

# Prevalence and risk factors of gastro-esophageal reflux disease among college students at a public university in Riyadh, Saudi Arabia

**Khalid A. Bin Abdulrahman<sup>1</sup>, Abdullah F. Alsaif<sup>2</sup>, Ibrahim A. Almehaidib<sup>2</sup>, Mohammed A. Alntehe<sup>2</sup>, Nawaf M. Alqahtani<sup>2</sup>, Abdulaziz K. Alabdali<sup>2</sup>**

<sup>1</sup>Department of Medical Education, College of Medicine, Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh, Saudi Arabia, <sup>2</sup>Department of Family Medicine, College of Medicine, Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh, Saudi Arabia

## ABSTRACT

**Background:** Gastroesophageal reflux disease (GERD) is one of the most prevalent gastrointestinal disorders worldwide. It manifests when the lower esophageal sphincter malfunctions, causing the stomach's contents to reflux into the esophagus, lead to discomforting symptoms. Heartburn and regurgitation are the typical symptoms of GERD. This study aims to determine the prevalence of GERD and assess its risk factors. **Materials and Methods:** This cross-sectional study was conducted at IMSIU, Saudi Arabia. An online survey was distributed to the students' email addresses to determine the prevalence of GERD, its related risk factors, and understanding of its symptoms. **Results:** One thousand five hundred and thirty-three (1533) students participated in the survey. The prevalence of GERD was 34.6%. The majority (79.7%) of the respondent students had heard of GERD. Stress is believed to be a factor in developing GERD by 35.7% of students. Heartburn was the predominant symptom of GERD (76.2%). No association existed between the socio-demographic traits of those with GERD except for age and academic year. **Conclusions:** It is imperative to raise public awareness of the disorder's characteristics and its modifiable risk factors to prevent the emergence of GERD and its complications.

**Keywords:** Gastro-esophageal reflux disease, prevalence, Saudi Arabia, students

## Introduction

Gastroesophageal reflux disease (GERD) is a widespread digestive disorder with varying prevalence across different regions, affecting approximately 10%–20% of individuals in North America and Europe and less than 5% in Asia.<sup>[1,2]</sup> This

condition is characterized by an effortless passage of stomach contents into the esophagus or mouth, leading to bothersome symptoms or complications. Retrosternal burning/heartburn and regurgitation are GERD hallmark symptoms.<sup>[3]</sup> These symptoms may exist without apparent esophageal mucosal injury or be linked to erosive esophagitis, esophageal stricture, Barrett's esophagus (BE), or esophageal cancer.<sup>[4]</sup>

**Address for correspondence:** Prof. Khalid A. Bin Abdulrahman, Department of Medical Education, College of Medicine, Imam Mohammad Ibn Saud Islamic University (IMSIU), P.O. Box: 7544 - Othman Bin Affan Rd, Al-Nada, Riyadh 13317 - 4233, Saudi Arabia.  
E-mail: kab@imamu.edu.sa

Patients commonly describe a burning sensation that ascends into the chest, extending to the neck, throat, and occasionally the back.<sup>[3]</sup> It happens post-prandially, especially after consuming large, fatty meals, spicy foods, citrus, chocolates, or alcohol.

Received: 21-10-2023

Revised: 07-12-2023

Accepted: 08-12-2023

Published: 22-04-2024

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow\_reprints@wolterskluwer.com

### Access this article online

#### Quick Response Code:



**Website:**  
<http://journals.lww.com/JFMPC>

**DOI:**  
10.4103/jfmpe.jfmpe\_1715\_23

**How to cite this article:** Bin Abdulrahman KA, Alsaif AF, Almehaidib IA, Alntehe MA, Alqahtani NM, Alabdali AK. Prevalence and risk factors of gastro-esophageal reflux disease among college students at a public university in Riyadh, Saudi Arabia. J Family Med Prim Care 2024;13:1401-7.

