

Sleep Quality, Stress Level, and Eating Patterns are Associated with the Incidence of Gastroesophageal Reflux Disease among University Students in Yogyakarta

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ABSTRACT

Background: Gastroesophageal Reflux Disease (GERD) is a prevalent digestive disorder among university students. The factors included impaired lifestyle habits, including inadequate sleep, elevated stress, and unhealthy eating patterns.

Objective: To examine the correlation between sleep quality, stress levels, and eating patterns with the incidence of GERD among university students in Yogyakarta.

Methods: A cross-sectional study was conducted from January to April 2025 in PGRI Yogyakarta University, involving 410 university students. We used validated questionnaires for data collection, including the GERD-Q, the Pittsburgh Sleep Quality Index (PSQI), the Depression, Anxiety, and Stress Scales (DASS-21), and an eating pattern questionnaire. We used chi-square tests and correlation tests with a 5% level of significance for the statistical analysis.

Results: About 20% of respondents were identified as having GERD symptoms. Students with poor sleep quality were 2.94 times to develop GERD ($p=0.001$). There was a strong association between stress levels and GERD ($p<0.001$; $r=0.382$). Students who have disordered eating were 3.2 times more likely to get GERD ($p=0.000$).

Conclusion: The prevalence of GERD among university students is significantly associated with poor sleep quality, increased stress levels, and disordered eating patterns. Health education aimed at promoting lifestyle changes plays a crucial role in preventing GERD among university students.

Keywords: Eating Pattern, Gastroesophageal Reflux Disease, Mental Health, Quality of Sleep

INTRODUCTION

Gastroesophageal Reflux Disease (GERD) is a chronic digestive disorder caused by the backflow of stomach contents into the esophagus, which triggers symptoms such as heartburn, regurgitation, chest burning sensation, nausea, and is often accompanied by sleep disturbances and reduced quality of life (Tjokroprawiro et al. 2015). GERD is not only commonly seen in adults and older people, but is also becoming more common in younger people. GERD can lead to problems like

esophagitis if not being treated (Muthmainnah et al. 2022). Studies related to GERD in Indonesia are around 10% and 27.4%, exhibiting considerable regional variation, especially in Medan, where the rates have escalated to 91.6% (Muhamasri 2023). Younger people, like college students, are more likely to have unhealthy lifestyles. The increasing prevalence of GERD in adolescents and young adults is believed to be significantly linked to lifestyle modifications influenced by academic

pressures, social expectations, and irregular dietary and sleep habits (Letelay et al. 2021).

The quality of sleep is a significant factor in the onset of Gastroesophageal Reflux Disease (GERD). University students frequently experience sleep disturbances due to academic pressures, prolonged screen time, and emotional stress, all of which can disrupt deep sleep cycles and reduce sleep efficiency. Research indicates that insufficient sleep may increase intra-abdominal pressure and impair gastric emptying, potentially leading to acid reflux. One of the most important things that can cause Gastroesophageal Reflux Disease (GERD) is how well you sleep. University students often suffer from sleep disturbances caused by academic demands, excessive screen time, and emotional stress, all of which can interrupt deep sleep cycles and diminish sleep efficiency. Poor sleep could elevate the intra-abdominal pressure and impede gastric emptying, consequently promoting gastric acid reflux (Hafizh 2021). Prior research has indicated that sleep disturbances aggravate GERD symptoms and diminish the efficacy of pharmacological treatments (Suputra & Saputra 2023). Stress, along with sleep, is a significant psychosocial factor that contributes to the development of GERD.

University students also frequently encounter elevated stress levels due to academic pressures, uncertainties regarding the future, and interpersonal conflicts. About 48.3% experienced moderate stress in Undergraduate Medical Students at Ahmad Dahlan University; academic stress was the most common cause (Nirwani et al. 2025). Stress can influence the cortisol release, a hormone that stimulates the stomach to excrete more acid and makes the mucous membranes less sensitive, which raises the risk of reflux (Ghonimah 2023). Exposure to stress increases the secretion of gastric acid, slows and delays the gastric emptying, and causes the reflux (Song et al. 2013). Unmanageable stress is likely to influence gastrointestinal disorders like GERD worse, both directly and indirectly, by affecting sleep quality and eating habits.

