

Prevalence of Gastrointestinal Symptoms and Its Effect on Quality of Life among Patients with Diabetes Mellitus

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Abstract Aim: The aim of this study was to determine the prevalence of gastrointestinal symptoms and its effect on quality of life among patients with diabetes mellitus. **Methods:** This descriptive, cross-sectional study was conducted at a university hospital in Manisa, Turkey. Among the diabetic patients who referred to two internal medicine polyclinics, 138 patients were selected randomly. A questionnaire has been designed including socio-demographic, medical history about diabetes mellitus (DM), Gastrointestinal Symptom Grading Scale (GSGS) and Gastrointestinal Quality of Life Index (GIQLI). Data were expressed as mean±standard deviation (SD). Comparisons between means were carried out using the Mann-Whitney U, Kruskal-Wallis H, correlations. $p < 0.05$ was considered statistically significant. **Results:** The mean±SD age of the patients was 49.5 ± 12.9 years (range 18-65 years). The proportion of men in the patients was slightly higher compared with that of women (53.6% vs 46.4%). Of the 138 diabetic patients interviewed, 85.2 percent of patients had type II diabetes. The most common GI symptoms were abdominal distension (71.6%), feeling of incomplete evacuation (70.3%), reflux (60.1%), and constipation (58.7%). GIQLI score was found to be 76.1 ± 25.1 (range 30-127) in the patients with diabetes who participated in this study. There were statistically significant negative correlation between GIQLI score and frequency of GI symptoms ($p < 0.01$). **Conclusion:** The results of this study indicated that patients with diabetes mellitus hold commonly complaint of gastrointestinal symptoms, and gastrointestinal problems can impair well-being and quality of life in diabetes.

Keywords: Format, Microsoft Word Template, Style, Insert, Template

Cite This Article: Ozden DEDELI, Sezgi CINAR PAKYUZ, Ummu KACER DABAN, Seda KIPCAK, Deniz SARI, Emel SENOL, and Zeliha HEKIMSOY, "Prevalence of Gastrointestinal Symptoms and Its Effect on Quality of Life among Patients with Diabetes Mellitus." *American Journal of Nursing Research*, vol. 3, no. 3 (2015): 48-53. doi: 10.12691/ajnr-3-3-1.

1. Introduction

Diabetes Mellitus (DM) refers to a group of disorders in which hyperglycaemia is the common denominator and is associated with insulin deficiency which may be total or relative due to insulin resistance. In general gastrointestinal (GI) symptoms and dysfunction caused by DM have been under recognised [1]. As mentioned, GI symptoms are increased prevalence in patients with diabetes mellitus. Many patients with diabetes mellitus suffer from upper and lower GI symptoms. The reported prevalence of these symptoms varies among different ethnic groups/populations [1,2]. As many as 75% of patients visiting diabetes clinics will report significant GI. The entire GI tract can be affected by diabetes from the oral cavity and esophagus to the large bowel and anorectal region. Thus, the symptoms complex that may be experienced can vary widely. Common complaints may include dysphagia, early satiety, reflux, constipation, abdominal pain, nausea, vomiting, and diarrhea [3]. The natural history of GI symptoms as well as their pathogenesis in patients with diabetes remains

poorly understood. Many patients go undiagnosed and untreated because the GI tract has not been traditionally associated with diabetes and its complications [3,4]. In recent years, studies have found that GI symptoms affect quality of life adversely and represent a substantial cause of morbidity in patients with diabetes [5,6]. The aim of this study was to determine the prevalence of GI symptoms and its effect on quality of life among patients with diabetes mellitus.

2. Methods

This descriptive, cross-sectional study was conducted between March and September during 2015 in Manisa, Turkey. Among the diabetic patients who referred to two internal medicine polyclinics in the university hospital, 138 patients were selected according to the following criteria; who had been Type I DM or Type II DM, HBV and HCV negative, non-malignancy, between 18 and 65 years of age, and had more than one year of diabetes, able to speak and read Turkish, to be willing participant. The study purpose, procedural details, the participant's rights

and potential benefits and risks of the study were explained and written consent forms were obtained from them. Data were collected by using a socio-demographic questionnaire, Gastrointestinal Symptom Grading Scale (GSGS) and Gastrointestinal Quality of Life Index (GQLI) by the researchers, which took a range from 20 to 30 minutes.

