Prevalence and pattern of gastrointestinal symptoms in patients with diabetes mellitus

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Abstract

Background and objectives: Gastrointestinal (GI) disorders are contributor of increased morbidity and poor quality of life in individuals with diabetes mellitus (DM). Racial, nutritional and life style may influence GI disorders to a large extent. Thus, the burden of GI disorders and its determinants warrant investigation in individual population. Therefore, the present study was undertaken to explore the types of GI symptoms in Bangladeshi population with DM for more than 10 years of duration.

Methodology: This observational study was conducted on patients with DM for more than 10 years of duration at the outpatient department of BIRDEM general hospital from July 2009 to June 2010. A total of 301 DM patients responded to self-reporting questionnaire (Bengali adaptation of Rome III diagnostic questionnaire). Then 91 participants were further studied for glycemic status, liver function, kidney function and basic defects of diabetes through homeostasis model assessment.

Results: The median age of 301 study population was 55 years (range 25 to 84 years) and the male female ratio was 1: 0.74. Out of 301 DM cases, 273 (90.7%) had GI symptoms. Significantly ($p < 0.05$) higher number of males (93.6%) had GI symptoms compared to females (86.7%). Among the clinical conditions, unspecified functional bowel disorder (UFBD) was present in 88.3% cases, followed by cyclic vomiting syndrome (38.1%) and functional fecal incontinence (20.9%). Single GI symptom was present in 123 (45.1%) cases while 32.6%, 12.5% and 9.9% had two, three and more than three GI symptoms respectively. No significant difference was found in any biochemical parameter between cases with and without GI symptoms. Multiple logistic regression analysis revealed sex and residence as poor predictors of UFBD while other variables did not show any significant relation/risk to UFBD.

Conclusion: A large proportion of patients with long duration of DM had GI symptoms. A comprehensive management of diabetes requires attention to GI disorders.

Introduction

Gastrointestinal (GI) symptoms are more common in patients with diabetes compared to individuals without diabetes. The pathogenesis of symptoms remains poorly understood. It has been suggested that symptoms reflect abnormal GI motility as a manifestation of irreversible autonomic neuropathy. Evidence for this concept, however, is limited. Studies have implicated duration of diabetes, type of diabetes treatment, or an increased perception of abdominal distension the as risk factors for GI symptoms [1].

Many of the symptoms prominent in the functional gastrointestinal disorders (FGIDs) are consistent

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with dysfunction of the sensory and/or motor apparatus of the digestive tract [2]. Various combinations of such dysfunction occur in different regions of the digestive tract in the FGIDs. The understanding of the origins of this gut sensori-motor dysfunction is gradually increasing. Inflammatory, immunologic, and other processes, as well as psycho-social factors such as stress, can alter the normal patterns of sensitivity and motility through alterations in local reflex activity or via altered neural processing along the brain-gut axis. In this context, a potential role of genetic factors, early-life influences, enteric flora, dietary components and autonomic dysfunction have also been considered in the disease model [3]. Therefore, the present study was designed to explore the types of GI symptoms and the related factors in a group of Bangladeshi population with DM of more than 10 years of duration.

Materials and Methods

The study was conducted at the outpatient department of BIRDEM general hospital from July 2009 to June 2010. It was designed in 2 steps. In step 1, 301 patients with DM of more than 10 years of duration were included, and in step 2 a subgroup of 91 cases were selected for biochemical analysis. Diabetes mellitus (DM) was defined as a condition of progressive pancreatic beta cell dysfunction having HbA1C level $\geq 6.5\%$ or fasting plasma glucose (FPG) ≥ 7.0 mmol/l or two-hour plasma glucose ≥ 11.1 mmol/l during an OGTT or a random plasma glucose of ≥ 11.1 mmol/l in a patient with classic symptoms of hyperglycemia or hyperglycemic crisis [4].

