and controversial entity, partly because past PEM, unrelated to hyperglycemia and/or steatorrhea, cannot be demonstrated to precede

Table 1—*Data pertaining to those with "genuine" MRDM*

	During primary PEM	At detection of diabetes
Age (years)	2.5–5	5–16
Interval between PEM & diabetes (years)	—	1.5–10
% deficit of dietary protein	25.5–29.4	20.2–23
% deficit of dietary energy	35.5–39.6	22.4–26
% deficit weight for age	35.4–41.6	26.4–29.4
% deficit weight for height	29.8–33.8	25.2–31.4
% deficit of height for age	14.9–16.9	14.7–17.2
Body mass index (kg/m^2)	16.2–17.6	16.2–17.6
Edema (% patients)	100	Nil
Wasting (% patients)	100	100
Hair changes (% patients)	100	62.5
FBG (mmol/l)	2.6–3.4	14.8–16.8
Serum albumin (g%)	2.3–2.5	2.2–2.4
Stool for excretion (g/day)	1.4–3.6	1.8–3.2
Ultrasonographic changes in pancreas (% patients)	—	Nil
Pancreatic calculi in X ray (% patients)	Nil	Nil
Insulin requirement (U · kg^{-1} · day^{-1})	—	1.8–2.7

n = 8; three were <6 years of age at onset. % deficit of dietary energy was assessed as per recommendations of ICMR. % deficit weight for age, weight for height, and height for age was assessed as per NCHS standard in children <6 years old; in others, body mass index was assessed. No ketosis was noted despite long (6–12 months) periods of insulin deprivation even in adverse conditions (infection, dehydration) in six (75%) patients.

the ketosis-resistant and insulin-resistant diabetic state with certainty. So the proposed natural history cannot be well delineated.

In our search for MRDM, we observed that 8 of the 96 ketosis-resistant, insulin-requiring, young (<25 years of age), and undernourished diabetic patients attending our Diabetic Clinic during 1986–1993 happened to be former patients of our Tropical Pediatric Clinic. Their records of that period show marked deficits in dietary energy and protein (35.5–39.6% and 25.5–29.4%, respectively) as well as in weight for age (35.4–41.6%), weight for height (29.8–33.8%), and height for age (14.9–16.9%), with clinical features indicative of marasmic kwashiorkor, i.e., edema, wasting, and hair changes. This chronic severe undernutrition was not related to hyperglycemia (fasting blood glucose [FBG] 2.6–3.4 mmol/l) or steatorrhea (stool fat excretion 1.4–3.6 g/day). Years later (1.5–10.0), they had become diabetic with severe hyperglycemia (FBG 14.8–16.8 mmol/l), strong ketosis resistance (periods of 6–12 months of insulin deprivation without ketosis), and high insulin requirements (1.8–2.7 U · kg^{-1} · day^{-1}). We then started recalling our former PEM patients to test their glucose tolerance, and of the first 40 respondants, we had one, 16 years of age, who was diabetic with a high insulin requirement (2.2 U · kg^{-1} · day^{-1}) and ketosis resistance (ketosis-free period of 5 months between onset of symptoms and initiation of insulin therapy). Thus, nine patients in all had confirmed past primary PEM, unrelated to diabetes, followed by ketosis-resistant high insulin–requiring diabetes at a rather young age (≤16 years). Ours appears to be the only report where primary PEM has been demonstrated to precede ketosis-resistant diabetes in the young (KRYD) with high insulin requirements, so we designated those nine patients as having "genuine" MRDM. This was to distinguish them from other insulin-requiring (KRYD) patients, usually categorized as having MRDM on the basis of unverified past primary PEM and presentation with PEM, which can result from uncontrolled diabetes or pancreatic maldigestion and thus is not of much diagnostic importance. Since three of our "genuine" MRDM patients (5–16 years of age) were ≤6 years old, ours appears to be the first report on such involvement in preschool children.

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