2.1. A Socio-demographic Questionnaire

A socio-demographic questionnaire was developed by the authors to capture personal information on age, gender, past medical history, type of diabetes mellitus, duration and complication of diabetes mellitus.

2.2. Gastrointestinal Symptom Grading Scale

The GSGS is a disease-specific instrument of 15 items combined into five symptom clusters depicting Reflux, Abdominal pain, Indigestion, Diarrhoea and Constipation. The GSGS has a seven-point graded Likert-type scale where 1 represents absence of troublesome symptoms and 7 represents very troublesome symptoms. The reliability and validity of Turkish version of the GSGS are well-documented, and norm values for a general population are available [7].

2.3. Gastrointestinal Quality of Life Index

The questionnaire contains up to 36 items, scored on a five point Likert scale (range 0–144, higher score=better quality of life), in which additional modules, specified by the particular gastrointestinal disorders, supplement a set of core questions. The reliability and validity of Turkish version of the GQLI are well-documented, and norm values for a general population are available [8,9,10].

2.4. Ethical Consent

This study was endorsed by the Research Ethics Committee of the Celal Bayar University Faculty of Medicine at Manisa, Turkey.

2.5. Data Analysis

Data analyses (descriptive statistics, Mann-Whitney, Kruskal-Wallis, and Pearson correlation analyses) were conducted using the SPSS 16.0 statistical packet. Descriptive statistics are expressed as mean \pm Standard deviation (SD). $p < 0.05$ was considered statistically significant. Grouping of the patients according to parameters associating with diabetes, was conducted regarding recommendations of Guideline Diagnosis and Treatment of Diabetes Mellitus, 2013 [11].

3. Results

The mean \pm SD age of the patients was 49.5 \pm 12.9 (range 18 to 65) years. The proportion of men in the patients was slightly higher compared with that of women (53.6% vs 46.4%). Table 1 summarizes sociodemographic characteristics of the patients with diabetes. Of the 138 diabetic patients interviewed, 85.2 percent of patients had type II diabetes. 18 diabetic patients had the history of hypertension, 13 patients had the history of heart failure, 12 patients had the

history of hyperlipidemia, 10 patients had both hypertension and hyperlipidemia, 7 patients had either hypothyroidism or hyperthyroidism, 3 patients had chronic obstructive pulmonary disease (COPD), 3 patients had asthma. 48.6% of the patients described moderate level of treatment adherence. HbA1c levels were respectively normal $< 7\%$ (3.6%), acceptable $< 8\%$ (14.5%), high $\geq 8\%$ (81.9%). Fasting glucose were respectively high ≥ 120 mg/dl (66.6%), acceptable 70-120 mg/dl (33.3%). Postprandial glucose were respectively high > 140 mg/dl (64.4%), acceptable ≤ 140 mg/dl (35.5%). 16.7% of diabetic patients had nephropathy, 70.4% of them had peripheral neuropathy, 50.7% of them had retinopathy. Table 2 summarizes diabetes characteristics of the patients with diabetes.

Table 1. Sociodemographic characteristics of patients with diabetes mellitus (n=138)

Characteristics	n	%
Gender		
Female	64	46.4
Male	74	53.6
Marital status		
Married	111	80.4
Single	27	19.6
Educational status		
Literate	11	8.1
Primary school	75	54.9
High School	43	31.6
University and Post graduate education (MSc, PhD)	9	6.5
Vocation/job		
Government official	19	13.6
Housewife	45	32.6
Retired	23	16.7
Farmer	13	9.4
Self-employment	20	14.5
Worker	18	13.0
Insurance		
Yes	129	93.5
No	9	6.5
Income		
Low	60	43.5
Moderate	62	44.9
High	16	11.6
Chronic disease		
Yes	63	45.6
No	75	54.3

