

Research Article

Gastroesophageal Reflux Disease (GERD) and its Association with Anxiety and Depression: An Online Cross-sectional Survey among Saudi Population

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ABSTRACT

Background: Gastroesophageal reflux disease occurs when gastric juice flows into the esophagus. The presence of psychological issues may increase the risk of GERD, such as anxiety and depression. This study aims to determine the association between GERD symptoms and psychological issues.

Methods: a cross-sectional study was done using an online questionnaire distributed through social media platforms (Facebook, Twitter, WhatsApp, Snapchat) to all Saudi residents ≥ 18 years of both genders. Anxiety and depression were assessed using the Hospital Anxiety and Depression Scale (HADS). The Frequency Scale for GERD symptoms (FSSG) was used to suggest GERD. GERD was considered present if the total FSSG score was ≥ 8 . In this study, the FSSG score was used to evaluate both acid-reflux symptoms and dyspeptic symptoms. Hospital Anxiety and Depression Scale (HADS) scores for depression items and for anxiety items were obtained by summing up the discrete scores. A regression model calculates odds ratios and their 95% confidence intervals.

Results: A total of 882 participants were investigated. Among participants, the mean age was 31.5 ± 14.9 years old. Prevalence of GERD was 78.2%. A total of 88.2% of participants with depression (cases) had GERD with 3.7 folds than others without (OR=3.7; 95% CI: 2.3-5.8). Also, those with borderline depression had 3.5 folds for GERD than normal participants (OR=3.5; 95% CI: 2.3-5.2). As for anxiety, participants with anxiety disorder (cases) had GERD with 5.3 folds than others without (OR=5.3; 95% CI: 3.0-9.4). Also, those with borderline anxiety had 2.7 folds for GERD than normal participants (OR=2.7; 95% CI: 1.7-4.3).

Conclusion: Our data revealed a significant positive association between the prevalence of GERD in participants with anxiety and depression compared to those without psychological factors. The correlation between GERD and anxiety is higher than between GERD and depression. We recommend offering an evaluation as early as possible for GERD for all patients with depression and anxiety.

INTRODUCTION

Gastroesophageal reflux disease (GERD) is caused by gastric juices regressing into the oesophagus, leading to symptoms such as regurgitation and heartburn. (Clarrett & Hachem, 2018) GERD consists of three subtypes: reflux esophagitis (RE), non-erosive reflux disease (NERD), and Barrett's esophagitis (Quach et al., 2022). In Saudi Arabia, previous studies showed that diagnostic criteria for GERD ranged from 23.47% to 45.4% (Almadi et al., 2014). Another study estimated the prevalence of the disease to be 15% in the south of the country. (Mohamed-Elbagir et al., 2010). GERD has proven

to have a substantial negative effect on a person's quality of life (QoL) with reported disturbances in their daily activities. Approximately 20% of GERD patients in the United States and Europe (El-Serag et al., 2014), 12% to 15% in Australia, and 2% to 5% in Asia experience symptoms every week (Boulton & Dett., 2022). Most patients with GERD use antacid medications to manage their associated clinical symptoms. GERD symptoms are often difficult to control (Garg et al., 2022; Galmiche., 2006).

Anxiety is a normal psychological phenomenon, characterised by feelings of fear and worry when threatening or stressful events occur (Kessing et al., 2015). Depression,

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on the other hand, is a serious mood disorder. This condition causes symptoms such as persistent sadness and loss of interest that interfere with daily activities such as sleeping and eating (Bai et al., 2021).

GERD and mental health were assessed in several studies (Van Oudenhove et al., 2016; Lee et al., 2015). A significant association between the GIT tract and the brain is found. Most GIT disorders result from emotional distress or anxiety affecting gut function. Likewise, GIT distress can impact mental and emotional well-being. The frequency of a functional GIT disorder can be influenced by psychological issues, affecting the perception of pain via activity on the gut-brain axis, which can also be attributable to GERD (Atkins et al., 2023; Bortoli., 2018; Lee et al., 2009). A previous study (Yang., 2015) revealed that anxiety and depression increase the incidence of GERD, and other studies have estimated that GERD's adverse effect on quality of life contributes to anxiety and depression, generating a vicious cycle (Faruqui., 2017). Yet, there is no scientific evidence that demonstrates a positive correlation between anxiety and increased stomach acid. This study aimed to evaluate the association between psychological factors (anxiety and depression) and gastroesophageal reflux disease (GERD).

