Medical Journal of the
Islamic Republic of Iran

Volume 13
Number 4
Winter 1378
February 2000

MALNUTRITION-RELATED DIABETES MELLITUS IN SOUTHERN IRAN

Z. KARAMIZADEH, G.H. AMIRHAKIMI, AND M.H. BAGHERI*

*From the Section of Endocrinology and Metabolism, Dept. of Pediatrics, and the *Dept. of Radiology, Shiraz University of Medical Sciences, Shiraz, I.R. Iran.*

ABSTRACT

Malnutrition-related diabetes mellitus (MRDM) is a major form of secondary diabetes, restricted to tropical developing countries. We studied 200 cases of diabetes mellitus aged 6-18 years in Fars Province to find the prevalence of MRDM. There were 14 cases who had clinical and laboratory findings compatible with MRDM. The mean age at presentation was 8.6±3 years, with a male to female ratio of 3:4. Moderate to severe malnutrition was noted in 92.9% of the subjects. Insulin requirement was more than 2 U/kg/day in 85.7% of the patients. 57.2% of the patients were from poor socioeconomical class (income less than 200,000 rials per month and a family size>7 members).

Recurrent abdominal pain, painless bilateral parotid swelling, lower extremity edema, ascites, retinopathy and renal failure were observed in 50%, 21.4%, 35.7%, 14.3%, and 7.1% of the cases, respectively.

An abnormal pancreatic ultrasonography was noted in 35.7% of the subjects. Ketoacidosis, regardless of other findings, was seen in 42% of the patients. Malabsorption, chronic diarrhea and pancreatic calcifications were not observed.

Finally, the prevalence of malnutrition-related diabetes mellitus was 7% in the diabetic population of Fars Province.

MJIRI, Vol. 13, No. 4, 261-263, 2000.
Keyword: Malnutrition-related diabetes mellitus.

INTRODUCTION

Malnutrition-related diabetes mellitus is a form of diabetes peculiar to developing countries within the tropical belt. The criteria suggested by Ahuja[1] for malnutrition-related diabetes are: a blood glucose greater than 200 mg/dL at any time, body mass index (BMI) less than 18 kg/m² (recently modified to <19 kg/m²),[2] onset of diabetes before age 30, absence of ketosis on withdrawal of insulin, poor socioeconomic status or childhood malnutrition, and insulin requirements of more than 1.5 U/kg per day (usually more than 2 U/kg/day). The WHO study group[3] classified MRDM into two subgroups: protein deficient pancreatic diabetes (PDPD) in which clinical evidence of exocrine pancreatic malfunction, pancreatic calcification and fibrosis are lacking, and tropical pancreatic diabetes (fiberocalculus pancreatic diabetes, FCPD) in which features of exocrine pancreatic disease are present.

In tropical pancreatic diabetes the following criteria also apply:[4] the presence of pancreatic calculi on plain abdominal x-ray and/or typical changes on ultrasonography,[5] and the absence of alcoholism, gallstones or hyperparathyroidism.

The present epidemiologic study was carried out to determine the prevalence of malnutrition-related diabetes mellitus in the age group of 6-18 years in southern Iran.

PATIENTS AND METHODS

With the cooperation of the authorities of the Ministry of Education and School Health Services (SHS) and the data from the training hospitals of Shiraz University of Medical Sciences, all children with IDDM in the age group of 6-18 years were identified.

Patients and one of their parents were invited to visit the diabetic clinic for interview and physical evaluation. Detailed history including presenting symptoms at the time of diagnosis, type and quality of feeding during infancy and childhood, and past history of recurrent abdominal pain was obtained. Weight, height and other physical findings at the time of diagnosis were recorded from their hospital charts. Ultrasonography of the pancreas was performed for all suspected cases.

RESULTS

A total of 200 diabetic cases (133 from SHS and 67 from hospital records) in the age range of 6-18 years were included in the study. 14 diabetic patients fulfilled the criteria for the diagnosis of MRDM. The mean age at presentation was 8.6±3 years, with a male to female ratio of 3:4.

