

NEED A BETTER RECOGNITION – MMDM

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ABSTRACT

Diabetes is a heterogeneous group of conditions characterized by hyperglycemia. Malnutrition and obesity are associated with diabetes. Malnutrition during intra-uterine period and early childhood may impair development and leads to several diseases later on. This study is aimed to determine the burden of malnutrition modulated diabetes mellitus (MMDM) from northwest part of India. This study was conducted on 6948 diabetes subjects attending a diabetic center over a period of 3 years. The criteria were fixed for the diagnosis of MMDM viz. age of the patient, fasting blood sugar level, BMI, mean requirement of insulin, imaging of pancreas by plain x-ray and sonography. Out of 6948 study cohort, only 344 patients were under the age of 30 years and 31 patients met the criteria of MMDM. There were 22 males and 9 females, 12 were from urban and 19 from rural background. Mean age of MMDM group was 15.35 yrs, mean BMI 12.66 kg/m², mean fasting blood sugar 260.87 mg/dl, mean insulin requirement was 64.12 IU/day and there was no pancreatic calcification in plain x-ray of abdomen. This study highlighted the burden of MMDM in north west region of India. Such studies are needed elsewhere also to decide the status of MMDM as an entity.

KEY WORDS: Malnutrition modulated diabetes; Malnutrition; Secondary diabetes; Malnutrition related diabetes mellitus.

INTRODUCTION

Malnourished states and obesity are both associated with several structural, biochemical and metabolic changes. The ill effects of over-nutrition and obesity already have drawn attention of scientists since early decades of the twentieth century. Global acceptance of the association of malnutrition with diabetes was first expressed by the National Diabetes Data Group (1) and subsequently corroborated by WHO expert committee (2, 3). Ketosis resistant, insulin requiring young diabetics (KRYD) are well recognized in the tropical developing countries (4),

however, controversies exist regarding its association with protein energy malnutrition (PEM) resulting in their categorization as malnutrition related diabetes mellitus (MRDM).

In India, one third of neonates are born low-birth weight and 63% of children less than five years are malnourished (5). Thrifty phenotype hypothesis proposes that malnutrition during intrauterine and early childhood period may impair development and maturation of various organ systems, thereby predisposing the individual to a variety of illnesses like diabetes mellitus, coronary artery diseases and hypertension in later part of life (6). Malnutrition in early part of life was proposed to be etiological agent for Malnutrition Related Diabetes Mellitus (7-9), however, it has also been argued that malnutrition, per se, does not cause diabetes mellitus but modifies its clinical picture. Hence a new term, Malnutrition Modified Diabetes Mellitus (MMDM) has also been proposed. Malnutrition can induce several structural, biochemical and metabolic changes (10). Low fasting (11) and high post-prandial blood glucose levels have also been reported (12). There are very few reports describing this phenomenon in India. The present study describes the prevalence of MMDM in North West India.

MATERIAL AND METHODS

This hospital based study, included all the patients under 30 years of age who were screened for inclusion and exclusion criteria of MRDM. Out of 6948 patients registered in diabetic clinic, Fasting Plasma Glucose (FPG) (glucose oxidase method) and mean insulin requirement were studied, with rural and urban background as subtypes. Lipid profile of each patient was done after overnight fasting of 10 hours. Imaging of pancreas was done with plain-x-ray of abdomen to detect pancreatic calcification. Pancreatic ultrasonography with measurement of dimensions of pancreatic head, body, tail and duct was done. The diagnosis of MRDM was done using following criteria (13).

