Characteristics of Gastroesophageal Reflux Disease Patients and Predictors of its Severity in Saudi Arabia: A Cross-Sectional Study on University Students

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Abstract

Background: Gastroesophageal reflux disease (GERD) gives rise to distressing symptoms and is closely linked to several risk factors.

Objectives: This study aimed to explore the characteristics of GERD patients and predictors of severity in Saudi Arabia among university students.

Patients and methods: This is a cross-sectional observational prospective study that was conducted between April and June 2022 at the Imam Mohammad Ibn Saud University Medical Center, Saudi Arabia. The study included four positive predictors: heartburn, regurgitation, sleep disruption and the use of OTC medication in addition to prescribed medication. Additionally, there are two negative predictors: epigastric pain and nausea. GerdQ questionnaire was used for data collection. A binary logistic regression statistical analysis was employed to ascertain the factors that exhibited an influence on individuals affected by the disease and the severity. A total of 160 patients were involved in this study.

Results: In final analysis of 160 participants, the mean GerdQ score was 8.1 (SD: 2.5). The majority of them are postgraduate students (Master and PhD). Bad eating habits were associated with being more influenced by GERD (having sleep disturbance together with using OTC medications) ($p<0.05$). Conversely, consuming caffeine, late meals and smoking had no association on the university students of the Imam Mohammad Ibn Saud University ($p>0.05$).

Conclusion: University students' lifestyle and eating habits are largely affecting GERD patients causing sleep disturbances leading to larger usage of OTC medications. Future studies are warranted to design appropriate interventions to decrease the disease burden.

Keywords: GERD: Heartburn; Survey; Students.

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Introduction

Gastroesophageal reflux disease (GERD) is a chronic gastrointestinal disorder caused by the backflow of gastric content into the oesophagus, leading to troubling symptoms and complications **(Belete et al., 2023; Fass et al., 2021; Moayyedi & Talley, 2006; Vakil et al., 2007)**. Among adults, GERD is one of the most prevalent gastrointestinal disorders **(Vakil et al., 2006)**. According to a previous systematic review and meta-analysis, the worldwide prevalence of GERD was approximately 14%, with significant regional variations **(Nirwan et al., 2020)**. In East Asia, prevalence rates continually remained below 10% **(El-Serag et al., 2014)**. A nationwide study conducted in Saudi Arabia revealed a high prevalence of 28.7% **(Alsuwat et al., 2018)**. GERD ranks as the fourth most prevalent chronic disorder observed in primary care settings, following depression, hyperlipidaemia, and hypertension **(Ornstein et al., 2013)**.

GERD is associated with a range of risk factors, predominantly linked to the patient's lifestyle, including fast-food intake, dietary choices, consumption of pickles or salt during meals, beverage preferences, family history, smoking habits, physical activity levels, elevated body mass index (BMI), and the use of analgesics such as non-steroidal anti-inflammatory drugs (NSAIDs) **(Jarosz and Taraszewska, 2014; Mahadeva et al., 2005; Saberi-Firoozi et al., 2007; Wong et al., 2003)**. GERD commonly has a significant influence on both patients' quality of life (by impacting their well-being due to symptoms) and their finances through medical care and consultations **(Chen et al., 2009; El–Serag, 2007; Shaheen, 2007)**. Common symptoms of GERD encompass chest pain, heartburn, and regurgitation **(Eusebi et al., 2018)**. GERD can also manifest with extra-oesophageal symptoms, like persistent cough, asthma, laryngitis, and dental erosions **(Eusebi et al., 2018; Saber and Ghanei, 2012)**. Furthermore, GERD can serve as a significant risk factor for numerous conditions, such as cardiovascular diseases **(Chen et al., 2016)**, mental health disorders **(You et al., 2015)**, cancer **(Maret-Ouda et al., 2020)**, respiratory disease **(Khan et al., 2017)**, inflammation of the oesophageal squamous epithelium **(Altomare et al., 2013)**, and head and neck diseases **(Kim et al., 2019)**.

GERD can affect individuals across all age groups, even starting in infancy. Research indicates that GERD is specifically common among university students **(Alrashed et al., 2019; Sharma et al., 2018)**, with prevalence rates ranging from 11.8% to 52.6% **(Akinola et al., 2020; Arivan and Deepanjali, 2018; Cardoso et al., 2018; Elnemr et al., 2018; Gunasinghe et al., 2020; Karthik et al., 2017; Martinucci et al., 2018; Nwokediuko, 2009)**. This higher prevalence among university students may be attributed to increased exposure to GERD risk factors, such as stress and stress-related behaviours **(El-Gilany et al., 2009; Song et al., 2013)**. Similarly, GERD affects around one-third of college students in south-western Saudi Arabia **(Awadalla, 2019)**.

In Riyadh, a prior study reported GERD prevalence rates of 45% **(Almadi et al., 2014)**. Although earlier studies

investigated GERD risk factors and clinical manifestations in adults and the prevalence of GERD across various age groups, there is still a significant knowledge gap regarding identifying the characteristics of GERD patients and predictors of its severity among university students in Saudi Arabia. As a result, the purpose of this study is to explore the characteristics of GERD patients and predictors of its severity in Saudi Arabia among university students.