MATERIALS AND METHODS

A cross-sectional study was conducted targeting all populations in Saudi Arabia during the period from November to December 2023. The inclusion criteria were all Saudi residents of ≥ 18 years old of both genders. The exclusion criteria were participants aged < 18 years and others who refused to participate in the study. Data was collected using an online structured, self-administered questionnaire distributed through social media platforms by researchers, friends, and families (Facebook, Twitter, WhatsApp, Snapchat). The researchers initiated the survey tool after a comprehensive review of the literature covering all relevant articles and field expert consultations. A consecutive sampling technique was followed to distribute the questionnaire to all accessible participants, fulfilling the inclusion criteria. The questionnaire's cover page explained the study's purpose and invited the participants to fill in the survey voluntarily. The questionnaire covered Participants' socio-demographic characteristics such as age, gender, and qualifications. The Hospital Anxiety and Depression Scale (HADS) and FSSG Questionnaire were used to assess mental disorders and GERD. The questionnaire was sent to study participants together with a statement regarding the study. Ethical approval for the study was obtained from the Institutional Review Board (IRB). (HAPO-02-K-012-2022-11-1251). The privacy of the participants' data was confirmed by avoiding asking for names.

Data analysis

The data were analyzed using the Statistical Package for Social Sciences version 21 (SPSS: An IBM Company). All statistical methods used were two-tailed with an

alpha level of 0.05, considering significance if the P value was less than or equal to 0.05. GERD was considered present if the total FSSG score was ≥ 8 . FSSG score was used in this study as it can evaluate the acid-reflux-related symptoms and the dyspeptic symptoms. FSSG, at a cut-off of eight points, showed a sensitivity of 62%, specificity of 59%, and accuracy of 60% in diagnosing GERD (Kusano et al., 2004; Sharma et al., 2018). As for psychological status, the Hospital Anxiety and Depression Scale (HADS) score for depression items and for anxiety items was obtained by summing up all items' discrete scores. Subsequently, the total score of depression and anxiety were categorised into normal, Borderline abnormal (borderline case), and abnormal (case) in reference to the reported scale cut-off points (0-7, 8-10, and 11-21, respectively) (Stern., 2014). Descriptive analysis was done by pre-scribing frequency distribution and percentage for study variables, including participants' bio-demographic data, medical history, and medications. Also, the Hospital Anxiety and Depression Scale (HADS) was graphed. The severity of the participants' GERD symptoms was also tabulated, while the prevalence of GERD was graphed. To investigate the association between the variables, the Chi-squared test.

RESULTS

A total of 882 participants completed the study questionnaire. A total of 270 were from the southern region, 232 from the northern region, 144 from the western region, 139 from the eastern region, and only 97 from the central region. Participants' ages ranged from 18 to more than 60 years, with a mean age of 31.5 ± 14.9 years old. Exact of 683 (77.4%) respondents were females. As for education, 721 (81.7%) had a university level of education or above, and 145 (16.4%) had a secondary level of education. A total of 266 (30.2%) were overweight, and 156 (17.7%) were obese. As for personal habits, 78 (8.8%) were current smokers and 42 (4.8%) were ex-smokers. Only 5 (0.6%) respondents had alcohol. Considering medical data, 119 (13.5%) had chronic health problems, 115 (13%) had medications, 59 (6.7%) had the psychological disease, and 93 (10.5%) were diagnosed with GERD (Table 1).

Moreover, Figure 1 shows depression and anxiety among study participants in Saudi Arabia. As for depression, 253 (28.7%) were borderline cases, while 212 (24%) were abnormal (cases). As for anxiety, 192 (21.8%) were borderline cases, while 185 (21%) were abnormal (cases). On the other hand, Table 2A shows the factors associated with GERD among study participants in Saudi Arabia. GERD was detected among 85.5% of participants aged 41-60 years versus 72.7% of others aged more than 60 years with recorded statistical significance ($P=0.012$). Table 2B shows that 80.5% of females had GERD compared to 70.4% of males ($P=0.002$). Also, 90.8% of participants with chronic health problems had GERD in comparison to 76.3% of others ($P=0.001$).

Table 1. Bio-demographic data of study participants, Saudi Arabia (N=882).

