

Exocrine Pancreatic Function in Tropical Fibrocalculous Pancreatic Diabetes

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Exocrine pancreatic function was studied by fecal chymotrypsin test in three groups of diabetic patients seen in southern India. Exocrine pancreatic insufficiency, as shown by low fecal chymotrypsin levels, was seen in 87.5% of patients with fibrocalculous pancreatic diabetes (FCPD), in 23.5% of insulin-dependent diabetes mellitus patients, and in 4.5% of non-insulin-dependent diabetes mellitus patients. There was no correlation between fecal chymotrypsin levels and serum amylase, serum lipase, age, body mass index, duration of diabetes, fasting plasma glucose, or glycosylated hemoglobin levels. The fecal chymotrypsin test is a useful additional investigation for the diagnosis of FCPD found in tropical countries. *Diabetes Care* 12:145-47, 1989

MATERIALS AND METHODS

Twenty healthy nondiabetic subjects with no family history of diabetes and normal glucose tolerance formed the control group. Forty-eight FCPD patients, 17 patients with insulin-dependent diabetes mellitus (IDDM), and 22 patients with non-insulin-dependent diabetes mellitus (NIDDM) were studied. FCPD was diagnosed as previously defined by the following criteria 1) history of recurrent abdominal pain from early age, 2) pancreatic calculous seen on x-ray of abdomen and confirmed by ultrasonography, 3) diabetes mellitus as defined by the World Health Organization study group report, and 4) exclusion of alcoholism (2). Only nondrinkers were included in the study. The clinical details of the study group are given in Table 1.

Basal blood samples were drawn for plasma glucose (glucose oxidase method, Boehringer Mannheim, FRG) and glycosylated hemoglobin. Serum α -amylase and lipase were measured with Boehringer Mannheim kits. Feces were collected in special containers for fecal chymotrypsin tests (FCTs), which were conducted by use of the spectrophotometric method of Kaspar and Neumann (3). Results are expressed as means \pm SD. Analysis of

Fibrocalculous pancreatic diabetes (FCPD) is a unique tropical form of diabetes secondary to chronic calcific nonalcoholic pancreatitis presenting at a young age (1). We reported earlier on the clinical and biochemical features of FCPD highlighting the heterogeneity within this syndrome (2). Protein-calorie malnutrition is a common, but not invariable, feature of FCPD (2). In this study, we describe exocrine pancreatic function in FCPD subjects.

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TABLE 1
Clinical details of study groups

Group	Sex (M/F)	Age (yr)	Age at diagnosis (yr)	Body mass index (kg/m ²)	Fasting plasma glucose (mg/dl)	Glycosylated hemoglobin (%)	Amylase (U/L)	Lipase (U/L)	Fecal chymotrypsin test (U/g)
Controls (n = 20)	14/6	36.3 ± 13.1		24.7 ± 3.6	97 ± 7	7.5 ± 0.3	124 ± 44	107 ± 55	23.0 ± 8.5
Fibrocalculous pancreatic diabetes (n = 48)	37/11	34.1 ± 9.3	27.7 ± 7.8	18.4 ± 2.7§	187 ± 87	10.6 ± 2.2	131 ± 83	67 ± 63¶	3.4 ± 2.2**
Insulin-dependent diabetes mellitus (n = 17)	13/4	28.1 ± 7.2*	25.1 ± 7.5	18.5 ± 2.7§	322 ± 142	13.1 ± 2.3	127 ± 65	81 ± 52	12.3 ± 10.0††
Non-insulin-dependent diabetes mellitus (n = 22)	16/6	40.8 ± 7.5†	37.1 ± 7.5‡	23.5 ± 2.3	200 ± 73	10.5 ± 1.4	117 ± 46	81 ± 48	21.6 ± 14.9

P* = .02 compared with fibrocalculous pancreatic diabetes (FCPD); †*P* = .004 compared with FCPD; ‡*P* < .001 compared with FCPD and insulin-dependent diabetes mellitus (IDDM); §*P* < .001 compared with controls and non-insulin-dependent diabetes mellitus (NIDDM); ||*P* < .001 vs. NIDDM and FCPD; ¶*P* = .02 vs. controls; *P* < .001 compared with controls, IDDM, and NIDDM; ††*P* = .003 compared with controls.

variance and linear regression analysis were used for statistical analysis.