Patients and methods

Study design

This is a cross-sectional survey study that was conducted between April and June 2022 at the healthcare centre at Imam Mohammad Ibn Saud University, Riyadh, Saudi Arabia. Patients were interviewed using structured questionnaire.

Study population and participants' recruitment

The inclusion criteria for this study were university students' patients who are diagnosed with GERD and aged 18 years and above. All children and teenagers below 18 years, employees and their family members who are not university students were excluded. GERD diagnosis was confirmed by the treating physician, oesophageal acid test, and endoscopy of the gastrointestinal tract. Patients who meet our inclusion criteria were invited to participate in this study. The aim and objectives of the study were explained for the patients. They were informed that their participation will be considered as informed consent.

Data collection

Demographic data were collected from eligible patients. Demographic data included age, gender, weight, height, body mass index (BMI), smoking status, caffeine consumption, whether they have bad eating habits (fatty, greasy foods, carbonated beverages, not having enough of the healthy foods we need each day, or consuming too many types of food and drink, which are low in fibre or high in fat, salt and/or sugar), whether they eat spicy food, whether they eat large amounts of food, and whether they eat during the last 3 hours before bed. The study employed the GerdQ questionnaire for data collection **(Jones, 2009)**. The study includes four positive predictors of GERD: heartburn and regurgitation, which are the two main symptoms of GERD, sleep disruption caused by these reflux symptoms, and the use of over-the-counter medication in addition to prescribed medication **(Jones, 2009)**. Additionally, there are two negative predictors of GERD: epigastric pain and nausea. The participants were requested to retrospectively consider their symptoms throughout the week that had just passed. A scoring system was utilized to assess positive predictors, with scores ranging from 0 to 3. Conversely, negative predictors were evaluated using a reversed scoring order, where scores ranged from 3 to 0, with 3 indicating the absence of the predictor. The GerdQ score was derived by summing the individual results, resulting in a composite score that ranges from 0 to 18 **(Jones, 2009)**. The cut-off point for the GerdQ is eight, any patient exceed this score has high probability of developing GERD. Those with a total score of 3 or higher (out of 6) for sleep disturbance and over-the-counter medication use were most likely to be affected by their disease.

Questionnaire piloting

The validity of the questionnaire was assessed by professional clinicians affiliated with the college of medicine at Imam Mohammad Ibn Saud University in Riyadh, Saudi Arabia. These doctors verified the appropriateness and clarity of the questionnaire items. The researchers verified the significance, lucidity, and comprehensibility of the items, as well as the suitability of the response options. In order to assess the comprehensibility of the questionnaire tool, a pilot study was undertaken on a sample of patients diagnosed with GERD prior to its widespread distribution. The execution of this task occurred subsequent to the evaluation of the questionnaire tool by professional clinicians.

Survey translation

The forward-backward translation technique was used to translate the questionnaire for this study. This translation technique is based on conception rather than word-by-word translation.

Ethical approval

This study was approved by the Institutional Review Board at Al-Imam Muhammad Ibn Saud Islamic University, Riyadh, Saudi Arabia (Project number: 353/2022). All patients gave their consent before taking part in this study.

Statistical analysis

The data analysis for this study was conducted using the Statistical Package for Social Science software version 27 (IBM Corp., Armonk, NY). The findings were presented using descriptive statistics. The normality of the GerdQ score was assessed by examining its distribution through the use of a histogram, as well as by calculating the measures of skewness and kurtosis. The mean and standard deviation were used for displaying continuous data, whereas frequency and percentage were used to present categorical data. A binary logistic regression analysis was employed to ascertain the factors that exhibited an influence on individuals affected by the disease and the severity of the disease. The dummy variable utilized in the logistic regression model was defined as having a score of three or greater. A 95% confidence interval ($p < 0.05$) was utilized to indicate the statistical significance of the findings, with a significance threshold set at 5%.

Results

Table.1 and **Table.3** presents the demographic characteristics for the study participants as well as the demographics predictors toward GERD patients. A total of 160 patients were involved in this study. More than half of them (60.0%) were females. The majority of the patients (70.6%) were aged 27 years and above. The mean BMI was 28.4 (SD: 6.6) kg/cm^2. Around 11.9% of the patients were current smokers. Table 2 and Table 4 presents the frequency of dietary pattern among patients and the severity predictors related to GERD which showed clearly that the majority of GERD patients (78.1%) reported that they consume caffeine-based products regularly. More than half of the patients (66.9%) reported that they have bad eating habits. Similar proportion of the patients (62.5%) reported that they eat spicy food regularly. Around one-third the patients (35.6%) reported that they eat large amounts of food regularly. More than half of the patients

(67.5%) reported that they eat during the last 3 hours before bed**.**

Predictors of being influenced by GERD and its severity

The mean GerdQ score for the study sample was 8.1 (SD: 2.5). Around 6.9% of the patients complained from sleep disturbance and used over-the-counter medication due to their disease. Binary logistic regression analysis did not identify any statistically significant difference in the severity of GERD among the patients based on their demographic characteristics ($p>0.05$). However, having bad eating habits was associated with being more influenced by GERD (having sleep disturbance together with using over the counter (OTC) medications) ($p<0.05$).