Bio-demographic data	No	%
Region		
Central	97	11.0%
Northern	232	26.3%
Eastern	139	15.8%
Western	144	16.3%
Southern	270	30.6%
Age in years		
18-40	657	74.5%
41-60	214	24.3%
> 60	11	1.2%
Gender		
Male	199	22.6%
Female	683	77.4%
Education		
Below secondary	16	1.8%
Secondary	145	16.4%
University / above	721	81.7%
Body mass index		
Underweight	59	6.7%
Normal weight	401	45.5%
Overweight	266	30.2%
Obese	156	17.7%
Smoking		
Non-smoker	762	86.4%
Ex-smoker	42	4.8%
Current smoker	78	8.8%
Alcohol intake		
Yes	5	0.6%
No	877	99.4%
Medical data		
Have chronic diseases	119	13.5%
Have medications	115	13.0%
Had psychological disease	59	6.7%
Was diagnosed with GERD	93	10.5%

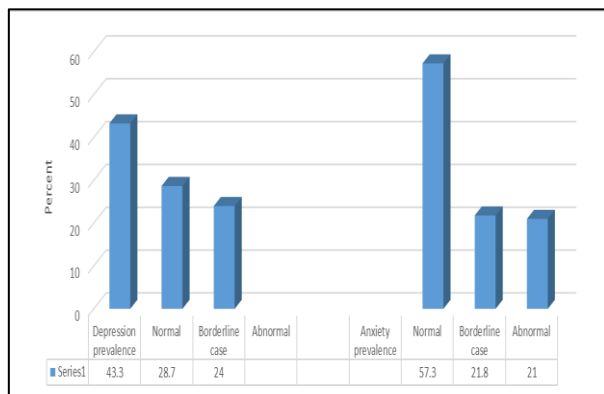


Figure 1. Depression and anxiety among study participants, Saudi Arabia (N=882).

Table 2A. Factors associated with GERD among study participants, Saudi Arabia (N=882).

Factors	GERD			
	No GERD		GERD	
	No	%	No	%
Region*				
Central	19	19.6%	78	80.4%
Northern	54	23.3%	178	76.7%
Eastern	37	26.6%	102	73.4%
Western	29	20.1%	115	79.9%
Southern	53	19.6%	217	80.4%
Age in years**				
18-40	158	24.0%	499	76.0%
41-60	31	14.5%	183	85.5%
> 60	3	27.3%	8	72.7%
Gender***				
Male	59	29.6%	140	70.4%
Female	133	19.5%	550	80.5%
Education****				
Below secondary	2	12.5%	14	87.5%
Secondary	35	24.1%	110	75.9%
University / above	155	21.5%	566	78.5%
Body mass index*****				
Underweight	12	20.3%	47	79.7%
Normal weight	103	25.7%	298	74.3%
Overweight	51	19.2%	215	80.8%
Obese	26	16.7%	130	83.3%
Smoking*****				
Non-smoker	169	22.2%	593	77.8%
Ex-smoker	9	21.4%	33	78.6%
Current smoker	14	17.9%	64	82.1%
P: Pearson X ² test; P-Values respectively: *0.485; **0.012; ***0.002; ****0.518; *****0.068; ***** 0.689				

Additionally, GERD was detected among 92.2% of those who had medications versus 76.1% of others (P=0.001). However, psychological disease Dyspeptic symptoms are also notably common, with a significant percentage of participants reporting feelings and alcohol intake did not show a statistically significant association with GERD in this study.

Dyspeptic symptoms are also notably common, with a significant percentage of participants reporting feelings of bloating, heaviness in the stomach, and fullness during meals. Table 3. showed GERD symptoms frequency among study participants, Saudi Arabia. As for Acid reflux related symptoms, the most frequent included 74.7% got heart burn, 65% got heartburn after meals, 61% got bitter liquid coming up into your throat, and 48.6% got heartburn if you bent over. Regarding Dyspeptic (dysmotility) symptoms, 87.2% feel heavy stomach after meals, 86.2% feel full while eating your meals, 79% reported that their stomach gets bloated, and 63.7% feel sick after meals. The least reported symptom was subconsciously rubbing their chest with their hands.

In Table 3 we have described overview of the frequency of various GERD symptoms among the participants in Saudi Arabia. The data reflects a high prevalence of acid reflux-related symptoms, with the majority experiencing heartburn in various scenarios, including after meals. In Table 4. We have presented a compelling association between Gastroesophageal Reflux Disease (GERD) and mental health conditions, specifically anxiety and depression, within the Saudi Arabian context. The data illustrates a significant prevalence of GERD among individuals with depression, where 88.2% of participants diagnosed with depression also experience GERD, indicating a 3.7 times higher likelihood compared to those without depression. Similarly, participants with borderline depression demonstrate a 3.5 times increased likelihood of having GERD.