Another important factor involves the food that an individual eats. Many college students fail to consume food regularly. For example, they might skip breakfast, eat quickly, or consume a lot of foods high in fat, salt, or caffeine. These eating habits can weaken the Lower Esophageal Sphincter (LES), which is essential for preventing reflux (Ajjah et al. 2020). Eating spicy and acidic foods, drinking coffee, carbonated drinks, and eating late at night have also been linked to GERD symptoms. Fadila et al. (2023) assert that eating spicy and acidic foods, drinking coffee, drinking carbonated drinks, and eating late at night can also make GERD symptoms worse. Prior research has investigated the correlation between one or two of these factors and GERD; however, there is a paucity of studies examining the concurrent relationship among sleep quality, stress

levels, and eating patterns in relation to GERD in university students, a demographic considered to be at elevated risk. Consequently, this study aims to investigate the correlation between sleep quality, stress levels, and eating patterns and the prevalence of GERD among students at Universitas PGRI Yogyakarta.

METHODS

This study carried out a cross-sectional design conducted at Universitas PGRI Yogyakarta from January to April 2025. The study involved 410 active undergraduate students from Universitas PGRI Yogyakarta. We used a proportionate random sampling technique to choose the subjects. To be included, participants had to be active university students, willing to participate, and complete the questionnaire. The Research Ethics Committee of Universitas Muhammadiyah Purwokerto has granted its approval for this study, as indicated by approval number KEPK/UMP/96/1/2025.

We used an online questionnaire made with Google Forms to collect data. It had four parts: the GERD-Q Questionnaire, the Pittsburgh Sleep Quality Index (PSQI), the Depression, Anxiety, and Stress Scale (DASS), and the Dietary Pattern Questionnaire. The GERD-Q consists of six questions about the occurrence of Gastroesophageal Reflux Disease (GERD) symptoms, with response options of "0 days," "1 day," "2–3 days," and "4–7 days." A cumulative score of 7 or lower indicates the absence of GERD, while a score between 8 and 18 indicates the presence of GERD symptoms. The item-total correlation coefficients were higher than the critical value, and the Cronbach's alpha reliability score was 0.83 (Patria 2023).

The Pittsburgh Sleep Quality Index, also known as the PSQI, was used in the Sleep Quality Questionnaire. It has 9 questions that look at different parts of the respondents' sleep, such as how well they sleep, how long it takes them to fall asleep, how long they sleep, how well they sleep, how often they wake up during the night, how often they take sleep medication, and how well they function during the day. Sleep quality was categorized as either good or poor based on the PSQI global score, with a score of ≤ 5 indicating good and a score of > 5 indicating poor sleep quality (Sabiqah 2022). The PSQI questionnaire was validated with factor loading values ranging from 0.410 to 0.831 and a Cronbach's alpha reliability coefficient of 0.83 by the University of Pittsburgh in 1988 (Anggun 2020).

Stress was measured by DASS-21 questionnaire. This questionnaire consists of 21 items Likert questions related to stress, which have scoring: "Never" (score=0), "Sometimes" (score=1), "Often" (score=2), and "Very often" (score=3). Validity testing of the DASS-21 yielded item-total correlation values ranging from 0.215 to 0.743,

indicating high reliability, as demonstrated by a Cronbach's alpha of 0.935.

The eating pattern questionnaire was self-developed and modified from (Ajjah et al. 2020), which consists of questions related to the types of food frequently consumed and eating habits that may contribute to the development of GERD. The response categories include: "Never" (score=0), "Occasionally" (score=1), "Often" (score=2), and "Always" (score=3). Data were categorized as Good (≤ 11.2) and Bad (> 11.2), based on the mean of the data. The questionnaire has been validated, with item-total correlation values ranging from 0.492 to 0.772, and a Cronbach's alpha reliability coefficient of 0.864 (Appendix 1).

