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ORIGINAL ARTICLE

Prevalence of Fibrocalculous Pancreatic Diabetes in Chennai in South India

Viswanathan Mohan, Syed Farooq, Mohan Deepa

Madras Diabetes Research Foundation and Dr. Mohan's Diabetes Specialities Centre, WHO Collaborating Centre for Noncommunicable Diseases Prevention and Control. Chennai, India

ABSTRACT

Context Fibrocalculous pancreatic diabetes is a form of diabetes secondary to chronic pancreatitis found in tropical, developing countries. There is no population based data on prevalence of fibrocalculous pancreatic diabetes.

Objective This paper reports on prevalence of fibrocalculous pancreatic diabetes in Chennai in South India based on the Chennai Urban Rural Epidemiology Study.

Results The prevalence of fibrocalculous pancreatic diabetes is 0.36% (1:276) of all self reported diabetes and 0.019% (1:5,200) of the general population of Chennai.

Conclusion Although the frequency is low, diagnosis of fibrocalculous pancreatic diabetes must be kept in mind in treating diabetic subjects in developing countries as its management would include management of pain, pancreatic enzyme supplements and periodic surveillance for pancreatic malignancy.

INTRODUCTION

Fibrocalculous pancreatic diabetes (FCPD) [1] is a form of diabetes, secondary to tropical chronic pancreatitis seen in developing countries. FCPD is characterized by insulin requiring diabetes and presence of pancreatic calculi or other evidence of chronic pancreatitis, e.g. dilated pancreatic ducts and mutations in the SPINK gene [2]. The term tropical chronic pancreatitis is used by gastroenterologists who deal primarily with the early, pre-diabetic phase of the disease [3] while the term FCPD, used by diabetologists to denote the later diabetes part of the syndrome, was introduced in 1985 by World Health Organization (WHO) [4]. In the more recent WHO classification of diabetes, FCPD is classified under 'diabetes due to other types' [5]. We have earlier reported on the clinical, biochemical, natural history and etiology of FCPD [1, 6, 7]. There is only one population based study on the prevalence of this entity and this dealt with tropical chronic pancreatitis and not with FCPD and was done in the Kerala state (India) which reportedly has the largest number of patients with tropical chronic pancreatitis in the world [8]. To our knowledge, there is no population based study on the prevalence of FCPD. This paper reports on the prevalence of FCPD in an urban South Indian population.

RESEARCH DESIGN AND METHODS

Study subjects were recruited from the Chennai Urban Rural Epidemiology Study (CURES), conducted on a representative population of Chennai (formerly Madras), the fourth largest city in India with a population of about 5 million. The methodology of the study has been published elsewhere [9]. Briefly, in the first phase of CURES, 26,001

Table 1. Characteristics of the 1,529 'known' diabetic subjects according to the participation to the study.

	Responders (n=1,382)	Non-responders (n=147)	Significance
Age (years)	51.7±10.7	51.3±9.1	P=0.662
Gender:			P=0.224
- Males	638 (46.2%)	76 (51.7%)	
- Females	744 (53.8%)	71 (48.3%)	
Fasting plasma glucose (mg/dL)	169±72 [a]	171±72	P=0.749
Blood pressure (mmHg):			
- Systolic	130±21 [a]	128±25	P=0.282
- Diastolic	78±12 [a]	77±11	P=0.333

[a] 1,381 cases had available data

individuals aged 20 years or more were recruited based on a systematic random sampling technique covering all the corporation wards of Chennai. Self reported diabetic subjects diagnosed by a physician and on any drug therapy, were classified as 'known' diabetic subjects.

A questionnaire elicited demographic, socio-economic, behavioral and past medical history of the study subjects and included specific questions related to chronic pancreatitis such as the history of recurrent abdominal pain and/or passing greasy or oily stools. In the second phase of CURES, all 'known' diabetic subjects (n=1,529) were invited to the centre for detailed studies and all respondents underwent a plain abdominal X-ray focused on T12/L1 region as well as abdominal ultrasonography to rule out pancreatic calculi.

