



General Medicine

EXPLORING THE PREVALANCE AND CLINICAL MANIFESTATION OF FIBROCALCULOUS PANCREATIC DIABETES IN THE JABALPUR REGION MADHYA PRADESH

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ABSTRACT

Background: Fibrocalculous pancreatic diabetes (FCPD) is a rare form of diabetes resulting from nonalcoholic chronic calcific pancreatitis, primarily found in tropical regions. It is characterized by abdominal pain and pancreatic calcification and was officially defined by the World Health Organization in 1985. **Objective:** Investigating the occurrence and clinical presentation of FCPD in the Jabalpur region of Central India. **Methods:** Between December 2014 and April 2016, 891 diabetes cases from Jabalpur and its vicinity sought medical attention at the Sukh-Sagar Medical College and Hospital's Department of Medicine. With their informed consent, these individuals underwent comprehensive assessments, including BMI measurement, blood sugar levels (fasting and postprandial), HbA1c measurement, abdominal ultrasound (USG), and plain X-ray abdomen. Specific criteria were employed to diagnose FCPD. **Results:** Among the 891 cases, 94.05% had Type 2 diabetes, 5.61% had Type 1 diabetes, and only 0.34% were diagnosed with FCPD. All FCPD cases were in the 35–45 age group, had a lower socio-economic status, and relied heavily on carbohydrate-rich diets. Abdominal pain was a common complaint among all three FCPD patients, and two of them (66.6%) exhibited pancreatic calcification on plain X-ray abdomen, with a history of chronic alcohol consumption. Further investigation revealed that all three FCPD cases had the highest basal and postprandial blood glucose levels, as well as poor glycemic control ($HbA1c > 7$), and primarily (66.6%) responded positively to insulin therapy. **Conclusion:** The prevalence of FCPD in the Jabalpur region of Central India was found to be 0.34%, which is lower than the prevalence rate observed in Southern India. This discrepancy may be attributed to differences in economic development, dietary habits, and nutritional status. Although the exact cause of FCPD remains unclear, additional research is needed to better comprehend the underlying pancreatic pathology, its triggers, and potential interventions to prevent the onset of diabetes.

KEYWORDS : Fibrocalculous pancreatic diabetes (FCPD), secondary diabetes, chronic pancreatitis, tropical chronic (calcific) pancreatitis.

INTRODUCTION:-

Fibrocalculous pancreatic diabetes (FCPD) is an un- common form of diabetes secondary to nonalcoholic chronic calcific pancreatitis of uncertain etiology predominantly found in tropical regions of the world, characterized by abdominal pain and pancreatic calcification. In India, the frequency of FCPD is higher in the South than the North. Several terms

had been earlier proposed for this syndrome including tropical calcific pancreatitis, tropical chronic pancreatitis, tropical pancreatic diabetes, nutritional pancreatitis, endemic pancreatic syndrome, and so on. The term “fibrocalculous pancreatic diabetes” was introduced by the World Health Organization Report.[1] The term “tropical chronic (calcific) pancreatitis (TCP)” is used to describe the patients with this condition before the onset of diabetes.[2] The cardinal triad of FCPD is abdominal pain, pancreatic calculi, and diabetes. Patients with FCPD present with several distinct clinical features. Patients were invariably poor and presented with extreme emaciation, protein energy malnutrition, bilateral parotid enlargement, distension of the abdomen, and rarely, a cyanotic hue of the lips. Recently, there appeared to be a change in the clinical features of patients with FCPD because of improved nutritional status. Although the etiology of FCPD is still unclear, the role of micronutrient deficiency merits further study. The first report of pancreatic pathology leading to diabetes was published more than 200 years ago by Cawley[3] who described the presence of pancreatic calcification in a patient with diabetes. After that various reports from Indonesia (Zuidema),[4] tropical Africa (Nigeria, Uganda, Zambia),[5,6] South America (Brazil),[7] and Asia (Bangladesh and Sri Lanka, India)[8–11] have suggested that certain type of diabetes may originated from generalized damage to both exocrine portion of pancreas and islets of Langerhans, moreover that this may be a unique form of secondary or pancreatic diabetes in these tropical zone. Our present knowledge suggested that there is not only wide variation in incidence and presentation between European, North American, USA, and South African countries but also a difference in the incidence and presentation between South and North Indian states, which may be due to nutritional and environmental factors. Madhya Pradesh, being the central state of our country, had a variation in environmental and nutritional factors along with inhabitants of different race, cast, and religions. It was thus thought worth- while to elucidate the incidence and clinical profile of FCPD.

