

Prevalence of Gastroesophageal Reflux Disease Among Diabetes Mellitus Patients in Ha'il City, Saudi Arabia

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Abstract

Objective: Gastroesophageal reflux disease is a chronic and relapsing condition which is a prolonged reflux of hydrochloric acid, pepsin, and bile salt into the esophagus. The purpose of the study is to determine the prevalence of gastroesophageal reflux disease in diabetes mellitus patients among Ha'il population and elicit a relation.

Methods: This is a cross-sectional study that was conducted via a pre-validated questionnaire and was distributed among different social media with a sample size of 394 diabetic patients.

Results: The prevalence of diabetes mellitus was 24.6%. Most participants (98.9%) had a 50% or greater chance of developing GERD. Only type of management of diabetes was found to be a significant factor in developing GERD (P value = 0.001).

Conclusion: The prevalence of GERD symptoms in diabetic patients is not uncommon, 98.9% of the participants had a 50% likelihood of developing GERD. The higher the duration of DM, the lower the risk of exhibiting symptoms of GERD.

Key words: Prevalence, GERD, DM, relations, risk factors.

Introduction

Gastroesophageal reflux disease (GERD) is characterized by the esophageal mucosal damage or symptoms of reflux which is caused by excessive gastric reflux into the esophagus (1). These symptoms include: non-cardiac chest pain, regurgitation of acids, and heartburn. GERD has a serious esophageal complication such as: adenocarcinoma of the esophagus, esophageal strictures, erosive esophagitis, and Barrett's esophagus. Various conditions such as: increased gastric acid secretion, elevated intragastric pressure, access to esophageal acid, and disturbance of the lower esophageal sphincter are thought to play an important role in the development of GERD (2-4).

There is insufficient understanding of the causes of this disorder. In Western societies, GERD has been found to be highly prevalent. However, it is a common disorder in both Western and Asian populations and has become more prevalent in recent decades, especially among Asian populations. In a study conducted in Saudi Arabia, they found that the prevalence of GERD was 28.7% (5). The disease is important not just for its effect on patients' quality of life, also in their productivity, and its complications and for a large proportion of the overall cost to the health care system that it produces. Diabetes mellitus (DM) is one of the metabolic disorders that is characterized by hyperglycemia, which is caused by defects of insulin secretion, insulin activity, or both (6). DM patients suffer from numerous complications and experience gastrointestinal symptoms considerably more frequently. The pathogenesis of gastrointestinal manifestations in DM, which is usually due to neurological dysfunction of particularly autonomic neuropathy, was not specifically elucidated. Long esophageal dysfunction is reported to occur frequently in patients with diabetic autonomic neuropathy and 35% of patients with DM have esophageal transit delay (7, 8).

There have been contradictory results produced by studies assessing the relationship between DM and GERD. Some researchers suggested a correlation with either DM or metabolic syndrome and GERD (9-11) although other research did not find any correlation to connect these disorders to each other (12, 13).

Methods

A cross-sectional study with a pre-validated questionnaire regarding both DM and GERD, which was used in another study was used in this research (14). A study sample size was estimated to be at least 383 participants, using the Raosoft sample size calculator with 5% marginal error and 95% confidence interval (15). The inclusion criteria were Ha'il citizens and diabetic patients. The questionnaire included three sections: demographics, DM, and GERD related questions, with 17-items in total. A link to an online questionnaire was distributed among Ha'il society through different social media platforms. Before filling out the questionnaire, participants had an in-screen message to

confirm that they are Ha'il citizens and ensuring that all collected data are secured and confidential; two options were available, whether to proceed or abstain. The online form was available during the period from November to December 2020. GerdQ was used in the study to estimate the likelihood developing GERD (16).

Statistical analysis. Data collection and organization were performed using Excel program (Version 16.0.8730.2046). Statistical analysis was performed using IBM SPSS (Version 23.0. Armonk, NY: IBM corp). Descriptive statistics (frequencies, percentages, mean, and standard deviation) were used to describe the quantitative variables. A chi-square test was used to measure the significance between the categorical variables. A P-value of <0.05 was considered statistically significant.