Table 1. Patients' demographic characteristics

Variables	Frequency	Percentage	Mean weight (kg)	Mean height (cm)	Mean BMI (kg/cm^2)	Smoking status	
						Current smoker	No Smoker
Male	64	40%	85.0 (19.4)	170.4 (8.6)	29.3 (6.5)	17 (10.7%)	47 (29.4%)
Female	96	60%	70.2 (15.7)	164.6 (6.2)	27.7 (6.6)	2 (1.25%)	94 (58.8%)
Age Group							
18-20 years	6	3.8%	76.3 (4.1)	161.8 (13.0)	28.0 (9.8)	1 (0.62%)	5 (3.1 %)
21-23 years	26	16.3%	65.9 (14.6)	163.8 (9.2)	24.4 (4.0)	3 (1.8%)	23 (14.4%)
24-26 years	15	9.4%	77.5 (19.8)	166.1 (10.6)	27.8 (4.8)	2 (1.2%)	13 (8.1%)
27 years and above	113	70.6%	78.3 (17.2)	168.0 (5.6)	29.4 (6.8)	13 (8.1%)	100 (62.5%)
Total	n=160		76.1 (SD: 18.7)	166.9 (SD: 48.0)	28.4 (SD: 6.6)	19 (11.9%)	141 (88.1%)

Table 2. Frequency of dietary pattern among patients

Do you consume caffeine regularly?		
Yes	125	78.1%
No	35	21.9%
Do you have bad eating habits?		
Yes	107	66.9%
No	53	33.1%
Do you eat spicy food regularly?		
Yes	100	62.5%
No	60	37.5%
Do you eat large amounts of food regularly?		
Yes	57	35.6%
No	103	64.4%
Do you eat during the last 3 hours before bed?		
Yes	108	67.5%
No	52	32.5%

Table 3. Demographic predictors of being influenced by GERD

Variables	Odds ratio of having more severe status (95% confidence interval)	Odds ratio of being influenced by GERD (95% confidence interval)
Gender		
Females (Reference category)	1.00	1.00
Males	1.56 (0.83-2.97)	1.27 (0.37-4.36)
Age group		
18-20 years (Reference category)	1.00	1.00
21-23 years	3.13 (0.32-30.79)	-
24-26 years	7.50 (0.69-81.25)	-
27 years and above	3.56 (0.40-31.48)	-
BMI category		
Below 28.4 kg/cm^2 (Reference category)	1.00	1.00
28.4kg/cm^2 and above	1.81 (0.96-3.43)	2.39 (0.67-8.51)
Smoking status		
Non-smoker (Reference category)	1.00	1.00
Current smoker	1.25 (0.48-3.27)	-

Table 4. Predictors of being influenced by GERD and its severity

Variables	Odds ratio of having more severe status (95% confidence interval)	Odds ratio of being influenced by GERD (95% confidence interval)	*p-value*
Do you consume caffeine regularly?			0.759
No (Reference category)	1.00	1.00	
Yes	1.51 (0.69-3.29)	1.28 (0.26-6.22)	
Do you have bad eating habits?			**0.036**
No (Reference category)	1.00	1.00	
Yes	1.02 (0.53-1.99)	3.92 (1.09-14.05)*	
Do you eat spicy food regularly?			0.574
No (Reference category)	1.00	1.00	
Yes	0.82 (0.43-1.56)	0.70 (0.21-2.41)	
Do you get eat large amounts of food regularly?			0.551
No (Reference category)	1.00	1.00	
Yes	1.02 (0.53-1.96)	0.66 (0.17-2.59)	
Do you eat during the 3 hours before bed?			0.117
No (Reference category)	1.00	1.00	
Yes	0.87 (0.44-1.69)	0.37 (0.11-1.28)	

Discussion

In this cross-sectional study, which aimed to investigate the characteristics of GERD patients and predictors of its severity among university students, the study findings highlight the significant impact of dietary habits on GERD prevalence and symptoms. A substantial proportion of university students diagnosed with GERD exhibited poor dietary behaviours, including regular consumption of spicy and caffeine-based products, overeating, eating close to bedtime, and other unhealthy eating habits.

Previous studies have consistently shown that college students have a higher prevalence of GERD. This increased susceptibility among students can be attributed to several factors, including caffeine consumption **(Elnemr et al., 2018; Martinucci et al., 2018)**. Over the past decade, global caffeine intake has been on the rise. This research identified that the majority of students with GERD (78.1%) reported regular consumption of caffeine-based products. That underscores the need to handle the considerable deficiency in knowledge regarding the side effects of caffeine consumption among these students. In line with the study findings, only 23.6% of individuals in a previous investigation within the Riyadh population identified caffeine as a risk factor for GERD **(Alshaikh et al., 2021).** Moreover, a prior study in Jakarta residing among individuals aged 18 to 65 has identified a substantial correlation between the consumption of coffee and GERD **(Hartoyo et al., 2022)**. Another research conducted among visitors to the Health Center of Imam Mohammad Ibn Saud Islamic University in Riyadh found a significant correlation between caffeine intake frequency and GERD occurrence **(AlHussaini et al., 2023)**. In this previous research, 73.9% of participants reported consuming caffeine on regular basis. There is a need to enhance educational initiatives concerning GERD in Saudi Arabia to raise awareness and understanding of GERD.