The most common GI symptoms were abdominal distension (71.6%), feeling of incomplete evacuation (70.3%), gastroesophageal reflux (60.1%), and constipation (58.7%). Table 3 summarizes frequency of GI symptoms in the patients with diabetes. GQLI score was found to be 76.1 \pm 25.1 (range 30 to 127) in the patients with diabetes who participated in this study. There were statistically negative correlation between GQLI score and frequency of GI symptoms ($p < 0.05$) (Table 4). There was statistically significant difference among patients' GSGS score and GQLI score regarding type of diabetes, peripheral neuropathy, and retinopathy ($p < 0.05$). It was found that no statistically significant difference among patients' GSGS score and GQLI score regarding nephropathy (Table 5).

Table 2. Diabet characteristics of the patients with diabetes (n=138)

Diabet characteristics	n	%
Type of DM		
Type I	23	14.8
Type II	115	85.2
Duration of DM		
Under 5 years	25	18.1
5-10 years	64	46.3
More than 10 years	46	33.3
HbA1c levels		
Normal	5	3.6
Acceptable	20	14.5
High	113	81.9
Fasting glucose		
Acceptable	46	33.3
High	92	66.6
Postprandial glucose		
Acceptable	49	35.5
High	89	64.4
Glycosuria		
Yes	33	23.9
No	105	76.0
Proteinuria		
Yes	21	15.2
No	117	84.7
Ketonuria		
Yes	86	62.3
No	52	37.6
Nephropathy		
Yes	23	16.6
No	115	83.3
Peripheral neuropathy		
Yes	95	68.8
No	43	31.1
Retinopathy		
Yes	70	50.7
No	68	49.2
Treatment		
OHD	11	7.9
Insulin	63	45.6
OHD+insulin	64	46.3
Treatment adherence		
Poor	24	17.3
Moderate	67	48.5
Good	47	34.0

DM=Diabetes mellitus, OHD=Oral hypolycaemic drugs.

Table 3. Frequency of gastrointestinal symptoms in the patients with diabetes

Gastrointestinal Symptoms	n	%
Abdominal pains	80	57.9
Heartburn	79	57.2
Acid regurgitation	83	60.1
Sucking sensations in the epigastrium	74	53.6
Nausea and vomiting	79	57.2
Borborygmus	30	21.8
Abdominal distension	98	71.6
Eructation	67	55.1
Increased flatus	79	57.2
Decreased passage of stools	81	58.7
Increased passage of stools	28	20.3
Loose stools	26	18.8
Hard Stools	67	48.6
Urgent need for defecation	46	33.3
Feeling of incomplete evacuation	97	70.3

Table 4. Correlations between Gastrointestinal Symptom Grading Scale scores and Gastrointestinal Quality of Life Index scores in the patients with diabetes (n=138)

Gastrointestinal Symptom Grading Scale	Gastrointestinal Quality of Life Index	
	r	p
Abdominal pains	-0.39	0.00
Heartburn	-0.30	0.00
Acid regurgitation	-0.38	0.00
Sucking sensations in the epigastrium	-0.32	0.00
Nausea and vomiting	-0.31	0.00
Borborygmus	-0.24	0.00
Abdominal distension	-0.32	0.00
Eructation	-0.21	0.00
Increased flatus	-0.27	0.00
Decreased passage of stools	-0.23	0.00
Increased passage of stools	-0.27	0.00
Loose stools	-0.26	0.00
Hard stools	-0.24	0.00
Urgent need for defecation	-0.28	0.00
Feeling of incomplete evacuation	-0.40	0.00

Table 5. Gastrointestinal Symptom Grading Scale scores and Gastrointestinal Quality of Life Index scores regarding type of diabet, nephropathy, peripheral neuropathy and retinopathy in the patients with diabetes (n=138)