A Bengali version of Rome III diagnostic questionnaire for the adult functional gastrointestinal disorders (including alarm questions) and scoring was used after pretesting [5]. Enrolled participants were evaluated for their glycemic status, liver function, kidney function and basic defects of diabetes through homeostasis model assessment [6]. Statistical analysis was performed using SPSS (Statistical Package for Social Science) software for Windows version 20. The data were expressed as frequency, mean ± SD (standard deviation) or median (range) as appropriate. The statistical significance of differences between the values was assessed by student's t test or Mann-Whitney U test as appropriate. Correlation was also analyzed among the parameters by using Pearson Correlation test. Regression analyses were done by taking appropriate dependent and independent variables. A p value of <0.05 was considered statistically significant.

Results

The median age of 301 study population was 55 years and the age ranged from 25 to 84 years. Male female ratio was 1: 0.74. Out of 301 DM cases, 273 (90.7%) had GI symptoms. Significantly ($p<0.05$) higher number of males (93.6%) had GI symptoms compared to females (86.7%). The rate of GI symptoms among urban and rural dwellers was 91.3% and 89.8% respectively (Table-1). Distribution of clinical conditions among the 273 cases with GI symptoms is shown in Table-2. Among the clinical conditions, unspecified functional bowel disorder (UFBD) was the most frequent (88.3%), followed by cyclic vomiting syndrome (38.1%) and functional fecal incontinence (20.9%). Out of 273 DM cases with GI symptoms, 123 (45.1%) had single symptoms while 32.6%, 12.5% and 9.9% had two, three and more than three GI symptoms respectively.

Table-1: *Characteristics of the study groups (n=301)*

Study population	Total number (%)	NGIS (n= 28)	GIS (n=273)
Male	173 (57.5)	11 (6.4)	162 (93.6)
Female	128 (42.5)	17 (13.3)	111 (86.7)
Urban	183 (60.8)	16 (8.7)	167 (91.3)
Rural	118 (39.2)	12 (10.2)	106 (89.8)

Note: *GIS= gastrointestinal symptoms, NGIS= without gastrointestinal symptoms; Compared between male and female of GIS: Z= 2.0443, p= 0.04136; urban and rural of GIS: Z= 0.4159, P= 0.67448*

Table-3 compares the biochemical parameters of diabetic patient with and without GI symptoms. There were no significant differences in any biochemical parameters between cases with and without GI symptoms. Multiple logistic regression analysis of the association of unspecified functional bowel disorder (UFBD) present and absent with

Table-2: *Distribution of gastrointestinal symptoms among the study population (n=273)*

Clinical condition	Frequency	Percent (95% CI)
Unspecified functional bowel disorders	241	88.3 (85.9-92.6)
Cyclic vomiting syndrome	104	38.1 (32.7-44.7)
Functional fecal incontinence	57	20.9 (16.4-26.2)
Functional dyspepsia	27	9.9 (6.6–11.3)
Post prandial distress syndrome	21	7.7 (5.2–9.8)
Heart burn	17	6.2 (4.1–7.9)
Proctalgia fugax	08	2.9 (1.4–6.1)
Irritable bowel syndrome	05	1.8 (0.7–3.2)
Aerophagia	03	1.1 (0.3–5.1)
Unexpected excessive belching	03	1.1 (0.5–4.8)
Chronic proctalgia	03	1.1 (0.7–5.5)
Chronic idiopathic nausea	01	0.4 (-)

Table-3: *Comparison of biochemical parameters in patients with and without GI symptoms (n=91)*

Biochemical parameters	Median values (Range) in		z/p value
	NGIS (n=12)	GIS (n=79)	
FSG (mmol/L)	9.95 (6.2-27.5)	9 (3.6-24.7)	-0.786/0.432
PPG(mmol/L)	12.45 (7.6-27)	13.9 (4.3-27.7)	-0.053/0.958
STG (mg/dl)	130 (80-360)	151 (24-663)	-1.261/0.207
S Chol (mg/dl)	179 (86-230)	172 (90-44)	-0.106/0.916
SGPT (U/L)	15.5 (12-56)	22 (12-65)	-1.71/0.087
S. Creatinine (mg/dl)	1 (0.8-1.3)	1.1 (0.8-2.8)	-1.777/0.076