Heartburn may be made worse by lying down and bending over. Heartburn at night may cause sleeping rugged and compromise performance the following day.<sup>[5]</sup>

Regurgitation, defined as the “perception of the flow of refluxed gastric contents into the mouth or hypopharynx,” according to the Montreal consensus statement, is another prevalent symptom associated with GERD.<sup>[3]</sup> Several factors, including temporary relaxations of the lower esophageal sphincter and abnormalities in the lower esophageal sphincter pressure, contribute to the development of GERD.<sup>[6]</sup> Older age, high body mass index (BMI), smoking, depression, anxiety, and decreased physical exercise at work are risk factors for GERD.<sup>[7-9]</sup>

This chronic ailment has a significant economic burden and affects the quality of life. Numerous studies have demonstrated that individuals with gastro-gastroesophageal have a lower quality of life than healthy controls, and as the disease gets worse, so does the patient’s health-related quality of life score.<sup>[10]</sup>

Recent studies in Saudi Arabia, such as the work by Al Ghadeer *et al.* (2021) and Alrashed *et al.* (2019), have highlighted a noteworthy prevalence of GERD among university students. These findings underscore the need for further exploration, especially given the limited research on the prevalence of GERD among university students in Saudi Arabia. Additionally, the susceptibility of college students to GERD risk factors, such as stress and sleep deprivation, due to academic pressures warrants special attention.<sup>[11,12]</sup>

Although this topic has been addressed worldwide, published studies on the prevalence of GERD among university students in Saudi Arabia have been limited and need further exploration. Moreover, college students are particularly vulnerable and predisposed to GERD risk factors such as stress and sleep deprivation since they are preoccupied with their academic studies. This study aims to contribute to the existing body of knowledge by determining the prevalence of GERD, exploring its associated risk factors, and enhancing understanding of its symptoms among students at IMSIU in Saudi Arabia. By addressing this gap in research, the findings of our study hold particular relevance to primary care physicians and family physicians, as they play a pivotal role in managing and providing care for individuals with GERD. The insights gained from this study inform preventive strategies and interventions in primary care settings, ultimately improving patient outcomes and overall healthcare practices.

## Materials and Methods

### Study design

A descriptive cross-sectional study was conducted in Riyadh, Saudi Arabia, in 2021 to measure the prevalence of GERD, students’ understanding of its symptoms, and associations with other factors and socio-demographic information among college students at IMSIU. Four major streams comprise the colleges of

Humanitarian, Science, Economic and Administrative Sciences, and Medicine.

### Inclusion and exclusion criteria

Eligible participants must be undergraduates, bachelors, and on-campus registered students in one of these disciplines mentioned above. However, participants were excluded if they were in diploma, master, and doctorate programs.

### Sample size calculation

Based on IMSIU’s website, the number of undergraduate regular bachelor students in these majors was 73938 for both genders (38756 were males and 35182 were females). The minimal sample size of responses was calculated to be at least 385 participants to reach a confidence level of 95% and a margin of error of 5%.

### Data collection tools and procedures

An online self-completed electronic questionnaire has been sent by email to a large random sample of participants provided by the I.T. Deanship. Follow-up reminder emails have been sent to increase the response rate.

### Demographic and social/clinical characteristics questionnaire

The questionnaire was classified into two parts: the first part covered the demographic information of the students, which covers gender, age, nationality, specialty, educational level, height, and weight. The second part includes the gastroesophageal reflux disease questionnaire (GERDQ) used to diagnose GERD.<sup>[13]</sup> The questionnaire from previously published Saudi studies included demographic characteristics and multiple lifestyle factors that might cause GERD. The GERDQ was used to diagnose students with GERD and validated as a patient-centered self-assessment. Those with a score of 8 or more were considered to have GERD, while those with a score of less than eight were not supposed to have this disease.<sup>[13]</sup>

### Statistical analysis

The data analyses were performed using Statistical Packages for Software Sciences (SPSS) version 26, Armonk, New York, IBM Corporation. Descriptive statistics were used to define the proportion of responses for each question and the total distribution of the total score of each questionnaire. Values were computed and reported as mean  $\pm$  SD (standard deviation).

The multivariable linear regression (MLR) analysis was applied to assess the statistically significant predictors of mean mental distress K6 score among university students; the associations between predictor variables with analyzed outcome in the linear regression were expressed as a beta coefficient with its associated 95% confidence interval. Also, the students’ help-seeking dependent outcome variables were analyzed with multivariable logistic binary regression analysis (MLBR) to assess the predictors of students’ help-seeking behavior upon mental distress. The association between predictor variables with the analyzed

binary logistic regression analysis outcome was expressed as a multivariable-adjusted odds ratio (OR) with 95% confidence intervals. The alpha significance level was considered to be at 0.050.