Results

A total of 1,613 engaged with the survey; 13 participants abstained from continuing, 1,206 were ruled out of the study as they were non-diabetic participants, and the remaining 394 participants were included as they met the inclusion criteria. The total prevalence of DM in Ha'il general population was found to be 24.6%. The majority of participants (56.3%) were female, and age ranged from 18 to 72 years (45.07 ± 13.12). The mean BMI was calculated to be 29.91 ± 6.93 , with a vast majority (83.8%) of non-smokers. Table 1 shows the demographic data of the participants.

Most participants (75.9%) were diagnosed with type 2 diabetes mellitus (T2DM), over the last five years, 33.5% of the participants were diagnosed with DM, 25.6% of participants use insulin replacement therapy. For complications, about half of the participants (47.7%) reported no complications, followed by 20.3% who reported hypertension, 4.3% reported retinopathy, and 2.3% reported proteinuria as their only complication. However, 20.6% reported multiple complications. A decent proportion (63.1%) confirmed sensation of numbness. In correlation between management of DM and numbness sensation, 61% of those on oral hypoglycemic agents felt a sort of numbness, 80.1% of those on insulin replacement therapy felt the sensation of numbness, whereas 56.4% on multiple therapeutic plans reported numbness sensation. Table 2 shows the diabetic characteristics of the participants. For those with type 1 diabetes mellitus (T1DM), 30.5% were diagnosed for more than twenty years, and 65.2% were using insulin replacement therapy as their only therapeutic plan. Regarding complications, half of the participants (50.52%) reported no complications, followed by 16.8% who reported hypertension, and 6.3% reported retinopathy as their only complication. The vast majority (75.78%) confirmed the sensation of numbness. For those with T2DM, 36.1% of the participants were diagnosed within the last five years, 33.4% were using oral hypoglycemic agents as their only therapeutic plan. For complications, more than two-fifths of the participants (46.82%) reported no complications, followed by 21.4% who reported hypertension and 3.67% reported retinopathy

as their only complication, while 20.6% reported multiple complications.

For the gastroesophageal reflux symptoms during the previous week; 46.2% reported no heartburn, 56.9% reported no nausea, 56.1% did not use antacids. Table 3 demonstrates the gastroesophageal reflux symptoms data. During the previous week, 57.5% of those diagnosed with DM within the last five years, reported the sensation of heartburn at least once, while 60.3% of those diagnosed for more than 20 years reported no heartburn sensation. Most of the participants (98.9%) had a likelihood of 50%

or higher of developing GERD. In correlation between T2DM, numbness, and GerdQ score, 33 (18.6%) of the participants who have been diagnosed with T2DM within five years had a likelihood of 50% developing GERD. Table 4 shows the likelihood of developing GERD among T2DM participants according to their duration. Meanwhile, gender ($p=0.103$), smoking status ($p=0.211$), type of diabetes ($p=0.847$) and duration of diabetes DM ($p=0.055$) were all non-significant factors affecting GERD scoring. On the other hand, the only significant factor found was type of management of Diabetics with a P value of 0.001 (Table 5).

Table 1: Demographic data of participants

Factor		Number / Mean	Percentage / Standard deviation
Gender	Male	172	43.7 %
	Female	222	56.3 %
Age		45.07	13.12
BMI		29.91	6.93
Smoking	Yes	64	16.2 %
	No	330	83.8 %

Table 2: Diabetic characteristic of participants

Factor	Number	Percentage
Type of diabetes		
Insulin dependent	95	24.1
Non-insulin dependent	299	75.9
Duration		
Less than 5 years	132	33.5
5-9 years	95	24.1
10-14 years	63	16
15-20 years	51	12.9
More than 20 years	53	13.5
Management		
Exercise	5	1.3
Diet therapy	18	4.6
Oral hypoglycemic agents	100	25.4
Insulin replacement therapy	101	25.6
Multiple therapeutic plans	170	43.1
Complications		
Hypertension	80	20.3
Organ failure	3	0.8
Proteinuria	9	2.3
Limb or digit amputation	1	0.3
Atherosclerosis	6	1.5
Stroke or Heart attack	2	0.5
Neuropathy	7	1.8
Retinopathy	17	4.3
No complications	188	47.7
Multiple complications	81	20.6
Numbness sensation		
Yes	249	63.1
No	145	36.9