Various reasons for caffeine consumption have been explored in previous literature, particularly among students. Students frequently use caffeine to enhance their alertness and concentration **(Mahoney et al., 2019)**. A prior research finding has shown that a majority of surveyed students turn to caffeinated beverages to sharpen their memory, boost their focus, and improve their mood while studying **(Kharaba et al., 2022)**. Furthermore, a study conducted in Korea revealed diverse causes for consuming caffeinated drinks, which varied depending on the source of caffeine and the specific type of caffeinated beverage **(Choi, 2020)**. These causes include sensory experiences, mood enhancement, heightened alertness, social influences, daily habits, and health considerations.

High caffeine consumption has been associated with various symptoms. Participants in prior surveys have reported a range of symptoms linked to their excessive caffeine intake. These symptoms include trouble sleeping, increased levels of anxiety and tension, and an elevated heart rate **(Kharaba et al., 2022)**. Numerous studies have established a substantial connection between caffeine consumption and these symptoms **(Choi, 2020; Richards and Smith, 2015; Samaha et al., 2020)**.

Previous research conducted in Australia and Korea has revealed a correlation between impaired sleep quality experienced by adults and energy drinks and caffeine consumption **(Park et al., 2016; Watson et al., 2016)**. A previous study among university students has also determined that heightened consumption of caffeinated beverages is linked to diminished sleep quality **(Brick et al., 2010; Choi, 2020; Reid and Baker, 2008)** . Conversely, other reports have indicated no detectable association between caffeine consumption and inadequate sleep quality.

The role of diet as an environmental factor is significant in the development of gastrointestinal and cardiometabolic disorders, as demonstrated by previous studies **(Argyrou et al., 2018; Heshmati et al., 2019; Surdea-Blaga et al., 2019)**. Additionally, modifiable risk factors encompass several factors, such as the duration between meals and sleep, eating speed, and the temperature and scale of consumed foods. In this study, the majority of university students with GERD exhibit unfavorable dietary habits, including bad eating habits (66.9%), regular consumption of spicy foods (62.5%), overeating (35.6%), and eating within the last three hours before bedtime (67.5%). These findings underscore the potential role of lifestyle factors, particularly dietary choices and meal timing, in GERD development and severity among this population. Addressing these habits through targeted education and interventions may offer a promising approach to improving GERD management among university students. Consistent with the findings of this study, a recent investigation conducted in Riyadh revealed that a significant proportion of participants (65.1%) acknowledged practicing unfavorable dietary habits **(AlHussaini et al., 2023)**. Among these participants, 62.7% reported consuming unhealthy and spicy foods, (28.4%) stated they consumed large portions of food, and (68.4%) of respondents reported having their last meal within three hours before bedtime **(AlHussaini et al., 2023)**.

Previous research has demonstrated a strong connection between dietary factors and GERD. Several studies have suggested that GERD could be connected with the quantity and quality of carbohydrates consumed **(Keshteli et al., 2017; Wu et al., 2018)** . Additionally, a prior study in Saudi Arabia observed a higher prevalence of GERD in individuals who lacked a consistent pattern of dietary fiber consumption **(Alkhathami et al., 2017)**. This underscores the potential benefits of incorporating fiber-rich diets in preventing and managing GERD, potentially extending the affected individual's healthy lifespan **(Fass et al., 2021; Maret-Ouda et al., 2020)**. Current evidence suggests that adopting healthier dietary habits, characterized by increased consumption of whole grains and fruits **(Wu et al., 2013)**, can enhance GERD symptoms. Consequently, enhancing dietary choices is considered a cost-effective strategy for reducing the incidence of GERD, offering a practical alternative to pharmaceutical interventions.

Previous research findings imply a link between the development of reflux and particular dietary factors, including soda

beverages, chocolates, foods high in salt, and fatty foods **(Rice and Blackstone, 2008; Săraru et al., 2021)**. Nevertheless, other investigations have reported a positive association between symptoms of GERD and high-fat consumption **(Bolin et al., 2000; Oliveria et al., 1999)**. Fast food consumption plays a significant role in increasing GERD prevalence. Fast food consumption consistently emerges as a significant acid reflux risk factor.