### Ethical considerations

The study adhered to ethical standards and guidelines for reporting. Participants provided informed consent, and the ethical review board of [Institution's Name] reviewed and approved the research protocol before initiation. Confidentiality of participant information was strictly maintained throughout the study.

## Results

### Demographic factors of the participants

The study included a total of 1,533 participants, with 68.6% being females and 99.2% being Saudi citizens. Most participants were distributed across different age groups, academic years, and colleges, reflecting the diverse student population at IMSIU [Table 1].

### Background knowledge of GERD

Table 2 provides background information on GERD. A noteworthy 34.6% reported experiencing GERD, while 20.3% were unfamiliar with the disease. Furthermore, 36.9% of respondents had an unfavorable opinion of caffeine's role in developing GERD. At the same time, 30.9% of those surveyed agreed that smoking is one of the causes, too. Additionally, 76.2% of individuals believe that heartburn is one of the symptoms of GERD [Table 2].

### Association with socio-demographic factors

Moreover, 34.4% of males and 34.6% of females were affected. The incidence increased as people aged, reaching a peak of 44.8% in the 24–25 age group. Participants in their fifth year had the highest incidence (48.2%). With a frequency of 37.5%, science stream colleges had the highest prevalence. The persons with heights between 160 and 170 cm and weights between 60 and 70 kg had the greatest prevalence rates, 39.3%, and 37.0%, respectively. The correlation between the participants' socio-demographic data and GERD is shown in Table 3. No significant link exists between any socio-demographic characteristics of individuals with GERD, except age, academic year, and height, with *P* values of 0.001, 0.001, and 0.020, respectively [Table 3].

Age, academic year, and height showed meaningful odds ratios, suggesting a potential association with GERD. Other factors, including gender, nationality, college, and weight, did not exhibit significant associations [Table 4].

## Discussion

### Prevalence of GERD

Our research aims to evaluate the prevalence of GERD and its risk factors among IMSIU students in Saudi Arabia. The population of this study consisted of university students only, with a small

**Table 1: Descriptive characteristics of university students (n=1533)**

	Frequency	Percentage
Gender		
Female	1051	68.6
Male	482	31.4
Age group—years		
18–19 years	366	23.9
20–21 years	536	35.0
22–23 years	401	26.2
24–25 years	230	15.0
Nationality		
Saudi	1520	99.2
Non-Saudi	13	0.8
College		
Economic and Administrative sciences	610	39.8
Humanities science	509	33.2
Science streams colleges	320	20.9
Medicine	94	6.1
Academic year		
First-year	457	29.8
Second year	235	15.3
Third year	284	18.5
Fourth-year	258	16.8
Fifth year	299	19.5
Height—cm		
<160	566	36.9
160–170	641	41.8
171–180	266	17.4
181–190	59	3.8
>190	1	0.1
Weight—kg		
<60	715	46.6
60–70	316	20.6
71–80	224	14.6
81–90	103	6.7
91–100	92	6.0
>100	83	5.4

age group ranging from 18 to 25. GERD is one of the major gastrointestinal disorders affecting adults worldwide.<sup>[14,15]</sup> Our study results revealed that GERD is a common problem among IMSIU students, with a prevalence of (34.6%). This prevalence is higher than reported in a previous study conducted among college students at Sharqa University, which reported a prevalence of 23.8%.<sup>[12]</sup> Additionally, prior research has demonstrated that, in comparison to the general population, college students, in particular, comprise a population with a higher frequency of GERD.<sup>[16–18]</sup> Our result is consistent with a comprehensive review that found GERD affects between 8.7 and 33.1% of the Middle Eastern population.<sup>[2]</sup> Our percentage is similar to the 33.2% reported among Saudi Arabia's southwest university students.<sup>[19]</sup>

### Socio-demographic factors associated with GERD prevalence

The prevalence of GERD appeared similar between males (34.4%) and females (34.6%). This result contradicts some previous