FCPD was diagnosed based on the following criteria [1]: i) presence of pancreatic calculi on abdominal X-ray and evidence of ductal dilation on ultrasonography; ii) absence of alcoholism, or other known causes of chronic pancreatitis; iii) evidence of diabetes; i.e., fasting plasma glucose equal to, or greater than, 7.0 mmol/L (126 mg/dL), or random plasma glucose greater than 11.1 mmol/L (200 mg/dL), or subject on drug treatment of diabetes.

ETHICS

The Madras Diabetes Research Foundation ethical committee approval, and written informed consent from all study subjects were obtained.

STATISTICS

Data are reported as means, standard deviations, and frequencies. Statistical analyses were performed by using SPSS for Windows version 10.0 software (SPSS Inc., Chicago, IL, USA). The Student's t test was used for continuous variable and the Fisher's exact test for dichotomic data. Two-tailed P values less than 0.05 were considered significant.

RESULTS

Of the 1,529 'known' diabetic subjects, 1,382 (90.4%) subjects participated to this study. There were no significant differences between the 1,382 responders and the 147 non-responders (Table 1). The remaining analyses are restricted to data from the responders.

The mean age of the study population was 51.7±10.7 years and 46.2% (n=638) of the subjects were males. Two-hundred and 20 subjects (15.9%) were smokers. FCPD was diagnosed in 5/1,382 diabetic subjects, yielding a prevalence of 0.36% among the total 'known' diabetic subjects (Figure 1). Four of the five patients gave a history of recurrent abdominal pain and two patients complained of passing greasy/oily stools.

The characteristics of the FCPD subjects (n=5) were compared with the other diabetic subjects (n=1,377), all of whom appeared to have type 2 diabetes. FCPD patients were younger (41.4±18.4 years *vs*. 51.7±10.7 years; P=0.032) and had a lower age at onset of diabetes (36.3±15.1 years *vs*. 46.0±10.0 years P=0.031). Body mass index (17.8±3.1 kg/m^2