High-salt and high-spice diets have been highlighted as potential accelerators of GERD development **(Alkhathami et al., 2017; Asl et al., 2015; Kariri et al., 2020; Wu et al., 2013)**. Moreover, consuming spicy foods and having a routine of lying down after eating raises GERD risk among Asian populations. Since lying down after eating impacts the reflux of gastric contents and lowers the LES pressure, it may be a significant contributor to this condition. Furthermore, it's not solely about the type of food consumed; the frequency and time of meals can also contribute to the development of GERD manifestation. Overindulging or insufficiently eating can place strain on the stomach **(Jarosz and Taraszewska, 2014)**. A reduced interval between the finishing of dinner and bedtime has been identified as a potential factor associated with GERD **(Fujiwara et al., 2005)**. Approximately 6.9% of the GERD patients in this study reported experiencing sleep disturbances and used OTC medication due to their disease. This finding underscores the substantial impact of GERD on patients' daytime comfort and sleep quality. Notably, this percentage stands significantly lower than the findings from a previous study conducted in Saudi Arabia, which showed that 26% of patients had nocturnal GERD and associated sleep problems **(Zacharakis et al., 2018)**. Extra-oesophageal symptoms (like coughing or choking) and significant regurgitation are frequently present in patients with night-time symptoms. These additional symptoms could explain the use of OTC medications among the participants in this study. As previously mentioned, another factor that could contribute to sleep disturbances is the high caffeine intake.

GERD is generally managed with OTC medications, like antacids, H-2 receptor antagonists, and Proton Pump Inhibitors (PPIs). PPIs stand out as the most effective class of medications for managing GERD. This distinction is due to their ability to achieve superior endoscopic healing rates compared to other acid-reducing medicines **(Savarino et al., 2009; Tjon et al., 2013)**. However, alginates and antacids can be used to treat intermittent reflux symptoms that happen less than twice a week.

Evidence suggests that employing non-pharmacological approaches, such as elevating the upper part of the bed and avoiding eating two to three hours before bedtime, can be effective in easing night-time GERD symptoms **(Hamilton et al., 1988; Katz et al., 2013; Stanciu and Bennett, 1977)**. Several randomized controlled trials (RCTs) found that raising the head of the bed using foam blocks or wedges results in improvements in oesophageal pH levels and GERD symptoms **(Hamilton et al., 1988; Katz et al., 2013; Stanciu and Bennett, 1977)**. Additionally, PPIs may be employed to

regulate night-time gastric pH in individuals experiencing nocturnal GERD symptoms **(Katz et al., 2013)**.

This found a significant association between having bad eating habits and being more influenced by GERD. Specifically, individuals with bad eating habits were more likely to report experiencing sleep disturbances and using OTC medications to manage their GERD-related symptoms. In line with these findings, a previous study established a link between GERD and reduced sleep quality in medical students. The researchers proposed that unhealthy dietary habits could have played a role in causing gastrointestinal symptoms, which, in turn, might have affected sleep quality **(Teimouri and Amra, 2021)**. As mentioned before, these will increase OTC medication use among those individuals.

Conclusion

The lifestyle and dietary choices of university students have a significant impact on those suffering from GERD, leading to sleep disruptions and reliance on over-the-counter (OTC) drugs for symptom management. Further research is necessary to develop suitable healthcare interventions aimed at reducing the impact of this particular health problem.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: All data are available from the corresponding author upon request.

Conflicts of Interest: The authors declare no conflict of interest.

Abbreviations: Gastroesophageal reflux disease (GERD); body mass index (BMI); non-steroidal anti-inflammatory drugs (NSAIDs); quality of life (QoL); over the counter (OTC)

References

- **Akinola MA, Oyedele TA, Akande KO, Oluyemi OY, Salami OF, Adesina AM, et al. (2020)**. Gastroesophageal reflux disease: prevalence and Extraesophageal manifestations among undergraduate students in South West Nigeria. BMC gastroenterology, 20(1): 1-6.
- **AlHussaini KI, Abbas FB, Aljabri SF., Bayamin RA, Alfraih YA, Alsarar SA (2023)**. Prevalence and Risk Factors for Gastroesophageal Reflux Disease (GERD) Among Visitors to the Health Center of Imam Mohammad Ibn Saud Islamic University. Cureus, 15(8).
- **Alkhathami AM, Alzahrani AA, Alzhrani MA, Alsuwat OB, Mahfouz ME (2017)**. Risk factors for

gastroesophageal reflux disease in Saudi Arabia. Gastroenterology Research, 10(5): 294.