92.9% of the subjects had a BMI≤15 kg/m² at the time of diagnosis, and insulin requirement was more than 2 U/kg/day in 85.7% of the patients. 57.2% of the patients were from poor socioeconomic class (income<200,000 rials per month, family size >7 members). Recurrent abdominal pain, painless parotid swelling, lower extremity edema, ascites, retinopathy and renal failure were observed in 50%, 21.4%, 35.7%, 35.7%, 14.3% and 7.1% of the cases, respectively (Table I).

An abnormal pancreatic ultrasonography was noted in 35.7% of the patients. Ketoacidosis regardless of other findings was seen in 42% of patients. In 48% there was no attack of ketoacidosis despite frequent discontinuation of insulin therapy. Malabsorption, chronic diarrhea and pancreatic calcifications were not observed.

Table I. Characteristics of 14 patients with MRDM.

Features	
Age at onset of diabetes	8.6±3 years
M/F	3:4
BMI	≤ 15 kg/m²
Insulin requirement >2 U/kg/day	85.7%
Poor socioeconomic status	57.2%
History of recurrent abdominal pain	50%
Painless parotid swelling	21.4%
Lower extremity edema	35.7%
Ascites	35.7%
Retinopathy	14.3%
Renal failure	7.1%

DISCUSSION

In 1955 Hugh-Jones[5] reported that 13 out of 215 diabetic patients in Jamaica could not be classified as typical insulin dependent or non-insulin dependent diabetes, and termed them J type diabetes. Similar cases were reported from India[6,7] and Africa.[8] In Indonesia, Zuidema[9] described what has come to be known as Z-type or tropical pancreatic diabetes.

Reported prevalence rates for malnutrition-related diabetes range from 0% in Ethiopia[10] and Cameroon[11] to 6.7% in Jamaica,[5] 22.9% in India and 80% of all diabetics in Indonesia.[12] In Nigeria[13] 50% of diabetics under the age of 20 had tropical pancreatic diabetes. In the present study 14 out of 200 diabetic patients had characteristics of MRDM.

Age range at onset of diabetes has been 10-40 years in FCPD.[14] In our cases mean age at presentation was 8.6±3 years, which was lower than that described by others.[5,14] Two subtypes of MRDM are more common in males than females.[6,14] In the present study in contrast to above mentioned reports the male to female ratio was 3:4.

Most patients are of low socioeconomic class and there is generally a history of childhood malnutrition. In Srilanka[15] 68%, in India[6,14] 52%, in Bangladesh[14,15] 50%, and in Madras 25% of the cases were underweight. In the present study 92.9% of the patients had a BMI ≤15 kg/m² at diagnosis. Many clinical features of MRDM are common in two arbitrary subtypes.[12,16] On presentation there is severe hyperglycemia, with signs of dehydration, but plasma glucose may be mildly abnormal or occasionally falls within the category of impaired insulin tolerance.[14,17] Protein deficiency is associated with a decrease in glucose tolerance and reduced insulin secretion.[18] Another characteristic feature is insulin resistance. High doses (≥2 U/kg/day) of insulin are required to maintain normoglycemia. However if insulin treatment is stopped, patients will not generally become ketotic.[1,12]

This characteristic has not been regularly found in cases of FCPD in which insulin requirement and chance of ketosis are variable.[16] Despite marked hyperglycemia, or even after insulin therapy was discontinued, 48% of our patients did not develop ketoacidosis. The classical clinical triad of

FCPD consists of abdominal pain, pancreatic calculi and diabetes. Symptoms usually start with recurrent abdominal pain in childhood. The diagnosis is often missed at this stage and abdominal pain is wrongly attributed to peptic ulcer disease, amebiasis or hysteria. In most cases the pain is severe but may be mild or occasionally absent.[14]

In PDPD (also known as J type diabetes), a history of recurrent abdominal pain is rarely present.[12]

Abdominal pain was present in 87% of Nigerian cases,[13] whereas Zuidema[9] noted abdominal pain in only 1 of 43 patients. 14.3% of MRDM cases in the present study had a history of severe recurrent abdominal pain during childhood which had been wrongly attributed to giardia infestation.

Steatorrhea is not a prominent feature in FCPD.[16] In our cases with MRDM, there was no evidence of steatorrhea, chronic diarrhea or pancreatic calcification.