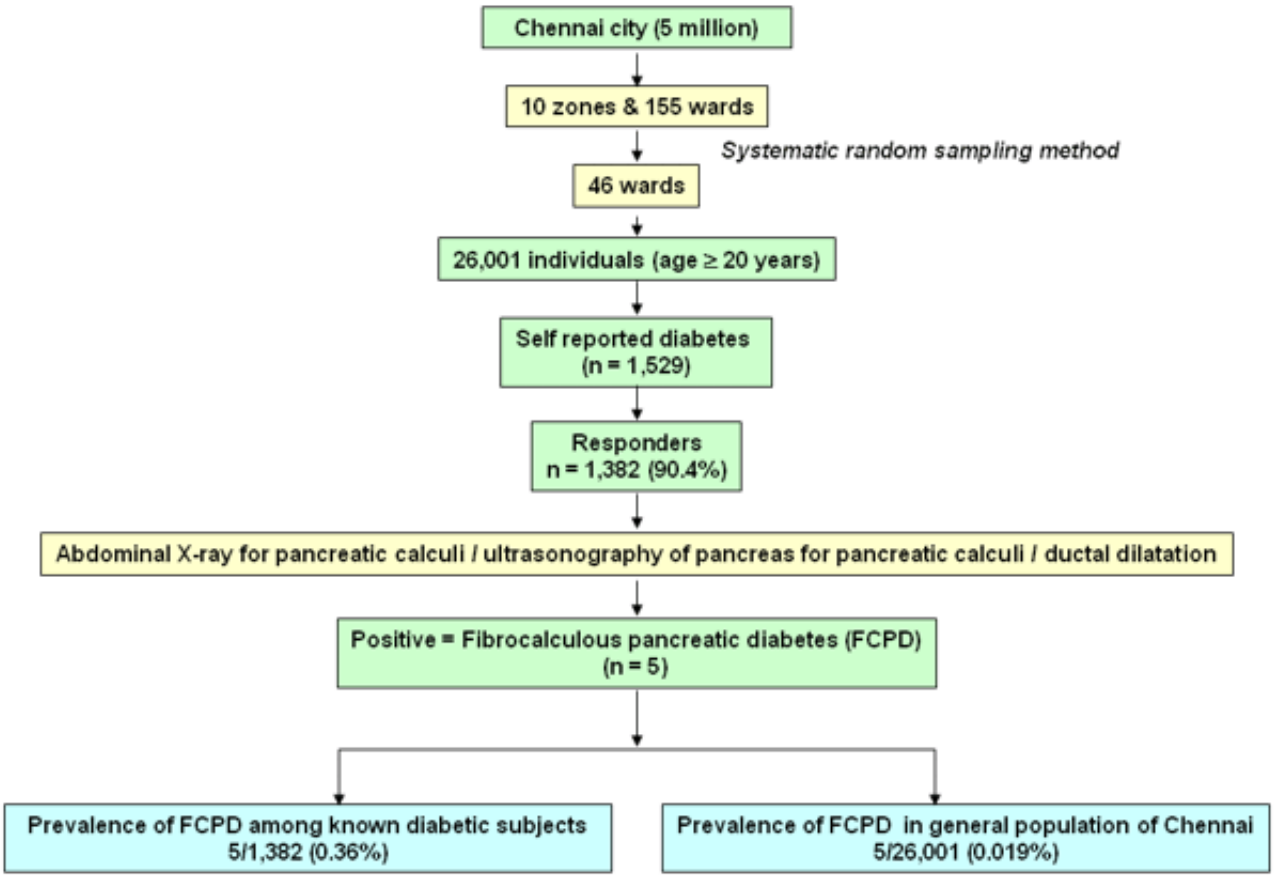

Figure 1. Sampling frame and prevalence of fibrocalculous pancreatic diabetes (FCPD) in Chennai, India.

vs. 25.1±4.3 kg/m^2; P<0.001), waist circumference (74.2±9.0 cm *vs*. 90.3±10.0 cm; P<0.001), serum cholesterol (166±42 mg/dL *vs*. 201±42 mg/dL; P=0.063) and triglyceride (92±32 mg/dL *vs*. 178±129 mg/dL, P=0.136) levels were significantly lower among FCPD subjects compared to type 2 diabetic subjects whereas glycated hemoglobin levels were significantly higher (12.5±3.1% *vs*. 8.8±2.3%, P<0.001). All FCPD patients required insulin for stabilization of the diabetes but none had evidence of ketonuria.

CONCLUSIONS

This is the first population based study on prevalence of FCPD in the world literature. Our study shows that 0.36% of self reported diabetic subjects had FCPD. Considering the high response rate (90.4%) it may be considered that no further cases might be present in the 147 diabetic subjects who unattended the study. Therefore a 0.019% prevalence of FCPD may be estimated in the total study population in Chennai in Tamil Nadu state (Figure 1). This corresponds to a frequency of FCPD of 1:276 among self-reported diabetic subjects and 1:5,200 in the general population. The prevalence in the general population is much lower than in Kerala where the frequency was reported to be about 1:1,000 persons [8]. The Kerala study however focused only on presence of pancreatic calculi, which can also occur in non-diabetic subjects (i.e., tropical chronic pancreatitis) while our study only included those with diabetes (i.e. FCPD). It is also possible that the prevalence of this condition is higher in Kerala.

Earlier clinic based studies had suggested that the prevalence of FCPD is higher in states like Kerala, Tamil Nadu and Orissa compared to the rest of the country [10]. However, clinic based data are subject to referral bias. In the absence of a national study, it is difficult to estimate the prevalence of FCPD in other parts of the country. Doing abdominal X-rays in a population is a major

challenge which explains why such a study has not been done earlier.
Although the prevalence of FCPD is low, this entity must be kept in mind in countries where its occurrence has been reported. The clinical significance of FCPD is that its therapy would include, in addition to control of diabetes, management of the pain of pancreatitis, long term pancreatic enzyme replacement and periodic screening for pancreatic adenocarcinoma [1, 11, 12].

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Keywords Calculi; Epidemiology; India; Pancreatitis, Chronic; Prevalence
Abbreviations CURES: Chennai Urban Rural Epidemiology Study; FCPD: fibrocalculous pancreatic diabetes

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Correspondence
Viswanathan Mohan
Madras Diabetes Research Foundation and
Dr. Mohan's Diabetes Specialities Centre
WHO Collaborating Centre for Noncommunicable Diseases Prevention and Control
4, Conran Smith Road
Gopalapuram, Chennai
600 086, India
Phone: +91-44.2835.9048
Fax: +91-44.2835.0935
E-mail: drmohans@vsnl.net

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