Table 3: Gastroesophageal reflux symptoms characteristic of participants

Factor	Number	Percentage
Heart burn		
Never	182	46.2
Once	116	29.4
Twice to three times	71	18
Four to seven times	25	6.4
Regurgitation		
Never	159	40.3
Once	129	32.7
Twice to three times	79	20.1
Four to seven times	27	6.9
Epigastric pain		
Never	149	37.8
Once	144	36.5
Twice to three times	74	18.8
Four to seven times	27	6.9
Nausea		
Never	224	56.9
Once	103	26.1
Twice to three times	51	12.9
Four to seven times	16	4.1
Sleep difficulties		
Never	215	54.6
Once	110	27.9
Twice to three times	52	13.2
Four to seven times	17	4.3
Antacids drugs		
Never	221	56.1
Once	86	21.8
Twice to three times	49	12.4
Four to seven times	38	9.7
Gastroesophageal reflux disease score		
0%	4	1
50%	215	54.6
79%	131	33.2
89%	44	11.2

Table 4: Likelihood of developing Gastroesophageal reflux disease in non-insulin dependent diabetes mellitus according to duration

Duration/Likelihood	0%	50%	79%	89%
Less than 5 years	1	60	37	10
5-9 years	0	61	21	8
10-14 years	0	19	19	4
15-20 years	0	14	13	8
More than 20 years	2	11	10	1

Discussion

GERD prevalence was investigated in patients with DM in relation to their age, gender, BMI, smoking, duration of diabetes, various therapeutic plans, peripheral numbness, and the presence of certain complications. The total prevalence of DM in the Ha'il general population was found to be 24.6%. Compared to a study in Turaif city, they found that the prevalence of DM was 5.8% (17). The enormous diversity between the two communities, is mostly related to the increased prevalence of obesity in the Ha'il community (33.9%), and the significant relation between DM and obesity (18, 19). T2DM prevalence (75.9%) in the study was more than that of T1DM. According to the WHO, the prevalence of T2DM in countries of all income levels has grown rapidly over the last three decades (20). Much research in several communities regarding the prevalence of GERD has been published to be more prevalent in DM patients than in the general population (21, 22). A 9 studies meta-analysis from different Asian regions showed a significant association between DM and GERD (23). An overall prevalence of 68% of DM patients with GERD was observed in Turkey (24). In China, a 3-fold higher prevalence of GERD among DM patients was found compared to the general population (22). The bulk of the participants in this study (98.9%) had a likelihood of 50% or higher developing GERD. As shown in Table 4, the longer the duration diagnosed with DM, the lesser likelihood developing GERD symptoms. The decrease in gastrointestinal symptoms is most likely due to simultaneous afferent and efferent nerve damage. This nerve damage is mostly a result of diabetic neuropathy, which occurs when blood glucose levels are increased, but this is mostly seen 5-10 years after the onset of DM (25, 26). On the other hand, a case-control study concludes that diabetic patients with neuropathy have a higher prevalence of esophageal dysmotility (27). Female gender, non-smoking status, T2DM, five years or less diagnosed with DM, on either oral hypoglycemic agents or insulin replacement therapy, and sensation of numbness all are found to be risks for developing GERD. The only risk factors found to be significant were oral hypoglycemic agents, insulin replacement therapy, and sensation of numbness.

Study limitations: Patients self-reported information about their DM and GERD manifestations. Subjects were from a single city, so the findings cannot be generalized. Objective measures of these complications are expected in future studies, with no causal relationships established.

Conclusions and Recommendations

The prevalence of GERD symptoms in diabetic patients is not uncommon, 98.9% of the participants had a 50% likelihood of developing GERD. The majority of participants (75.9%) were diagnosed with T2DM. The higher the duration of DM, the lower the risk of exhibiting symptoms of GERD. One-fifth (20.3%) complained of hypertension. Oral hypoglycemic agents, insulin replacement therapy, and sensation of numbness are considered significant risk factors.