Data were analyzed using SPSS software. Univariate analysis was performed to describe the data characteristics. Bivariate analysis used the Chi-square test and Spearman's rank correlation to examine the association between sleep quality, stress level, and dietary patterns with the incidence of GERD. Results were considered statistically significant if the p-value was less than 0.05.

RESULT AND DISCUSSION

This study involved 410 respondents, with females making up most of them (74.9%). About 52.4% are between 21 and 23 years old, followed by those aged 17–20 years (41.0%), and 24 years or older (6.6%). The respondents were in their fourth year (7th-8th semesters) (40%), followed by first year students (semesters 1–2) at 28.5%. Gastroesophageal reflux disease (GERD) is a condition characterized by the retrograde flow of stomach contents into the esophagus or beyond, into other regions, such as the oral cavity, larynx, or lungs, primarily resulting in inflammation of the esophageal mucosa. Most common symptoms of GERD are heartburn, regurgitation, and noncardiac chest pain (Azer & Goosenberg, 2025).

The prevalence of Gastroesophageal Reflux Disease (GERD) among respondents was 20%, while 80% did not report experiencing GERD symptoms. Based on the analysis of the questionnaire GERD-Q (Figure 1), nausea was the most commonly reported symptom, affecting 58.3% of respondents, followed by reflux (51.7%) and epigastric pain (45.9%). Furthermore, 22.9% respondents are reported to be taking GERD-related medications (e.g., antacids, ranitidine, or pantoprazole), whereas the majority (77.1%) did not use such treatments.

In this study, there are 70.2% respondents who had bad of sleep quality. In this case can be influenced by the characteristics of this study, which mostly involves fourth grade students. The sleep itself related to GERD has a mutual connection.

Based on the analysis presented in Table 2, among the 288 respondents with poor sleep quality, 17% were found to have GERD, while 53.2% did not. In contrast, among the 122 respondents with good sleep quality, only 3% reported experiencing GERD, while 26.8% did not. The p-value of 0.001 indicates a statistically significant association between sleep quality and the occurrence of GERD. An Odds Ratio (OR) of 2.9 suggests that respondents with poor sleep quality were 2.9 times more likely to develop GERD compared to those with good sleep quality.

Having a poor sleeping pattern, for example, staying up late, feeling sleepy during the day, and getting up late, is likely to have higher fast-food intake, which can worsen the GERD symptoms (Ridho et al. 2025). Short-duration acid reflux during the sleeping period was associated with conscious awakenings, which may interrupt sleep, and hyperarousal that be likely related to the neuroendocrine systems, manifested by increased heart rate and blood pressure. While the sleep disturbance is able to heighten sensory activity and lead to GERD symptoms (Jung et al. 2010). The study highlights sleep quality as one of the critical factors influencing academic performance, thus functioning as a major mediator in the negative impacts of stress and screen time (Gani et al. 2025). Poor sleep quality can, in turn, escalate the risk of psychological problems such as stress and depression.

The stress levels based on DASS-21, there are 5 categories, and the result showed that most respondents fell into the normal category (32.9%), moderate (25.6%), very severe (17.1%), mild (13.4%), and severe stress (11%). Elevated stress levels are linked to a greater likelihood of developing GERD. Stress can negatively affect overall bodily functions and disrupt metabolic harmony, especially in the digestive tract, increasing gastric acid production (Mile et al. 2022). The occurrence of GERD was found to be higher among participants experiencing very high stress levels (8.3%), followed by those with severe (4.2%), moderate levels (3.9%), and mild stress (2.4%).