- **Almadi MA, Almousa MA, Althwainy AF, Altamimi AM, Alamoudi HO, Alshamrani HS, et al.(2014)**. Prevalence of symptoms of gastroesopahgeal reflux in a cohort of Saudi Arabians: a study of 1265 subjects. Saudi journal of gastroenterology: official journal of the Saudi Gastroenterology Association, 20(4): 248.
- **Alrashed AA, Aljammaz KI, Pathan A, Mandili AA, Almatrafi SA, Almotire MH, et al(2019).** Prevalence and risk factors of gastroesophageal reflux disease among Shaqra University students, Saudi Arabia. Journal of family medicine and primary care, 8(2): 462.
- **Alshaikh OM, Alkhonain IM, Anazi MS, Alahmari AA, Alsulami FO, Alsharqi AA, et al (2021)**. Assessing the Degree of Gastroesophageal Reflux Disease (GERD) Knowledge Among the Riyadh Population. Cureus, 13(11).
- **Alsuwat OB, Alzahrani AA, Alzhrani MA, Alkhathami AM, Mahfouz ME (2018).** Prevalence of gastroesophageal reflux disease in Saudi Arabia. Journal of clinical medicine research, 10(3): 221.
- **Altomare A, Guarino MP, Cocca S, Emerenziani S, Cicala M (2013)**. Gastroesophageal reflux disease: Update on inflammation and symptom perception. World journal of gastroenterology: WJG, 19(39): 6523.
- **Argyrou A, Legaki E, Koutserimpas C, Gazouli M, Papaconstantinou I, Gkiokas G, etal. (2018).** Risk factors for gastroesophageal reflux disease and analysis of genetic contributors. World journal of clinical cases, 6(8): 176.
- **Arivan R, Deepanjali S (2018)**. Prevalence and risk factors of gastro-esophageal reflux disease among undergraduate medical students from a southern Indian medical school: a cross-sectional study. BMC research notes, 11: 1-5.
- **Asl SF, Mansour-Ghanaei F, Samadi H, Joukar F (2015)**. Evaluations of life style factors and the severity of Gastroesophageal reflux disease; a case-control study. International journal of molecular epidemiology and genetics, 6(1): 27.
- **Awadalla NJ(2019)**. Personal, academic and stress correlates of gastroesophageal reflux disease among college students in southwestern Saudi Arabia: A cross-section study. Annals of medicine and surgery, 47: 61-65.
- **Belete M, Tesfaye W, Akalu Y, Adane A, Yeshaw Y (2023)**. Gastroesophageal reflux disease symptoms and associated factors among university students in Amhara region, Ethiopia, 2021: a cross-sectional study. BMC gastroenterology, 23(1): 130.
- **Bolin TD, Korman MG, Hansky J, Stanton R (2000)**. Heartburn: community perceptions. Journal of gastroenterology and hepatology, 15(1): 35-39.
- **Brick CA, Seely DL, Palermo TM (2010)**. Association between sleep hygiene and sleep quality in medical

students. Behavioral sleep medicine, 8(2): 113-121.

- **Cardoso AL, Figueiredo AG, Sales LG, Souza AM, Barreto ÍD, Trindade LM(2018)**. Gastroesophageal reflux disease: prevalence and quality of life of health science undergraduate students. Acta Gastroenterológica Latinoamericana, 48(3): 197-205.
- **Chen, CH, Lin CL, Kao CH (2016)**. Association between gastroesophageal reflux disease and coronary heart disease: A nationwide population-based analysis. Medicine, 95(27).
- **Chen MJ, Wu MS, Lin JT, Chang KY, Chiu HM, Liao WC, et al. (2009)**. Gastroesophageal reflux disease and sleep quality in a Chinese population. Journal of the Formosan Medical Association, 108(1): 53-60.
- **Choi J (2020)**. Motivations influencing caffeine consumption behaviors among college students in Korea: Associations with sleep quality. Nutrients, 12(4): 953.
- **El-Gilany AH, Amr M, Awadalla N, El-Khawaga G (2009)**. Perceived stress among medical and law students in Mansoura, Egypt. Egypt J Occup Med, 33: 1-13.
- **El-Serag HB, Sweet S, Winchester CC, Dent J (2014)**. Update on the epidemiology of gastro-oesophageal reflux disease: a systematic review. Gut, 63(6): 871-880.
- **El–Serag, HB (2007)**. Time trends of gastroesophageal reflux disease: a systematic review. Clinical Gastroenterology and Hepatology, 5(1): 17-26.
- **Elnemr GM, Almuntashiri AH, Alghamdi SA, Alharthi FR, Masoodi I (2018)**. The predictors of Gastroesophageal Reflux Disease among University students: A cross sectional study in the western region of Saudi Arabia. The Egyptian Journal of Hospital Medicine, 73(1): 5828-5838.
- **Eusebi LH, Ratnakumaran R, Yuan Y, Solaymani-Dodaran M, Bazzoli F, Ford AC (2018)**. Global prevalence of, and risk factors for, gastro-oesophageal reflux symptoms: a meta-analysis. Gut, 67(3): 430-440.
- **Fass R, Boeckxstaens GE, El-Serag H, Rosen R, Sifrim D, Vaezi MF (2021)**. Gastro-oesophageal reflux disease. Nature reviews Disease primers, 7(1): 55.
- **Fujiwara Y, Machida A, Watanabe Y, Shiba M, Tominaga K, Watanabe T, et al. (2005)**. Association between dinner-to-bed time and gastro-esophageal reflux disease. Am J Gastroenterol 100(12): 2633
- **Gunasinghe D, Gunawardhana C, Halahakoon S, Haneeka A, Hanim N, Hapuarachchi C, et al. (2020)**. Prevalence, associated factors and medication for symptoms related to gastroesophageal reflux disease among 1114 private-tuition students of Anuradhapura, Sri Lanka. BMC gastroenterology, 20(1): 1-9.
- **Hamilton JW, Boisen RJ, Yamamoto DT, Wagner JL, Reichelderfer M (1988).** Sleeping on a wedge diminishes exposure of the esophagus to refluxed

acid. Digestive diseases and sciences, 33: 518-522.