**Table 2: Background knowledge of gastroesophageal reflux disease (n=1533)**

	Frequency	Percentage
Have you ever heard of gastroesophageal reflux disease?		
Yes	1222	79.7
No	311	20.3
Do you think that consuming coffee is one of the causes of GERD?		
Strongly Agree	284	18.5
Agree	469	30.6
Neutral	566	36.9
Disagree	167	10.9
Strongly Disagree	47	3.1
Do you think that smoking is one of the causes of GERD?		
Strongly Agree	457	29.8
Agree	473	30.9
Neutral	402	32.7
Disagree	83	5.4
Strongly Disagree	18	1.2
Could being exposed to stress be a triggering factor for GERD?		
Strongly Agree	547	35.7
Agree	537	35.0
Neutral	335	21.9
Disagree	105	6.8
Strongly Disagree	9	0.6
Nausea is a symptom of GERD.		
Yes	838	54.7
No	103	6.7
I do not know	592	38.6
Vertigo is a symptom of GERD.		
Yes	361	23.5
No	282	18.4
I do not know	890	58.1
Vomiting is a symptom of GERD.		
Yes	920	60.0
No	129	8.4
I do not know	484	31.6
Headache is a symptom of GERD.		
Yes	343	22.4
No	338	22.0
I do not know	852	55.6
Heartburn is a symptom of GERD		
Yes	1168	76.2
No	34	2.2
I do not know	331	21.6
Do you suffer from gastroesophageal reflux disease?		
Yes	530	34.6
No	1003	65.4

studies that suggested a significant difference between the two genders, considering the prevalence of GERD.<sup>[12,20,21]</sup> However, our findings emphasize that GERD affects both genders,

highlighting the importance of considering individual factors beyond gender, similar to what is presented in some previous studies.<sup>[22,23]</sup> The incidence of GERD increased with age, reaching a peak of 44.8% in the 24–25 age group. This age-related trend aligns with the general understanding that GERD risk tends to rise.<sup>[24,25]</sup> Additionally, participants in their fifth academic year had the highest incidence (48.2%), indicating a potential cumulative effect or increased susceptibility as students progress through their educational journey. Individuals with heights between 160 and 170 cm and weights between 60 and 70 kg exhibited the greatest prevalence rates of 39.3% and 37.0%, respectively. While these findings might be suggestive, additional research is needed to understand the underlying mechanisms linking height, weight, and GERD. It could be related to body composition, dietary habits, or other lifestyle factors.

### Background knowledge and awareness

In understanding the background knowledge of GERD among IMSIU students, it is crucial to note that approximately 79.7% of participants reported awareness of the disease. However, a significant portion (20.3%) remained unfamiliar with GERD, emphasizing this population's need for increased education and awareness campaigns. This lack of awareness may contribute to delayed diagnosis and treatment, potentially leading to complications associated with untreated GERD, which is similar to what was reported previously.<sup>[26]</sup>

### Symptoms perception

The survey explored students' perception of GERD symptoms. Notably, a substantial number of participants recognized heartburn as a symptom (76.2%), aligning with the classic manifestation of GERD.<sup>[14]</sup> However, there was a notable lack of awareness regarding other symptoms, such as nausea, vertigo, and vomiting. This highlights a critical gap in knowledge that may hinder early recognition and management of GERD, emphasizing the importance of comprehensive education programs.

### Trigger factors awareness

Understanding the triggers of GERD is essential for preventive measures. While 30.6% of students recognized coffee consumption as a trigger, a considerable number (36.9%) remained neutral, indicating potential misconceptions or lack of clarity. Smoking, a well-established risk factor for GERD, was acknowledged by 30.9% of students, with variations in agreement levels. The majority recognized stress as a common lifestyle factor (35.7%), reinforcing its association with GERD. These findings underscore the need for targeted educational interventions to address misconceptions and promote a better understanding of GERD triggers among students.