Table 2B. Factors associated with GERD among study participants, Saudi Arabia (N=882).

Factors	GERD				p-value
	No GERD		GERD		
	No	%	No	%	
Had psychological disease					
Yes	7	11.9%	52	88.1%	0.056
No	185	22.5%	638	77.5%	
Alcohol intake					
Yes	1	20.0%	4	80.0%	0.923 ^{\$}
No	191	21.8%	686	78.2%	
Have chronic diseases					
Yes	11	9.2%	108	90.8%	0.001*
No	181	23.7%	582	76.3%	
Have medications					
Yes	9	7.8%	106	92.2%	0.001*
No	183	23.9%	584	76.1%	

P: Pearson X2 test \$: Exact probability test
*P < 0.05 (significant)

DISCUSSION

We investigated the association between gastroesophageal reflux disease (GERD) and psychological factors (such as depression and anxiety) in our study. Moreover, we found that there is a statistically significant relationship between GERD and depression (p-value 0.001) as well as anxiety (p-value 0.001). This pattern of results is consistent with previous literature (Yang., 2015; Choi et al., 2018). Another study showed that psychosocial disorders are more common in GERD patients than in healthy individuals. It is also possible that psychosocial disorders can increase the likelihood of GERD. Positive interaction between the two factors (Paul et al., 2022).

This study found that anxiety patients have GERD 5.3 times more often than those without anxiety. GERD was 3.7 times more prevalent in participants with depression than in those without depression. This result is in agreement with Jansson's study (2007). Based on the results of this study, we can safely conclude that GERD and anxiety are more closely related than GERD, and depression is based on the results of this study. Moreover, a different study suggested that symptom intensity severity is

closely linked with levels of anxiety (Kessing et al., 2015).

These findings highlight the intricate link between gastrointestinal and mental health. As shown in Table 4; A total of 88.2% of participants with depression (cases) had GERD with 3.7 folds than others without (OR=3.7; 95% CI: 2.3-5.8). Also, those with borderline depression had 3.5 folds for GERD than normal participants (OR=3.5; 95% CI: 2.3-5.2). As for anxiety, participants with anxiety disorder (cases) had GERD with 5.3 folds than others without (OR=5.3; 95% CI: 3.0-9.4). Also, those with borderline anxiety had 2.7 folds for GERD than normal participants (OR=2.7; 95% CI: 1.7-4.3).

We think that anxiety and depression lower the threshold for bodily experience and interfere with pain perception, which is the best explanation for the current result (Cimpean et al., 2019; He et al., 2022). Furthermore, previous research has shown that psychological disorders are caused by reflux, making people more susceptible to its effects (Yang., 2015; Jansson et al., 2007).

This research provides supporting evidence that gastroesophageal reflux disease (GERD) is a common clinical problem. It affects millions of people worldwide with an estimated prevalence of 18.1–27.8% in North America (Clarrett & Hachem,2018). And the prevalence of gastroesophageal reflux disease (GERD) in Saudi Arabia. A total of 690 (78.2%) of the study participants had GERD-related symptoms, while 192 (21.8%) had no GERD-related complaints. Most patients with GERD present with heartburn as acid reflux-related symptoms.

Heartburn happens when the lower oesophageal sphincter fails to close when the food arrives in your stomach. So, the acid then goes back up through your oesophagus into your throat and mouth, giving you a sour taste. The majority of the time occurs after meals and when they come over. Regarding dyspeptic (dysmotility) symptoms, the participants report feeling a heavy stomach after meals and becoming full while eating. And as we said, there is an association between GERD and anxiety. So, increased levels of anxiety and depression are associated with GERD severity. In addition, GERD is associated with anxiety, so, the severity of symptoms such as severe retrosternal burning will reduce the quality of life and trigger anxiety and depression symptoms (Kessing et al., 2015).