- **Hartoyo FZ, Tandarto K, Sidharta V, Tenggara R (2022).** The Correlation Between Coffee Consumption and Gastroesophageal Reflux Disease. The Indonesian Journal of Gastroenterology, Hepatology, and Digestive Endoscopy, 23(1): 11-16.
- **Heshmati J, Sepidarkish M, Namazi N, Shokri F, Yavari M, Fazelian S, et al (2019).** Impact of dietary calcium supplement on circulating lipoprotein concentrations and atherogenic indices in overweight and obese individuals: a systematic review. Journal of Dietary Supplements, 16(3): 357-367.
- **Jarosz M, Taraszewska A (2014).** Risk factors for gastroesophageal reflux disease–the role of diet. Gastroenterology Review/Przegląd Gastroenterologiczny, 9(5): 297-301.
- **Jones R, Junghard O, Dent J, Vakil N, Halling K, Wernersson B, et al. (2009).** Development of the GerdQ, a tool for the diagnosis and management of gastro-oesophageal reflux disease in primary care. Alimentary pharmacology & therapeutics, 30(10): 1030-1038.
- **Kariri AM, Darraj MA, Wassly A, Arishi HA, Lughbi M, Kariri A, et al. (2020).** Prevalence and risk factors of gastroesophageal reflux disease in Southwestern Saudi Arabia. Cureus, 12(1).
- **Karthik RC, Balaji SM, Arumugam B, Sriram RM, Ezhilvanan M (2017)**. Prevalence of gastro esophageal reflux disease among medical students in Chennai, South India. Indian J Forensic Community Med, 4(3): 199-203.
- **Katz PO, Gerson LB, Vela MF (2013).** Guidelines for the diagnosis and management of gastroesophageal reflux disease. Official journal of the American College of Gastroenterology| ACG, 108(3): 308-328.
- **Keshteli AH, Haghighatdoost F, Azadbakht L, Daghaghzadeh H, Feinle-Bisset C, Afshar H, et al. (2017).** Dietary glycaemic index and glycaemic load and upper gastrointestinal disorders: results from the SEPAHAN study. Journal of Human Nutrition and Dietetics, 30(6): 714-723.
- **Khan HN, Suleman A, Ullah R, Abdullah A, Naz S (2017).** GASTRO ESOPHAGEAL REFLUX DISEASES IN CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS. Journal of Ayub Medical College Abbottabad, 30(1): 64-66.
- **Kharaba Z Sammani N, Ashour S, Ghemrawi R, Al Meslamani AZ, Al-Azayzih A, et al. (2022).** Caffeine consumption among various university students in the UAE, exploring the frequencies, different sources and reporting adverse effects and withdrawal symptoms. Journal of Nutrition and Metabolism, 2022.
- **Kim SY, Park B, Lim H, Kim M, Kong IG, Choi HG (2019).** Gastroesophageal reflux disease increases the risk of chronic rhinosinusitis: a nested case-control study using a national sample cohort.

- **Mahadeva S, Raman MC, Ford AC , Follows M, Axon AT, Goh KL, et al. (2005).** Gastro-oesophageal reflux is more prevalent in Western dyspeptics: a prospective comparison of British and South-East Asian patients with dyspepsia. Alimentary pharmacology & therapeutics, 21(12): 1483-1490.
- **Mahoney CR, Giles GE, Marriott BP, Judelson DA, Glickman EL, Geiselman PJ, et al. (2019).** Intake of caffeine from all sources and reasons for use by college students. Clinical nutrition, 38(2): 668-675.
- **Maret-Ouda J, Markar SR, Lagergren J (2020).** Gastroesophageal reflux disease: a review. Jama, 324(24): 2536-2547.
- **Martinucci I, Natilli M, Lorenzoni V, Pappalardo L, Monreale A, Turchetti G, et al. (2018).** Gastroesophageal reflux symptoms among Italian university students: epidemiology and dietary correlates using automatically recorded transactions. BMC gastroenterology, 18: 1-10.
- **Moayyedi P, Talley NJ (2006).** Gastro-oesophageal reflux disease. The Lancet, 367(9528): 2086-2100.
- **Nirwan JS, Hasan SS, Babar ZU, Conway BR, Ghori MU (2020).** Global prevalence and risk factors of gastro-oesophageal reflux disease (GORD): systematic review with meta-analysis. Scientific reports, 10(1): 5814.
- **Nwokediuko S (2009).** Gastroesophageal reflux disease: a population based study. Gastroenterology Research, 2(3): 152.
- **Oliveria SA, Christos PJ, Talley NJ, Dannenberg AJ (1999).** Heartburn risk factors, knowledge, and prevention strategies: a population-based survey of individuals with heartburn. Archives of Internal Medicine, 159(14): 1592-1598.
- **Ornstein SM, Nietert PJ, Jenkins RG, Litvin CB (2013).** The prevalence of chronic diseases and multimorbidity in primary care practice: a PPRNet report. The Journal of the American Board of Family Medicine, 26(5): 518-524.
- **Park S, Lee Y, Lee JH (2016).** Association between energy drink intake, sleep, stress, and suicidality in Korean adolescents: energy drink use in isolation or in combination with junk food consumption. Nutrition journal, 15: 1-8.
- **Reid A, Baker FC (2008).** Perceived sleep quality and sleepiness in South African university students. South African Journal of Psychology, 38(2): 287-303.
- **Rice TW, Blackstone EH (2008).** Surgical management of gastroesophageal reflux disease. Gastroenterology Clinics of North America, 37(4): 901-919.
- **Richards G, Smith A(2015).** Caffeine consumption and self-assessed stress, anxiety, and depression in secondary school children. Journal of psychopharmacology, 29(12): 1236-1247.
- **Saber H, Ghanei M (2012).** Extra-esophageal manifestations of gastroesophageal reflux disease: controversies between epidemiology and