Note: *GIS= with gastrointestinal symptoms, NGIS= without gastrointestinal symptoms; FSG=Fasting serum glucose; PPG=Postprandial glucose (2 hrs after breakfast); STG=Serum Triglyceride; S Chol=Serum total cholesterol; SGPT=Serum glutamate pyruvate transferase.*

Table-4: *Multiple logistic regression analysis of the association of unspecified functional bowel disorder (UFBD) present and absent with variables of interest (n=91).*

Independent variables	β	OR	Lower	Upper	P value
Age group(years)	1.469	4.345	0.369	51.234	0.243
Sex (male-female)	-2.815	0.060	0.007	0.511	0.010*
Residence (urban-rural)	-3.034	0.048	0.004	0.640	0.022*
FSG(mmol/L)	-0.086	0.918	0.739	1.139	0.437
STG(mmol/l)	0.627	1.872	0.484	7.232	0.363
T Chol(mg/dl)	0.215	1.240	0.213	7.218	0.811
SGPT(U/L)	-1.138	0.321	0.043	2.389	0.267
S. Creatinine (mg/dl)	-0.061	0.941	0.128	6.901	0.953
C Peptide (Pmol/l)	0.534	1.706	0.180	16.169	0.642
HOMA%B	-0.007	0.993	0.968	1.018	0.573
HOMA%S	0.013	1.013	0.982	1.045	0.413
Constant (intercept)	39.191	2.408	.000	1.010	0.999

Note: *FSG=Fasting serum glucose; PPG=Postprandial glucose (2 hrs after breakfast); STG=Serum Triglyceride; S Chol=Serum total cholesterol; SGPT=Serum glutamate pyruvate transferase; HOMA-B %= Beta cell function assessed by homeostasis model assessment and HOMA-S%= Insulin sensitivity assessed by homeostasis model assessment. HOMA%S was calculated by using the following formula: fasting glucose (mg/dL) X fasting insulin (μU/mL) / 405 (for SI units: fasting glucose (mmol/L) X fasting insulin (μU/L) / 22.5). A value greater than 2 indicates insulin resistance [6].*

variables of interest is shown in Table-5. Sex and residence, though significant, were very poor predictors of UFBD. Other variable did not show any significant relation/risk to UFBD.

Discussion

In the present study, Rome III diagnostic criteria were used to determine the GI symptoms among the patients with diabetes mellitus of more than 10 years of duration. Rome III diagnostic criteria are considered to be one of the up to date instrument in this area for ascertaining the gastrointestinal symptoms. Over 90% of our study population had one or more GI symptoms. We found unspecified functional vowel disorder (UFBD) as the most frequent disorders among the study population (88.3%) which was followed by cyclic vomiting and fecal incontinence. Studies from USA, Europe and Australia have reported 40% to 55% GI disorders among patients with diabetes mellitus [7-12]. The effect was shown to be linked to poor glycemic control but not to duration of diabetes or type of treatment [11]. But in our study, in contrast to the prevalent concept of association between glycemic control and GI disorders, no significant relationship was found between the two variables. In addition to the glycemic status, no association of GI symptoms with lipidemic status and liver function was found. Data from other studies [5,12] support the present conclusion that blood glucose control may not affect GI symptoms in a straight forward way.

Bangladeshi patients with type 2 DM have functional beta cell deficiency and secretory failure [13,14]. We have tried to find out whether these basic defects have any association with GI symptoms or not. No significant association was found between GI symptoms and insulin secretion and sensitivity from the absolute values of serum C peptide as well as from the derived values of HOMA% B (a measure of pancreatic β cell secretory function) and HOMA% S (a measure of insulin sensitivity) [15].

The present study, thus, revealed that a large proportion of Bangladeshi population with DM of long duration had one or more GI symptoms. Although, it may not be directly related to mortality in diabetes, it may have considerable impact on the quality of life of patients with DM. Therefore, attention to GI disorders should be given in planning comprehensive management of diabetes mellitus.

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