There is a significant relationship between stress levels and the incidence of GERD ($p < 0.001$) with an odds ratio of 17.33. According to Lazarus's 1984 theory, stress is a dynamic response to external pressures that, if chronic and unmitigated, may lead to mental health disorders such as anxiety and depression. It shows how college students can be very vulnerable to mental health problems because of the stress of their schoolwork, trouble fitting in socially, and worries about their future. Additionally, stress from schoolwork and not knowing what will happen next is a significant cause of anxiety and depression in students (Mofatteh 2021).

Table 1. Distribution of Characteristics, GERD, Sleep Quality, Stress, and Dietary Pattern

Variables	n	%
Sex		
Male	103	25.1
Female	307	74.9
Age		
18-20 years old	168	41.0
21-23 years old	215	52.4
>23 years old	27	6.6
Year of University		
Year 1	117	28.5
Year 2	59	14.4
Year 3	59	14.4
Year 4	164	40.0
>Year 4	11	2.7
GERD medicine consumption		
Yes	94	22.9
No	316	77.1
GERD		
In risk of GERD	82	20.0
Normal	328	80.0
Sleep quality		
Good	122	29.8
Bad	288	70.2
Stress		
Normal	135	32.9
Mild	55	13.4
Moderate	105	25.6
Severe	45	11.0
Very severe	70	17.1
Eating pattern		
Good	199	48.5
Bad	211	51.5

Table 2. Association between sleep quality, stress, and eating patterns with the incidence of GERD among university students

Variables	GERD	Normal	Total	p-value	OR
Sleep quality^a					
Bad	70 (17.0)	218 (53.2)	288 (70.2)	0.001*	2.9
Poor	12 (3.0)	110 (26.8)	122 (29.8)		
	82 (20.0)	328 (80.0)	410 (100.0)		
Stress					
Normal	34 (8.3)	36 (8.8)	70 (17.1)	<0.001 ^{a**}	Reff
Mild	17 (4.1)	28 (6.8)	45 (11.0)		3.846 ^b
Moderate	16 (4.0)	89 (21.7)	105 (25.6)		0.000 ^b
Severe	10 (2.4)	45 (11.0)	55 (13.4)		4.348 ^b
Very severe	5 (1.2)	130 (31.7)	135 (32.9)		17.33 ^{b*}
	82 (20.0)	328 (80.0)	410 (100.0)		
Dietary pattern^a					
Good	60 (14.6)	151 (36.8)	211 (51.5)	<0.001 ^{**}	3.2
Poor	22 (5.4)	177 (43.2)	199 (48.5)		
	82 (20.0)	328 (80.0)	410 (100.0)		

Note: *p<0.05; **p<0.001; ^aPearson chi-square test; ^bLogistic regression (normal as reference)

Dietary patterns also revealed that a slightly higher proportion of respondents had poor eating patterns (51.5%). There is a significant correlation between eating patterns and the prevalence of GERD, the Odds Ratio (OR) of 3.2 suggests that students with a poor eating pattern are 3.2 times

more likely to develop GERD. This result is consistent with (Ajjah et al. 2020), indicating that despite university students having sufficient nutritional knowledge, lifestyle pressures often lead them to engage in unhealthy eating behaviors, like skipping meals, and preference for high-density food

or processed food, which could increase the risk of digestive disorders such as GERD.

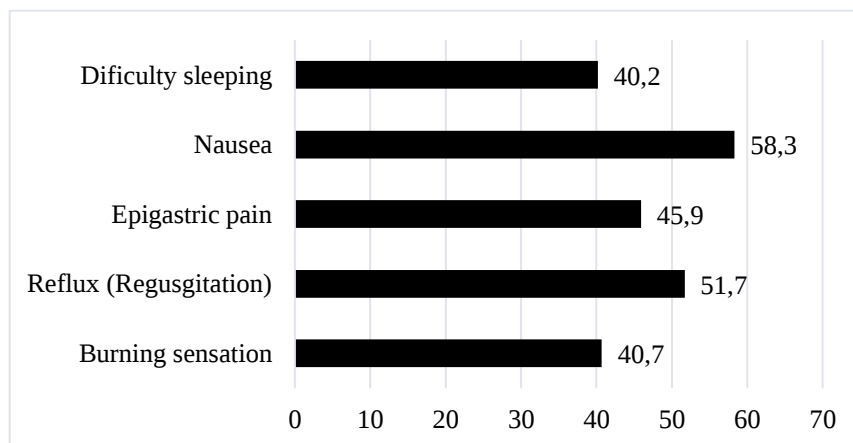


Figure 1. Prevalence of Gastrointestinal Symptoms Among Respondents (%)