RESULTS

The FCPD and IDDM patients had significantly lower body mass indexes (BMIs) than the control group (*P* < .001) and the NIDDM patients (*P* < .001). There was no difference in the mean serum amylase levels among the three diabetic groups. The mean serum lipase levels were lower in all three diabetic groups compared with the control group, but the differences reached statistical significance only in the FCPD patients (*P* < .02).

The FCT level was significantly lower in FCPD subjects compared with control, IDDM, and NIDDM subjects (*P* < .001 vs. all 3 groups). Figure 1 shows a scatter diagram of the FCT values. With a cutoff point of 5.8 U/g (mean - 2SD) for diagnosis of exocrine pancreatic insufficiency, 42 of 48 FCPD patients (87.5%), 1 NIDDM patient (4.5%), and 4 IDDM patients (23.5%) had values within this range. There was no correlation between the FCT and age, BMI, duration of diabetes, fasting plasma glucose, glycosylated hemoglobin, amylase, or lipase levels in any of the study groups.

DISCUSSION

Earlier studies have shown the usefulness of FCT in the evaluation of exocrine pancreatic function in chronic alcoholic pancreatitis (4). There are few data on exocrine pancreatic function tests in FCPD patients (5,6). This is the first study to research the usefulness of FCT in FCPD patients. We found that in a group of FCPD patients with pancreatic calculus, using the FCT, which is a simple noninvasive test, 87.5% of

patients could be shown to have abnormal exocrine pancreatic function. The findings of this study may have potential implications regarding epidemiological studies on FCPD patients because facilities for x-ray and ultrasonography may not be available in smaller towns in developing countries. FCT is a simple laboratory investigation that can be conducted in small laboratories with minimal equipment. The main drawback with FCT is that the test may not uncover many mild cases of chronic pancreatitis, but this problem is common to all tubeless tests (4). In patients with pancreatic steatorrhea, FCT has a sensitivity of 92% compared to 97% for the *N*-benzoyl-L-tyrosyl-*p*-aminobenzoic acid (NBT-PABA) test (7).

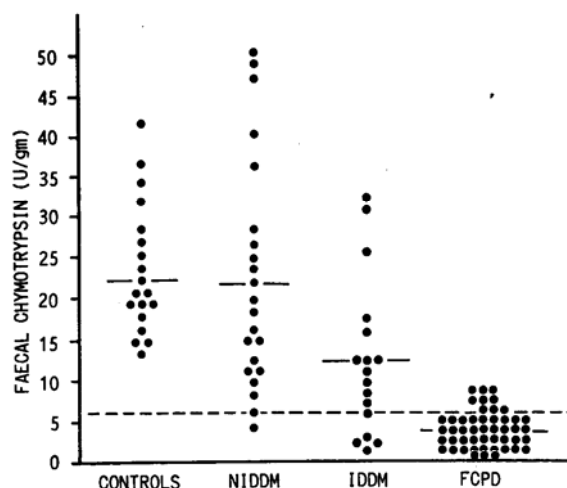


FIG. 1. Scatter of fecal chymotrypsin values in various study groups. Dotted line represents mean - 2SD of control value.

The specificity of FCT is 87% compared to 81.8% for NBT-PABA (7).

The finding that 23.5% of IDDM patients and 4.5% of NIDDM patients had low FCT results is of interest. Other groups have found evidence of exocrine pancreatic insufficiency in primary forms of diabetes mellitus, and several explanations have been offered for this (8). It is possible that some of the IDDM patients are in reality noncalcific FCPD patients. Only invasive tests like endoscopic retrograde cholangio-pancreatography (ERCP) will help to finally resolve this issue. ERCP could be used in only one of the patients studied in whom the duct morphology was normal. In summary, we have shown that exocrine pancreatic insufficiency is a prominent feature in patients with FCPD and it is also occasionally seen in IDDM patients.

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Glucose 1 mM = 18 mg/dl

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