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References

- Kellerman R, Kintanar T. Gastroesophageal reflux disease. *Primary Care: Clinics in Office Practice*. 2017 Dec 1;44(4):561-73.
- Rebecchi F, Allaix ME, Patti MG, Schlottmann F, Morino M. Gastroesophageal reflux disease and morbid obesity: To sleeve or not to sleeve?. *World journal of gastroenterology*. 2017 Apr 7;23(13):2269.
- Iwakiri K, Sugiura T, Hayashi Y, Kotoyori M, Kawakami A, Makino H, et al. Esophageal motility in Japanese patients with Barrett's esophagus. *Journal of gastroenterology*. 2003;38(11):1036-41.
- Kawada A, Kusano M, Hosaka H, Kuribayashi S, Shimoyama Y, Kawamura O, Akiyama J, Yamada M, Akuzawa M. Increase of transient lower esophageal sphincter relaxation associated with cascade stomach. *Journal of clinical biochemistry and nutrition*. 2017;60(3):211-5.
- Alsuwat OB, Alzahrani AA, Alzhrani MA, Alkhathami AM, Mahfouz MEM. Prevalence of Gastroesophageal Reflux Disease in Saudi Arabia. *Journal of clinical medicine research*. 2018;10(3):221-5.
- American Diabetes Association. Diagnosis and classification of diabetes mellitus. *Diabetes care*. 2014 Jan 1;37(1):S81-90.
- Meldgaard T, Brock C. Diabetes and the gastrointestinal tract. *Medicine*. 2019 Jul 1;47(7):454-9.
- Bharucha AE. Epidemiology and natural history of gastroparesis. *Gastroenterology Clinics*. 2015 Mar 1;44(1):9-19.
- Natalini J, Palit A, Sankineni A, Friedenber FK. Diabetes mellitus is an independent risk for gastroesophageal reflux disease among urban African Americans. *Diseases of the Esophagus*. 2015 Jul 1;28(5):405-11.

Table 5: Correlation using Chi-Square test between GERD score and different variables

		GERD Score				P value	
		0(n)	50(n)	79(n)	89(n)		Total(n)
Gender	Male	0	103	53	16	172	0.103
	Female	4	112	78	28	222	
	Total	4	215	131	44	394	
Smoking	No	0	29	28	7	64	0.211
	Yes	4	186	103	37	330	
	Total	4	215	131	44	394	
Numbness	No	3	90	42	10	145	0.020*
	Yes	1	125	89	34	249	
	Total	4	215	131	44	394	
Type of Diabetes	T1DM	1	50	31	13	95	0.847
	T2DM	3	165	100	31	299	
	Total	4	215	131	44	394	
Diabetes Duration	< 5 years	1	71	46	14	132	0.055
	5-9 years	0	64	22	9	95	
	10-14 years	1	30	26	6	63	
	15-19 years	0	23	17	11	51	
	> 20 years	2	27	20	4	53	
	Total	4	215	131	44	394	
Management	Sport	0	4	1	0	5	0.001*
	Diet	0	9	7	2	18	
	Drugs	0	57	36	7	100	
	Insulin	1	54	31	15	101	
	Sport, Diet, Drugs	0	19	9	3	31	
	Sport, Drugs, Insulin	0	6	6	2	14	
	Diet, Drugs	0	25	11	3	39	
	Sport, Diet	1	15	1	0	17	
	Sport, Diet, Insulin	0	5	4	0	9	
	Diet, Insulin	2	4	2	1	9	
	Drugs, Insulin	0	7	7	5	19	
	Sport, Drugs	0	5	6	3	14	
	Sport, Insulin	0	1	1	1	3	
	Sport, Diet, Drugs, Insulin (All)	0	1	2	0	3	
	Diet, Drugs, Insulin	0	1	1	1	3	
	Sport, Insulin	0	2	6	1	9	
Total	4	215	131	44	394		