clicnic. The open respiratory medicine journal, 6: 121.

- **Saberi-Firoozi M, Khademolhosseini F, Yousefi M, Mehrabani D, Zare N, Heydari ST (2007).** Risk factors of gastroesophageal reflux disease in Shiraz, southern Iran. World journal of gastroenterology: WJG, 13(41): 5486.
- **Samaha A, Al Tassi A, Yahfoufi N, Gebbawi M, Rached M, Fawaz MA (2020).** Data on the relationship between caffeine addiction and stress among Lebanese medical students in Lebanon. Data in brief, 28 :104845.
- **Săraru ER, Enciu V, Peagu R, Fierbinţeanu-Braticevici C (2021).** Advances in the diagnosis of GERD. Romanian Journal of Internal Medicine, 59(1): 3-9.
- **Savarino V, Di Mario F, Scarpignato C (2009).** Proton pump inhibitors in GORD: an overview of their pharmacology, efficacy and safety. Pharmacological Research, 59(3): 135-153.
- **Shaheen NJ (2007).** The burden of gastrointestinal and liver diseases. GI Epidemiology: 8-15.
- **Sharma A, Sharma PK, Puri P (2018).** Prevalence and the risk factors of gastro-esophageal reflux disease in medical students. medical journal armed forces india, 74(3): 250-254.
- **Song EM, Jung HK, Jung JM (2013).** The association between reflux esophagitis and psychosocial stress. Digestive diseases and sciences, 58: 471-477.
- **Stanciu C, Bennett JR (1977).** Effects of posture on gastro-oesophageal reflux. Digestion, 15(2): 104-109.
- **Surdea-Blaga T, Negrutiu DE, Palage M, Dumitrascu DL (2019).** Food and gastroesophageal reflux disease. Current medicinal chemistry, 26(19): 3497-3511.
- **Teimouri A, Amra B (2021).** Association between sleep quality and gastroesophageal reflux in medical students. Middle East Journal of Digestive Diseases, 13(2): 139.
- **Tjon JA, Pe M, Soscia J , Mahant S(2013).** Efficacy and safety of proton pump inhibitors in the management of pediatric gastroesophageal reflux disease. Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy, 33(9): 956-971.
- **Vakil N, Van Zanten SV, Kahrilas P, Dent J, Jones R (2007).** The Montreal definition and classification of gastroesophageal reflux disease: a global, evidence-based consensus paper. Zeitschrift Fur Gastroenterologie, 45(11): 1125-1140.
- **Vakil N, Van Zanten SV, Kahrilas P, Dent J, Jones R, Global Consensus G. (2006).** The Montreal definition and classification of gastroesophageal reflux disease: a global evidence-based consensus. Official journal of the American College of Gastroenterology| ACG, 101(8): 1900-1920.
- **Watson EJ, Coates AM, Kohler M, Banks S (2016).** Caffeine consumption and sleep quality in Australian adults. Nutrients, 8(8): 479.

- **Wong WM, Lam KF, Lai KC, Hui WM, Hu WH, Lam CL, et al. (2003).** A validated symptoms questionnaire (Chinese GERDQ) for the diagnosis of gastro-oesophageal reflux disease in the Chinese population. Alimentary pharmacology & therapeutics, 17(11): 1407-1413.
- **Wu KL, Kuo CM, Yao CC, Tai WC, Chuah SK, Lim CS, et al. (2018).** The effect of dietary carbohydrate on gastroesophageal reflux disease. Journal of the Formosan Medical Association, 117(11): 973-978.
- **Wu P, Zhao XH, Ai ZS, Sun HH, Chen Y, Jiang YX, et al. (2013).** Dietary intake and risk for reflux esophagitis: a case-control study. Gastroenterology research and practice, 2013.
- **You ZH, Perng CL, Hu LY, Lu T, Chen PM, Yang AC, et al. (2015).** Risk of psychiatric disorders following gastroesophageal reflux disease: a nationwide population-based cohort study. European Journal of Internal Medicine, 26(7): 534-539.
- **Zacharakis G, Alharbi MH, Alsalmi MM, Alotibi SB, Algaradi YA, Alsadiq FN, et al. (2018).** Prevalence of gastroesophageal reflux disease symptoms in Saudi Arabia. studies, 3: 6.