### BMI and GERD association

Our study identified a significant association between high BMI and GERD, consistent with existing literature. High BMI contributes to increased thoracoabdominal pressure and reduced

**Table 3: Association between the socio-demographic characteristics of the participants and GERD**

	GERD				P
	Yes		No		
	Number	%	Number	%	
Gender					
Male	166	34.4	316	65.6	0.942
Female	364	34.6	687	65.4	
Age					
18-19	72	19.7	294	80.3	<0.001*
20-21	178	33.2	358	66.8	
22-23	177	44.1	224	55.9	
24-25	103	44.8	127	55.2	
Nationality					
Saudi	526	34.6	994	65.4	0.514
Non-Saudi	4	30.8	9.0	69.2	
Academic Year					
First-year	108	23.6	349	76.4	<0.001*
Second year	74	31.5	161	68.5	
Third year	97	34.1	187	65.9	
Fourth-year	107	41.5	151	58.5	
Fifth year	144	48.2	155	51.8	
College					
Economic and Administrative sciences	211	34.6	399	65.4	0.587
Humanities science	169	33.2	340	66.8	
Medicine	30	37.5	64	62.5	
Science streams colleges	120	31.9	200	68.1	
Height—cm					
<160	180	31.8	386	68.2	0.020*
160-170	252	39.3	389	60.7	
171-180	80	30.1	186	69.9	
181-190	18	30.5	41	69.5	
Weight—Kg					
<60	245	34.3	470	65.7	0.726
60-70	117	37.0	199	63	
71-80	112	34.2	215	65.8	
91-100	27	29.3	65	70.7	
>100	29	34.9	54	65.1	

lower esophageal sphincter pressure, predisposing individuals to GERD.<sup>[27,28]</sup> This highlights the importance of lifestyle modifications, including weight management, among university students in GERD prevention and management.

Comparing our findings with previous studies, the prevalence of GERD among IMSIU students aligns with the global trend of GERD being a common digestive disorder. However, this population's specific risk factor awareness and symptom perception provide valuable insights for targeted interventions. Our results emphasize the need for tailored educational programs, considering university students' unique characteristics and perceptions.

### Limitations of the study

This study has several limitations that warrant consideration when interpreting the findings. The cross-sectional design

restricts our ability to establish causation, emphasizing the need for future longitudinal investigations. The study's exclusive focus on IMSIU students aged 18–25 introduces potential sampling bias, limiting generalizability to other age groups and academic levels. Reliance on self-reported data, particularly regarding GERD symptoms and lifestyle factors, raises concerns about recall bias. The absence of formal diagnostic confirmation through medical examinations or endoscopy may contribute to misclassification of GERD status. Being a single-center study conducted in Saudi Arabia, the results may only partially represent diverse populations or university settings. Cultural and regional factors influencing lifestyle behaviors were not extensively explored, affecting the generalizability of findings. The study did not delve deeply into participants' underlying health conditions or medications, which could impact GERD symptoms. Addressing these

**Table 4: Univariate logistic regression for the associated factors with GERD**

	Odds ratio	95% CI		P
		Lower	Upper	
Gender				
Male	0.991	0.790	1.244	0.941
Female**	1.000			
Age				
18-19**	1.000			
20-21	2.030	1.483	2.780	<0.001*
22-23	3.227	2.333	4.463	<0.001*
24-25	3.312	2.297	4.775	<0.001*
Nationality				
Saudi	1.191	0.365	3.885	0.772
Non-Saudi**	1.000			
Academic Year				
First-year**	1.000			
Second year	1.485	1.047	2.107	0.027
Third year	1.676	1.209	2.324	0.002
Fourth-year	2.290	1.649	3.180	<0.001*
Fifth year	3.002	2.195	4.106	<0.001*
Collage				
Economic and Administrative sciences	0.881	0.665	1.168	0.379
Humanities science	0.828	0.619	1.109	0.206
Medicine	0.781	0.479	1.274	0.323
Science streams colleges **	1.000			
Height—cm				
<160**	1.000			
160-170	1.389	1.096	1.762	0.007
171-180	0.922	0.672	1.265	0.616
181-190	0.941	0.526	1.684	0.839
Weight—Kg				
<60	0.971	0.602	1.564	0.903
60-70	1.095	0.660	1.815	0.726
71-80	0.970	0.585	1.608	0.906
91-100	0.773	0.409	1.462	0.429
>100**	1.000			

\*Significant P. \*\*Used as a reference

limitations in future research endeavors will contribute to a more comprehensive understanding of GERD among university students.

## Conclusions

Gastroesophageal reflux disease is highly prevalent among the students of the IMSIU population. Moreover, most of the students have heard about GERD. Heartburn was the most widely recognized symptom of the disease. However, many students were unaware of vertigo as a symptom. The study identified coffee, smoking, stress, and high BMI as common triggers for GERD. It is essential to raise awareness about the nature of the disease and these modifiable risk factors to prevent the development of GERD and its complications.