	Gastrointestinal Symptom Grading Scale			Gastrointestinal Quality of Life Index		
	Mean±SD	U	p	Mean±SD	U	p
Type of DM						
Type 1 DM	36.4±1.6	742.0	0.01**	78.9±2.3	147.0	0.00**
Type 2 DM	43.6±1.9			64.7±2.7		
Nephropathy						
Yes	37.3±1.6	1.25	0.70	75.3±1.5	1.80	0.30
No	38.6±2.0			76.7±1.9		
Retinopathy						
Yes	37.5±1.7	804.0	0.00**	76.3±1.5	1.84	0.03*
No	34.3±1.5			78.7±1.6		
Peripheral neuropathy						
Yes	41.1±1.8	132.2	0.01**	72.5±2.2	143.6	0.01**
No	30.3±1.1			82.6±1.8		

DM=Diabetes mellitus, SD=Standart deviation
 p<0.05* p<0.01**.

There was statistically significant difference among patients' GSGS score and GQLI score regarding duration of diabetes, and HbA1c levels ($p < 0.05$), but no statistically significant difference among patients' GSGS score and GQLI score regarding treatment and treatment adherence (Table 6). In addition, it was found that statistically

positive correlation between patients' GSGS score and duration of diabetes ($r = 0.64$, $p < 0.05$), HbA1c levels ($r = 0.56$, $p < 0.05$). However, it was found that statistically negative correlation between patients' GQLI score and duration of diabetes ($r = -0.54$, $p < 0.05$), HbA1c levels ($r = -0.46$, $p < 0.05$).

Table 6. Gastrointestinal Symptom Grading Scale scores and Gastrointestinal Quality of Life Index scores regarding duration of diabetes, HbA1c levels, treatment and treatment adherence in the patients with diabetes (n=138)

	Gastrointestinal Symptom Grading Scale			Gastrointestinal Quality of Life Index		
	Mean±SD	KW	p	Mean±SD	KW	p
Duration of DM						
Under 5 years	32.2±1.0	20.6	0.01**	83.4±2.2	13.9	0.01**
5-10 years	34.1±1.2			79.5±1.2		
More than 10 years	47.0±1.9			67.0±1.0		
HbA1c levels						
Normal	33.0±1.5	6.67	0.03*	84.6±2.4	11.5	0.01**
Acceptable	34.2±1.7			86.0±2.4		
High	40.4±1.6			72.0±2.8		
Treatment						
OHD	30.9±8.5	4.5	0.10	79.3±2.0	4.9	0.09
Insulin	31.7±1.9			69.7±2.8		
OHD+Insulin	32.5±1.5					
Treatment adherence						
Poor	37.0±1.8			72.9±1.5		
Moderate	37.0±1.6			73.2±1.6		
Good	38.0±1.6	0.63	0.72	72.4±1.3	3.24	0.19

DM=Diabetes mellitus, OHD=Oral hypoglycaemic drugs, SD=Standard deviation
 $p < 0.05$ * $p < 0.01$ **.

4. Discussion

Prevalence of gastrointestinal symptoms has been reported to be higher in patients with diabetes than in the general population. Although there is controversy, these symptoms are not considered important causes of mortality in patients with diabetes, but they can also have a negative influence on health status and quality of life [12]. In the current study, we aimed to assess GI symptoms and its effects on quality of life in patients with diabetes mellitus. The results of this study indicated that patients with diabetes mellitus hold commonly complaint of gastrointestinal symptoms.

The pathophysiological changes observed in the diabetic patient include the effects of acute and long-term hyperglycemia on neuronal function and gastrointestinal motility [13]. Dysfunction of the gastrointestinal tract related to diabetes mellitus results from diabetic autonomous neuropathy, impaired sensory innervation and a direct effect of chronic hyperglycaemia [14]. Impaired motility and delayed gastric emptying can be affected by diabetic neuropathy in patients with longstanding diabetes. For that reason, diabetic patients commonly suffer from abdominal distension, esophageal dysmotility and gastroparesis [13]. The prevalence of gastroesophageal reflux symptoms in diabetes could be as high as 41% [15]. Delayed gastric emptying can be demonstrated in 27%-65% of patients with type 1 diabetes and about 30% of patients with type 2 diabetes [16]. We found that the most common GI symptoms were abdominal distension, and