Malnutrition-related diabetes mellitus is now recognized as a major form of the disease, and of the two subgroups, PDPD is more difficult to diagnose because of its non-specific clinical features. These patients are young with male predominance, underweight, and require a high maintenance dose of insulin for their glycemic control, but on withdrawal usually don't develop ketosis, and may or may not have pancreatic calculi. FCPD is readily identified by the presence of pancreatic calculi. In the present study, 35.7% of the subjects had abnormal pancreatic ultrasonography (increased echogenicity, pancreatic duct dilatation), but none of the patients had pancreatic calculi. Because of the presence of other findings, it is difficult to separate these two groups from each other. Recent evidence suggests that there is considerable heterogeneity in the clinical and biochemical profile of FCPD and PDPD.[4] Malnutrition-related diabetes deserves further study, not only because of its importance, but also because it may improve our understanding regarding diabetes mellitus.

REFERENCES

1. Ahuga MM: Heterogeneity in tropical diabetes. Diabetologia 708: 28-31, 1985.
2. Mohan V, Mohan R, Sushjeela L, et al: Tropical pancreatic diabetes in South India: heterogeneity in clinical and biochemical profile. Diabetologia 28: 229-32, 1985.
3. WHO study group on diabetes mellitus. WHO Technical Report Series 727, 1985.
4. Mohan V, Sreeram D, Ramachandran A, Viswanathan M, Doraiswamy KRI: Ultrasonographic evaluation of the pancreas in tropical diabetes. Acta Diabetol Lat 22: 143, 1985.
5. Hugh-Jones P: Diabetes in Jamaica. Lancet ii: 891-97, 1955.
6. Tripathy BB, Kar BC: Observations on clinical patterns of diabetes mellitus in India. Diabetes 14: 402-12, 1965.
7. Viswanathan M: Pancreatic diabetes in India-an overview. In: Podolsky S, Viswanathan M, (eds.), Secondary Diabetes: The Spectrum of the Diabetic Syndrome. New York: Raven Press, pp.105-16, 1980.
8. McMillan DE, Geevarghese PH: Dietary cyanide and tropical malnutrition diabetes. Diabetes Care 2: 202-8, 1979.
9. Zuidema PJ: Cirrhosis and disseminated calcification of the pancreas in patients with malnutrition. Trop Geog Med 11: 70-74, 1959.
10. Lester FT: A search for malnutrition diabetes in an Ethiopian diabetic clinic. IDF Bull 29: 14-16, 1984.
11. Ducorps MN, Dong W, Jupkwo B, et al: Epidemiological aspects of diabetes in Cameroon. What is the role of tropical diabetes? Metab 23(1): 61-7, 1997.
12. Abu-Bakare A, Taylor R, Gill GV, Alberti KGMM: Tropical or malnutrition related diabetes: a real syndrome. Lancet 17: 1135-38, 1986.
13. Osuntokun BO, Akinkugbe FM, Francis TI, Reddy S, Osuntokun O, Taylor G: Diabetes mellitus in Nigerians: a study of 832 patients. W Afr Med J 20: 295-312, 1971.
14. Mihan VR, Manchandran A, Viswanathan M: Malnutrition Related Diabetes Mellitus, In: Pickup J, Williams G, (eds.), Textbook of Diabetes. Chap 26, Blackwell Scientific Publications, pp. 247-55, 1991.
15. Ajgaonkar SA: Epidemiology of diabetes in the tropics. An overview. In: Waldhausel WK, (ed.), Diabetes 1979. Excerpta Med Int Congr. Ser No 500, Amsterdam: Excerpta Medica, pp. 819-23, 1980.
16. Olurin EO, Olurin O: Pancreatic calcification. Br Med J IV: 534-39, 1969.
17. West KM: Epidemiology of diabetes and its vascular lesions. New York: Elsevier, pp. 324-31, 1978.
18. Reis MA, Carniro EM, Mello MA, et al: Glucose induced insulin secretion is impaired and insulin induced phosphorylation of the insulin receptor and insulin receptor substrate-1 are increased in protein deficient rats. J Nutr 127(3): 403-10, 1997.