## Acknowledgment

The authors would like to thank the college students who all participated in the survey.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## References

- Sharma A, Sharma PK, Puri P. Prevalence and the risk factors of gastroesophageal reflux disease in medical students. *Med J Armed Forces India* 2018;74:250-4. doi: 10.1016/j.mjafi.2017.08.005.
- El-Serag HB, Sweet S, Winchester CC, Dent J. Update on the epidemiology of gastro-oesophageal reflux disease: A systematic review. *Gut* 2014;63:871-80. doi: 10.1136/gutjnl-2012-304269.
- Vakil N, van Zanten SV., Kahrilas P, Dent J, Jones R. The montreal definition and classification of gastroesophageal reflux disease: A global evidence-based consensus. *Am J Gastroenterol* 2006;101:1900-20. doi: 10.1111/j.1572-0241.2006.00630.x.
- Kellerman R, Kintanar T. Gastroesophageal reflux disease. *Prim Care Clin Off Pract* 2017;44:561-73. doi: 10.1016/j.pop.2017.07.001.
- Johnson DA, Orr QC, Crawley JA, Traxler B, McCullough J, Brown KA, *et al.* Effect of esomeprazole on nighttime heartburn and sleep quality in patients with GERD: A randomized, placebo-controlled trial. *Am J Gastroenterol* 2005;100:1914-22. doi: 10.1111/j.1572-0241.2005.00285.x.
- Mikami DJ, Murayama KM. Physiology and pathogenesis of gastroesophageal reflux disease. *Surg Clin North Am* 2015;95:515-25. doi: 10.1016/j.suc.2015.02.006.
- Zheng Z, Nordenstedt H, Pedersen NL, Lagergren J, Ye W. Lifestyle factors and risk for symptomatic gastroesophageal reflux in monozygotic twins. *Gastroenterology* 2007;132:87-95. doi: 10.1053/j.gastro.2006.11.019.
- Jarosz M, Taraszewska A. Risk factors for gastroesophageal reflux disease - the role of diet. *Prz Gastroenterol* 2014;9:297-301. doi: 10.5114/pg.2014.46166.
- Ferrioli E, Oliveira RB, Matsuda NM, Braga FJ, Dantas RO. Aging, esophageal motility, and gastroesophageal reflux. *J Am Geriatr Soc* 1998;46:1534-37. doi: 10.1111/j.1532-5415.1998.tb01538.x.
- Revicki DA, Wood M, Maton PN, Sorensen S. The impact of gastroesophageal reflux disease on health-related quality of Life 11 supported by research funding from Astra/Merck, Wayne, Pennsylvania. *Am J Med* 1998;104:252-8. doi: 10.1016/S0002-9343(97)00354-9.
- Al Ghadeer HA, Alabbad ZE, AlShaikh SB, Ahmed SU, Bu-Khamseen AA, Alhashem AT, *et al.* Prevalence of gastroesophageal reflux disease and associated risk factors in the eastern region, Saudi Arabia. *Cureus* 2021;13:e19599. doi: 10.7759/cureus.19599.
- Alrashed AA, Aljammaz K, Pathan A, Mandili AA, Almatrafi SA, Almotire MH, *et al.* Prevalence and risk factors of gastroesophageal reflux disease among Shaqra University students, Saudi Arabia. *J Fam Med Prim Care* 2019;8:462-67. doi: 10.4103/jfmpc.jfmpc\_443\_18.
- Jones R, Junghard O, Dent J, Vakil N, Halling K, Wernersson B, *et al.* Development of the GerdQ, a tool for the diagnosis and management of gastro-oesophageal reflux disease in