10. Niigaki M, Adachi K, Hirakawa K, Furuta K, Kinoshita Y. Association between metabolic syndrome and prevalence of gastroesophageal reflux disease in a health screening facility in Japan. *Journal of gastroenterology*. 2013 Apr 1;48(4):463-72.
11. Sun H, Yi L, Wu P, Li Y, Luo B, Xu S. Prevalence of gastroesophageal reflux disease in type II diabetes mellitus. *Gastroenterology research and practice*. 2014 Jan 1;2014.
12. Wang F, Liu J, Lv Z. Association of Helicobacter pylori infection with diabetes mellitus and diabetic nephropathy: a meta-analysis of 39 studies involving more than 20,000 participants. *Scandinavian journal of infectious diseases*. 2013 Dec 1;45(12):930-8.
13. Kase H, Hattori Y, Sato N, Banba N, Kasai K. Symptoms of gastroesophageal reflux in diabetes patients. *Diabetes Research and Clinical Practice*. 2008;79(2):e6-e7.
14. AlTassan FM, Al-Khowaiter SS, Alsubki HE, Alhamoud WA, Niazi AK, AlJarallah BM. Prevalence of gastroesophageal reflux in diabetic patients at a tertiary hospital in Central Saudi Arabia. *Saudi medical journal*. 2020;41(2):151-6.
15. Raosoft sample size calculator [Available from: <http://www.raosoft.com/samplesize.html>].
16. Physician AF. Diagnosis of Gastroesophageal Reflux Disease American Family Physician: American Family Physician; [Available from: <https://www.aafp.org/afp/2010/0515/p1278.html>].
17. Alanazi NH, Alsharif MM, Rasool G, Alruwaili ABH, Alrowaili AMZ, Aldaghmi AS, et al. Prevalence of diabetes and its relation with age and sex in Turaif city, northern Saudi Arabia in 2016-2017. *Electronic physician*. 2017;9(9):5294-7.
18. Al-Goblan AS, Al-Alfi MA, Khan MZ. Mechanism linking diabetes mellitus and obesity. *Diabetes, metabolic syndrome and obesity : targets and therapy*. 2014;7:587-91.
19. Al Othaimen AI, Al Nozha, M. & Osman, A.K. Obesity: an emerging problem in Saudi Arabia. Analysis of data from the National Nutrition Survey 2007 [Available from: <https://apps.who.int/iris/handle/10665/117265>].
20. Organization WH. Diabetes [Available from: https://www.who.int/health-topics/diabetes#tab=tab_1].
21. Natalini J, Palit A, Sankineni A, Friedenberg FK. Diabetes mellitus is an independent risk for gastroesophageal reflux disease among urban African Americans. *Diseases of the esophagus : official journal of the International Society for Diseases of the Esophagus*. 2015;28(5):405-11.
22. Sun H, Yi L, Wu P, Li Y, Luo B, Xu S. Prevalence of Gastroesophageal Reflux Disease in Type II Diabetes Mellitus. *Gastroenterology research and practice*. 2014;2014:601571.
23. Sun XM, Tan JC, Zhu Y, Lin L. Association between diabetes mellitus and gastroesophageal reflux disease: A meta-analysis. *World journal of gastroenterology*. 2015;21(10):3085-92.
24. Sun XM, Tan JC, Zhu Y, Lin L. Association between diabetes mellitus and gastroesophageal reflux disease: A meta-analysis. *World Journal of Gastroenterology: WJG*. 2015 Mar 14;21(10):3085.
25. Frøkjær JB, Andersen SD, Ejskær N, Funch-Jensen P, Arendt-Nielsen L, Gregersen H, et al. Gut sensations in diabetic autonomic neuropathy. *Pain*. 2007;131(3):320-9.
26. Moki F, Kusano M, Mizuide M, Shimoyama Y, Kawamura O, Takagi H, et al. Association between reflux oesophagitis and features of the metabolic syndrome in Japan. *Alimentary pharmacology & therapeutics*. 2007;26(7):1069-75.
27. Gokturk S, Akyuz F, Arici S, Alpaslan B, Ormeci A, Soyer OM, et al. Gastroesophageal Reflux in Asymptomatic Patients with Diabetes: An Impedance Study Diabetes, Obesity and Gastroesophageal Reflux. *Experimental and clinical endocrinology & diabetes : official journal, German Society of Endocrinology [and] German Diabetes Association*. 2020;128(1):52-8.