This study was conducted in Department of Medicine, Sukh-Sagar Medical College and Hospital (SSMCH), Mukanwara Jabalpur (Madhya Pradesh, India). A total of 891 cases of diabetes mellitus who were from in and around Jabalpur and who attended the OPD of Department of Medicine, SSMCH between December 2014 and April 2016 took part in the study with informed consent. Subjects were put to detailed history, clinical, and laboratory workup including base metabolic index, blood sugar level (fasting, postprandial), HbA1c, USG abdomen, and plain X-ray Abdomen. The cases which were lost during follow-up or could not be fully investigated were excluded from the study. The standard criteria were used for diagnosis of FCPD.[12]. Exocrine (“Tubeless” tests) and endocrine (measurement of c-peptide) pancreatic function could not be assessed because of unavailability and high cost of tests.

Statistical Analysis :-

Statistical analysis was carried out using SPSS software, version 20.0 (SPSS, Inc., USA). The chi-squared test and in- dependent sample t- test were used to compare categorical and continuous variables, respectively. Data were presented as mean $\pm$ standard deviation or proportion as appropriate. The p-value less than 0.05 was considered to be significant.

RESULT :-

The total number of patients with diabetes enrolled in the study was 891, of these 838 cases were of type 2 DM of which 478 were men and 360 were women, 50 cases were of type 1 DM of which 28 were men and 22 were women, and only 3 cases were of FCPD of which 2 were men and 1 a woman. Increase in FCPD in the third and fourth decade of life ($p < 0.001$). Two cases whose plain X-ray abdomen revealed pancreatic calcification were due to chronic alcoholism and whether calcification of pancreas was a result of chronic alcoholism or was due to some other factor could not be proved conclusively. Social and economic class of the subjects studied revealed that 100% of the patients with FCPD belonged to low social and economic status (total family income = Rs.1,001 to 2,000 per month), and 33.3% of the subjects with FCPD consumed 1,500 calories/day whereas 66.6% used to take 1,501–2,000 calories/day. Most of the subjects with FCPD consumed high percentage of carbohydrates and moderate to low quantities of fat and proteins as a source of caloric intake per day. $p < 0.001$ and p-values preferable suggest significance.

MATERIALS AND METHODS:-

In this study, we found that FCPD had the highest basal and

postprandial blood glucose levels. Most of our series cases fell in uncontrolled group. In both the subjects with FCPD, HbA1c was found to be $> 7\%$. $p < 0.001$ and p-values preferable suggest significance. Two of the FCPD cases were insulin dependent, although only one case responded to oral therapy.

DISCUSSION :-

T2DM and T1DM are the two major entities of the diabetic syndrome. There are certain types of diabetes, which do not fit into either of these categories. In tropical countries, diabetes associated with malnutrition, such as J type diabetes and tropical pancreatic diabetes and FCPD have been described, and by this study, we were trying to know the prevalence and clinical presentation of FCPD in and around Jabalpur, Central

Table 1: Economical status and caloric intake per day of patients of different groups

Income in rupees (PM)	T2DM	T1DM	FCPD
Less than Rs.1,000	414	42	—
Rs.1,001–Rs.2,000	288	06	03
Rs.2,001–Rs.3,000	34	02	—
Rs.3,001 to above	42	—	—
Calories/day			
1500	298	12	01
1501–2000	500	38	02
2001–2500	38	—	—
2500 and above	2	—	—
Carbohydrates			
0–50%	78	08	—
51%–60%	740	39	—
60%–75%	20	03	03
Fat			
0–20%	120	—	02
21%–30%	704	33	01
More than 30%	12	11	—
Proteins			
0–10%	178	13	02
10–20%	636	37	01
More than 20%	24	—	—

India. Total enrolled cases were 891, of these 94.05% of the cases were of T2DM, 5.61% of the cases were of T1DM, and only 0.34% of the cases were of FCPD. All (100%) cases of FCPD belonged to 35–45 years of age group, low socioeconomic status, and consumed high percentage of carbohydrates as a main source of diet. Abdominal pain was one of the main complaints found in all three patients with FCPD. Although two (66.6%) cases whose plain X-ray abdomen revealed pancreatic calcification were chronic alcoholic, when we investigated further, we found that all the three cases of FCPD had the highest basal, postprandial blood glucose levels, as well as poor glycemic control ($\text{HbA1c} > 7$), and mainly 66.6% of them responded to insulin therapy.