This study revealed that gastroesophageal reflux disease GERD was highly detected among patients aged between (41- 60 years), mainly in women. Therefore, many factors may contribute to the disease's development. Among them are non-modifiable factors such as age, sex, genetic, and modifiable factors e.g., as lifestyle, diet, excessive body weight, smoking, and alcohol consumption (Taraszewska., 2021). High BMI or obesity can elevate gastroesophageal pressure, leading to a hiatal hernia. This is associated with esophagitis (Kermansaravi et al., 2020). Moreover, smoking plays a significant role in causing GERD by lowering LES resting pressure -

Table 3. GERD symptoms frequency among study participants, Saudi Arabia (N=882)

FSSG items	Never		Occasionally		Sometimes		Often		Always	
	No	%	No	%	No	%	No	%	No	%
Acid reflux-related symptoms										
Do you get heart-burn	223	25.3%	288	32.7%	235	26.6%	94	10.7%	42	4.8%
Do you get heart-burn after meals	309	35.0%	218	24.7%	250	28.3%	67	7.6%	38	4.3%
Do you get bitter liquid coming up into your throat	344	39.0%	186	21.1%	223	25.3%	86	9.8%	43	4.9%
Do you get heart-burn if you bean over	453	51.4%	163	18.5%	181	20.5%	51	5.8%	34	3.9%
Dyspeptic symptoms										
Does your stomach get bloated	185	21.0%	256	29.0%	248	28.1%	114	12.9%	79	9.0%
Does your stomach ever feel heavy after meal	113	12.8%	229	26.0%	293	33.2%	147	16.7%	100	11.3%
Do you sometimes subconsciously rub your chest	488	55.3%	162	18.4%	160	18.1%	43	4.9%	29	3.3%
Do you ever feel sick after meals	320	36.3%	201	22.8%	239	27.1%	90	10.2%	32	3.6%
Do you feel full while eating your meals	122	13.8%	222	25.2%	256	29.0%	147	16.7%	135	15.3%
Do some things get stuck while you swallow	483	54.8%	127	14.4%	176	20.0%	53	6.0%	43	4.9%
Do you burp a lot	339	38.4%	233	26.4%	179	20.3%	79	9.0%	52	5.9%
Do you get heart-burn if you bean over	453	51.4%	163	18.5%	181	20.5%	51	5.8%	34	3.9%

Table 4. Gastroesophageal Reflux Disease (GERD) in Saudi Arabia, and its association with Anxiety and Depression.

Depression & Anxiety	GERD				p-value	OR (95% CI)
	No GERD		GERD			
	No	%	No	%		
Depression						
Normal	136	32.6%	281	67.4%	0.001*	Ref 3.5 (2.3-5.2) * 3.7 (2.3-5.8) *
Borderline case	31	12.3%	222	87.7%		
Abnormal	25	11.8%	187	88.2%		
Anxiety						
Normal	152	30.1%	353	69.9%	0.001*	Ref 2.7 (1.7-4.3) * 5.3 (3.0-9.4) *
Borderline case	26	13.5%	166	86.5%		
Abnormal	14	7.6%	171	92.4%		

P: Pearson X2 test; OR: Odds ratio; CI: Confidence interval; * P < 0.05 (significant)

-(Alturki et al., 2023). Additionally, GERD was detected among those who had used medication such as some types of antibiotics, bisphosphonates taken orally, and pain relievers such as ibuprofen.

This study had several limitations, including the fact that it was a cross-sectional study, which meant that the exact relationship between GERD symptoms and psychological symptoms could not be established due to the study's cross-sectional design. Despite these limitations, these results suggest several practical implications for reducing GERD symptoms, like lifestyle and behavioral

modifications, smoking cessation, and weight reduction. In addition, identifying triggering factors can help such patients reduce their anxiety, as patients will be proactive in controlling their daily activities (Commisso & Lim, 2019).

Future research would benefit from examining the habits that lead to these diseases. It would also be useful to extend the age groups up to 60 years and above to become comprehensive research covering all segments of society. Furthermore, see how they diagnose

their disease by themselves or in the clinic by further investigation and mention it.

CONCLUSION

The study showed there is a significant positive association between GERD and psychological factors (anxiety and depression) in Saudi adults. The prevalence of GERD is higher in participants with anxiety and depression than in others without psychological factors. The correlation between GERD and anxiety is higher than between GERD and depression. We recommend identifying triggering factors that can help such patients in reducing anxiety, as patients will be proactive in controlling their daily activities.

AUTHOR CONTRIBUTION

Authors, RA, SA, FK, HQ, HA, MO- Concept and design the study, acquisition of data, analysis, and interpretation of data, drafting the article, revising, and approval for publication.

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DECLARATIONS

Ethical Approval

Ethical approval for the study was obtained from the Institutional Review Board (IRB). (HAPO-02-K-012-2022-11-1251).

Participants Consent

All participants gave informed consent at the onset of the study. They were assured of confidentiality and their right to withdraw from the study.

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Conflict of Interest

All authors have declared that no other relationships or activities could appear to have influenced the submitted work.

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