gastroesophageal reflux in the patients with diabetes. This could indicate that GI symptoms such as abdominal discomfort and gastroesophageal reflux may be influenced long-term hyperglycemia, longstanding diabetes, and neuropathy. Similar to reference [17] demonstrated that patients with diabetes mellitus had abdominal pain, bowel-related pain, reflux, constipation frequently. Neuropathy may affect the nerves innervating the colon, leading to a decrease in colon motility and constipation [14,18]. Constipation is a common problem affecting up to 60% of patients with long-standing diabetes mellitus [19]. We demonstrated that the most common GI symptoms were feeling of incomplete evacuation and constipation in the patients with diabetes. Similar to reference [5] stated that the most commonly symptoms were constipation followed by bloating, mass protruding through anus, abdominal pain. Contrary to Chinese patients with type 2 diabetes had GI symptoms, most commonly diarrhea, constipation, and epigastric fullness [20]. Among 68 patients with type 2 diabetes followed up at the German diabetes research institute in Duesseldorf, 22% reported constipation and 11.8% had nausea [21]. On the other hand, GI symptoms including abdominal pain, diarrhea, and constipation were similar in 89 randomly selected Finnish patients with insulin-dependent diabetes, 481 Finnish patients with noninsulin-dependent diabetes [22]. An ethnic predisposition may also exist for experiencing GI symptoms in patients with diabetes mellitus.

The results of this study indicated that gastrointestinal problems can impair well-being and quality of life in patients with diabetes mellitus. It has been reported in the literature that GI symptoms impact negatively on health

related quality of life in diabetes mellitus [16,23]. In addition, several studies have shown that type II DM with patients hold an increased prevalence rate of GI symptoms and negative impact on quality of life [6,17,21,23]. We found that frequency of GI symptoms increased, and quality of life impaired among patients with Type II DM. This result could be explained that patients with type II DM was more than type I DM in our study group.

It is known that diabetes affects virtually every organ system in the body and the duration and severity of the disease may be had a direct impact on organ involvement in diabetics. Though GI complications are common in longstanding diabetes. Elevated glycated hemoglobin level, duration of diabetes in excess of 10 years and the presence of macro- and microvascular complications are all accepted risk factors for the development of GI symptoms [18]. We found that the presence of diabetic neuropathy, retinopathy, duration of diabetes more than 10 years, and HbA1c of $\geq 8\%$ were association between increasing GI symptoms and declining quality of life. Similar to reference [24] reported that the presence of diabetic neuropathy, retinopathy, and HbA1c of $>7\%$ were significantly related to GI symptoms in 250 patients with diabetes. Certainly, poor glycemic control will lead to early manifestation of diabetic late complications including nephropathy, neuropathy and retinopathy [19]. It has been shown that GI symptoms were significantly related to poor controlled glucose levels in patients with diabetes ($n=136$). [25]. In our study group, it was shown that poor controlled glucose levels. Although autonomic test was not performed in the patients with diabetes, the results of this study demonstrated that the presence of diabetic neuropathy and retinopathy were statistically significant relationships between increased GI symptoms and impaired quality of life.

5. Conclusions

In summary, our results provide evidence that GI symptoms are more prevalent in patients with diabetes mellitus and are associated with duration of diabetes, poor glycemic control, the presence of diabetic neuropathy and retinopathy. Our findings suggest that patients with diabetes mellitus hold commonly complaint of gastrointestinal symptoms, and gastrointestinal problems can impair health related quality of life in diabetes.

6. Recommendations

The limitation of this study is investigated the single clinic population and no control group recruiting from a general non-diabetic population. Therefore, we suggest that in further studies, matching with control group of this group may be of interest. In addition, we recommend that in further studies, each GI symptoms and its effects quality of life should be assessed in patients with diabetes mellitus.

Conflict of Interest

The authors declare that they have no conflict of interests.

Acknowledgment

We would like to thank all the patients for kindly participating in this study.

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