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Clinical Profile	Score
Age at onset 10-30 years	1
Poor economic status (Rural origin)	1
Lean BMI < 16 kg/m ²	2
< 18 kg/m ²	1
History of malnutrition in childhood	2
Stigmata of malnutrition (clinical) (past and present)	1
Severe hyperglycemia (fasting blood glucose > 200 mg/dl)	1
Lack of proneness to ketosis: (Absence of ketonuria on withdrawal of insulin for long periods)	3
Insulin requiring. Over 60 U/day (2 U/kg body wt.)	2
Unresponsive to sulphonylurea compounds	2
Absence of X-ray / Ultrasound evidence of pancreatic calculi and ductal dilatation	3
Total Score	17
Diagnostic Score	13
Suggestive Score	12

RESULTS

Out of 6948 patients attending diabetic clinic 2001-2003, we could identify 344 (231M, 113F) patients under the age of 30 years. 137 patients were from rural area whereas 207 had an urban background. Mean age of rural and urban patients was 23.38 yrs and 22.14 yrs respectively. Most of the patients were in 21-30 years age group followed by 11-20 age group. 1 patient was below 1 year (Table 1).

Table 1: Age Range (in group of below 30 years)

Group	Total	Percentage
0-1	1	0.29
2-5	6	1.74
6-10	22	6.39
11-20	92	26.74
21-30	223	64.82

All patients were subjected to inclusion and exclusion criteria of MMDM and only 31 patients were found to have MMDM (score ≥ 13). Mean age (15.35 years), mean body mass index (12.86 kg/m²). 12 patients had urban background while 19 belonged to rural background. Mean fasting blood glucose of these patients was 260.87 mg/dl. Mean insulin requirement of these patients was 64.12 U/day. (Table 2)

Table 2: Clinical and Biochemical Characteristics of MMDM Group (N=31)

Mean age	15.35
Sex M:F	22:9
Urban/Rural	12/19
Mean BMI	12.86
Mean blood glucose	260.87
Mean requirement of insulin U/day	64.12

None of the patients had calculi in their plain-x-ray abdomen. On ultra sound examination of pancreas, the mean dimensions of pancreatic head, body, tail and duct were 19.88 \pm 2.86 mm, 16.15 \pm 4.05 mm, 15.03 \pm 3.06 mm and 1.9 \pm 0.48 mm respectively. When compared with normal values of pancreatic head, body, tail and duct, it was observed that there was no significant difference in all the dimensions (Table 3).

Table 3: Pancreatic Sonographic Indices in MMDM Group

	MMDM group (mm)	Normal values (mm)
Mean dimension of pancreatic head	19.88 \pm 2.86	22-24
Mean dimension of pancreatic body	16.15 \pm 4.05	15-21
Mean dimension of pancreatic tail	15.03 \pm 3.06	15-22
Mean dimension of pancreatic duct	1.9 \pm 0.48	1-1.5

DISCUSSION

Fasting plasma glucose value depends on balance between hepatic glucose output (due to glycogenolysis and gluconeogenesis) and peripheral glucose utilization (mainly in brain) (14). In malnutrition, defective glycogenolysis (15), decreased hepatic gluconeogenesis because of substrate deficiency and low pancreatic glucagons (16) have been implicated for low fasting plasma glucose by various investigators.

Post-prandial hyperglycemia in malnutrition is attributed to combined effects of decreased secretion of insulin (insulinopenia) (12, 16), impaired peripheral action of insulin (insulin resistance) (17, 18) and decreased muscle mass sequence that takes up most of the glucose post-prandially. Insulinopenia is reported to be due to β -cell damage (19), disturbance in gut β -cytotrophic mechanism (19), potassium deficiency (20) and vitamin D3 deficiency.

Impaired disposal of glucose load in malnourished

children has been observed by several authors (11, 12). Magnitude of impairment in glucose metabolism was related to degree and duration of malnutrition i.e. more severe and longer the duration of the malnutrition, greater was the derangement in glucose metabolism.

Despite discussion at several different international levels, the controversies on the term MMDM and its placement along with the sub classes Protein Deficient Diabetes Mellitus and Fibrocalculus Pancreatic Diabetes remain open (21). It was felt that this situation persisted mostly due to lack of opportunity for diabetologists from all the regions to have a first hand exposure to such clinical disease. There has been no suggestion from any quarter as to what could be the alternative. The present study has, however, clearly delimited the role of malnutrition. Such studies are needed elsewhere also to define the status of MMDM as an entity.

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