Academic pressures, a lack of time, and peer pressure often reinforce this kind of dietary pattern. Over time, these habits can contribute not only to GERD but also to broader nutritional problems such as obesity and micronutrient deficiencies. The amount of stomach acid decreases when food or beverages enter the stomach. By doing this, the stomach's lining is shielded from digestion (Astuti et al. 2025). Hasibuan study (2024) described in his study that consuming spicy foods, fried foods, sugary drinks, and citrus fruits can increase the likelihood of reflux and swallowing problems by altering the stomach's acidity and affecting the digestion process. relationship between eating patterns and GERD (Hasibuan et al. 2024).

Based on a systematic review related to the risk of reflux in GERD, consumption of fatty meals appears to exacerbate the development of GERD by reducing Lower Esophageal Sphincter (LES) pressure. Furthermore, large high-fat meals are associated with increased acid exposure time in patients compared to low-fat meals. High salt food and high spicy food can accelerate the development of reflux by reducing LES pressure, but do not improve the GERD (Heidarzadeh-Esfahani et al. 2021). Another theory is that most Asian people have the habit of eating followed by the habit of lying down after eating, which can increase the risk of GERD. Lying down after eating can reduce LES pressure and affect the reflux of gastric contents (Asl et al. 2015). Carbonated beverages may increase the likelihood of dysphagia reflexes by altering the acidity of the gastrointestinal tract, especially the stomach, and affecting digestion (intragastric residence time and inducing poor digestion) (Asl et al., 2015). Another beverage, like coffee and tea coffee, is likely to relax the LES, and increase the percentage of reflux time in the fasting state (Akbar & Howden 2016).

This study found that most of the respondents were female students aged 21–23 years,

with approximately 40% in their 4th year. Females were likely to have GERD than men because of the biological sex and hormones that influence the development of reflux symptoms (Kim et al. 2016). The prevalence of GERD among the student population reached 20%, with nausea and epigastric pain identified as the most common symptoms. Poor sleep quality was observed in 70.2% of participants and was significantly associated with an increased incidence of GERD (OR=2.94). High stress levels were shown with 75% of students experiencing depression, 85.9% having anxiety, and 26.8% having stress; these were found to have a significant association with GERD. Almost 50% of respondents experienced of bad eating pattern, which raises the risk of GERD by 3.2 times. These results highlight that the quality of sleep, levels of stress, and eating patterns are some of the factors that play a significant role in the prevalence of GERD in college students.

Several limitations of this study should be noted. The study was conducted exclusively at Universitas PGRI Yogyakarta, which may limit the generalizability of the findings to student populations in other settings. Second, data were collected via online questionnaires, which limited the opportunity to develop the participants experiences or perspectives further. The internet process can also affect the validity of the question because participants may have answered the questions wrong or too soon. Future research must acknowledge these constraints and adopt more comprehensive methodologies to gather more robust and representative data.

CONCLUSION

GERD in this study was a significant factor i.e the sleep quality, stress, and eating pattern. This result suggests that the lifestyle of students can contribute to GERD, for example, the improvement of quality of sleep, the coping and management of

stress, and the regulation of eating patterns that might trigger GERD symptoms.

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Conflict of interest and funding disclosure

The author declares that there are no conflicts of interest in the writing and preparation of this article.

Author Contributions

MMH: conceptualization, investigation, methodology, writing—original draft, formal analysis, resources; AF: supervision, writing—review and final editing.

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