- primary care. *Aliment Pharmacol Ther.* 2009;30:1030-8. doi: 10.1111/j. 1365-2036.2009.04142.x.
14. Clarrett DM, Hachem C. Gastroesophageal reflux disease (GERD). *Mo Med.* 2018;115:214-8. <http://www.ncbi.nlm.nih.gov/pubmed/30228725>.
  15. Boulton KH, Dettmar PW. A narrative review of the prevalence of gastroesophageal reflux disease (GERD). *Ann Esophagus* 2022;5:7. doi: 10.21037/aoe-20-80.
  16. Elnemr G, Almuntashiri AH, Alghamdi SA, Alharthi FR, Masoodi I. The predictors of Gastroesophageal Reflux Disease among University students: A cross-sectional study in the western region of Saudi Arabia. *Egypt J Hosp Med* 2018;73:5828-38. doi: 10.21608/ejhm. 2018.12046.
  17. Martinucci I, Natilli M, Lorenzoni V, Pappalardo L, Monreale A, Turchetti G, *et al.* Gastroesophageal reflux symptoms among Italian university students: Epidemiology and dietary correlates using automatically recorded transactions. *BMC Gastroenterol* 2018;18:116. doi: 10.1186/s12876-018-0832-9.
  18. Baklola M, Terra M, Badr A, Fahmy FM, Elshabrawy E, Hawas Y, *et al.* Prevalence of gastro-oesophageal reflux disease, and its associated risk factors among medical students: A nation-based cross-sectional study. *BMC Gastroenterol* 2023;23:269. doi: 10.1186/s12876-023-02899-w.
  19. Awadalla NJ. Personal, academic and stress correlates of gastroesophageal reflux disease among college students in southwestern Saudi Arabia: A cross-section study. *Ann Med Surg (Lond)* 2019;47:61-5. doi: 10.1016/j.amsu. 2019.10.009.
  20. Rasool MF, Sarwar R, Arshad MS, Imran I, Saeed H, Majeed A, *et al.* Assessing the frequency and risk factors associated with gastroesophageal reflux disease (GERD) in Southern Punjab, Pakistan. *Risk Manag Health Policy* 2021;14:4619-25. doi: 10.2147/RMHP.S335142.
  21. Warsi I, Ahmed J, Younus A, Rasheed A, Akhtar TS, Ain QUI, *et al.* Risk factors associated with oral manifestations and oral health impact of gastro-oesophageal reflux disease: A multicentre, cross-sectional study in Pakistan. *BMJ Open* 2019;9:e021458. doi: 10.1136/bmjopen-2017-021458.
  22. Nusrat S, Nusrat S, Bielefeldt K. Reflux and sex: What drives testing, what drives treatment? *Eur J Gastroenterol Hepatol* 2012;24:233-47. doi: 10.1097/MEG.0b013e32834f6baa.
  23. Matar Alsulobi A, Mohamed Abo El-Fetoh N, Ghazi Eid Alenezi S, Alanazi RA, Hamdan Salem Alenazy R, Aied Lafi Alenzy F, *et al.* Gastroesophageal reflux disease among population of Arar City, Northern Saudi Arabia. *Electron Physician* 2017;9:5499-505. doi: 10.19082/5499.
  24. Cho Y-S, Choi M-G, Jeong J-J, Chung W-C, Lee I-S, Kim S-W, *et al.* Prevalence and clinical spectrum of gastroesophageal reflux: A population-based study in Asan-si, Korea. *Am J Gastroenterol.* 2005;100:747-53. doi: 10.1111/j. 1572-0241.2005.41245.x.
  25. Li Y, Du J, Zhang H, Yu C. Epidemiological investigation in outpatients with symptomatic gastroesophageal reflux from the department of medicine in Zhejiang Province, East China. *J Gastroenterol Hepatol* 2008;23:283-9. doi: 10.1111/j. 1440-1746.2007.05045.x.
  26. Alshahrani SM, Alahmari AO, Alobaidi AJ. Assessment knowledge and attitude and practice toward GERD among smokers in Riyadh City, 2018. *Egypt J Hosp Med* 2018;73:6763-6.
  27. Jung HS, Choi MG, Baeg MK, Lim CH, Kim JS, Cho YK, *et al.* Obesity is associated with increasing esophageal acid exposure in Korean patients with gastroesophageal reflux disease symptoms. *J Neurogastroenterol Motil* 2013;19:338-43. doi: 10.5056/jnm. 2013.19.3.338.
  28. Seeras K, Campbell J, Pryor AD. Considerations in the management of gastroesophageal reflux disease in the morbidly obese. *Ann Esophagus* 2022;5:41. doi: 10.21037/aoe-21-20.