Age and Sex

This study was conducted on the entire group with diabetes irrespective of age and sex and it was noticed that FCPD was found in the age group of 35–45 years and calcification was present in men whereas the solitary case of pseudopancreatic cyst was a woman, but no valid conclusion could be drawn. It is likely that condition is more common in men than in women as noted in some previous studies also.[4–6]

Table 2: Blood sugar level, glycaemic control, and mode of therapy in patients of different groups

Fasting blood sugar	T2DM	T1DM	FCPD
Less than 120 mg%	312	—	—
120–140 mg%	168	12	—
141–160 mg%	76	—	08
161–180 mg%	60	24	—
181–200 mg%	64	02	—
Above 200 mg%	158	04	02
Blood sugar (PP)			
Less than 150 mg%	86	-	-
151–200 mg%	230	—	—
201–240 mg%	194	26	01

241–280 mg%	108	—	—
281–320 mg%	92	14	—
231 mg% and above	128	10	02
HbA1C%			
Less than 7%	202	04	01
7% and above	636	46	02
Mode of therapy			
Diet	296	-	01
OHA + Diet	480	—	—
Insulin	40	50	02
OHA + Insulin	22	—	—

Nutritional Factors

The mean body mass index (BMI) was found to be normal in both men and women but the female cases of FCPD had low BMI when compared with same age and sex. So like other studies by Mohan et al.[12] and Sathiaraj et al.,[14] our study also found that malnutrition is not the primary cause of FCPD, although it may well be a promoting factor.

Prevalence of Alcoholism in Different Group of Diabetes Mellitus In our series of FCPD, two cases whose plain X-ray abdomen revealed pancreatic calculi were the ones who had chronic alcoholism and whether the calcification of pancreas was as result of chronic alcoholism or some other factor could not be proved conclusively. Howard[15] stated that pancreatic calculi were sequelae of alcoholic pancreatitis. Alcoholism is also an important cause of chronic calcific pancreatitis in USA, South Africa, France, Australia, and some part of Europe.

Geographic Variations

In India, FCPD disease is most prevalent in the states of Kerala, Tamil Nadu, Telangana, Karnataka, and Orissa. Some correlation has been shown between the consumption of Cassava (Tapioca) and the occurrence of FCPD in Kerala (South India).[16] Although in our study, the disease is relatively rare (0.34%), and all patients were from central India where they do not eat Cassava; thus, the causative factor whether environmental or dietary cannot be ruled out.

Blood Sugar Level

In our study, we found that all the cases of FCPD had the highest basal, postprandial blood glucose levels, as well as poor glycemic control ($\text{HbA1c} > 7$), but the reason behind this cannot be found.

Clinical Features

Clinical features of the patients with FCPD in Kerala, Tamil Nadu, Western Countries, and present study have shown subtle differences in several ways. All of these differences are summarized in the form of Table 1.

Mode of Management and Ketone Resistance

It was our observation that patients with FCPD required large dose of insulin for stabilization of the diabetes. One of our patients was still on diet and oral hypoglycemic drug; however, none of them developed ketosis. Earlier studies to explain the ketosis resistance in MRDM has suggested a number of mechanisms such as low adipose tissue mass and delayed mobilization of free fatty acids from adipose tissue.[18,19] Recent studies have offered other explanations. In one study, it was shown that although the plasma glucagon levels in patients with IDDM rose after administration of oral glucose, in patients with malnutrition diabetes (PDDM variety) there was a paradoxical fall in the glucagon levels.[20] Thus, low glucagon levels were suggested as one of the mechanisms for the resistance to ketosis.

Table 3: Clinical presentations of FCPD in different studies

Criteria	Western countries[4–6]	Kerala [10]	Madras [17]	Present study
Age of cases > 30 years	Most of > 30	90%	100%	100%
Sex–M:F	03:1	02:1	03:1	02:1
Nutritional status	Good	90% Undernourished	80 % Undernourished	66% Undernourished
Socioeconomic status	Good	Poor	Poor	Poor
Abdominal pain	93%	70%–95%	90%	100%

Steatorrhea	30%	Not recorded	Not recorded	Not recorded
Alcoholism	70%–90%	20%	Not recorded	66%
Pancreatic calcification	25%–35%	60%–95%	13%	66%
Diabetes mellitus	11.8%–50%	90%	90%	100%
Insulin requirement	10–50 unit/day	40–60 unit/day	60–100 unit/day	> 60 unit/day

of hyperglycemia over the past few years. More studies need to be conducted to understand the exact nature of the pancreatic pathology in FCPD, what triggers it and if, and how, the process can be arrested, before the development of diabetes.

CONCLUSION:-

FCPD is a rare form of secondary diabetes that remains confined to tropical parts of Asia, Africa, and South America. The prevalence rate of FCPD was 0.34% in and around Jabalpur (Central India), which was lower than the prevalence rate found in Southern India, probably on account of economic development, difference in dietary habits, and better levels of malnutrition, even though the etiology remains unknown. Also, the management of diabetes in these patients remains challenging, in spite of the vast strides made in the treatment

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