



The Effect of Academic Anxiety and Stress on The Risk of Functional Dyspepsia Among Pre-Clinical Medical Students: A Literature Review

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Abstract

Functional dyspepsia is a functional gastrointestinal disorder commonly found in the productive-age population, including medical students. This condition is characterized by symptoms such as epigastric pain, postprandial fullness, early satiety, nausea, bloating, and a burning sensation in the upper abdomen (heartburn), without any identifiable organic abnormalities. Various studies have shown that psychological factors, particularly anxiety and academic stress, contribute to the occurrence of functional dyspepsia through the brain–gut axis mechanism. This literature review aimed to analyze the relationship between anxiety and academic stress and the incidence of functional dyspepsia among medical students. The method used was a literature review based on a systematic search of scientific databases, primarily PubMed, as well as relevant international journals. The articles included were published between 2016 and 2026. A total of 11 articles that met the inclusion criteria were analyzed using a narrative synthesis approach.

INTRODUCTION

Functional dyspepsia is a functional gastrointestinal disorder characterized by symptoms such as epigastric pain or discomfort, postprandial fullness, early satiety, nausea, bloating, and a burning sensation in the upper abdomen (heartburn), without any structural abnormalities detectable through diagnostic examinations (Adibi et al., 2016). Based on the Rome IV criteria, functional dyspepsia is classified into postprandial distress syndrome and epigastric pain syndrome, which reflect variations in its clinical manifestations (Lee et al., 2024).

Epidemiologically, functional dyspepsia is a common gastrointestinal disorder, with a global prevalence ranging from 5% to 40% in the general population (Ruan et al., 2024). Although not life-threatening, this condition has a significant impact on quality of life, daily activities, and individual productivity (Hosseini et al., 2025; Weber et al., 2019). In Indonesia, dyspepsia is also included among the top ten most common diseases in healthcare facilities, making it a relevant public health concern (Randini et al., 2024).

The productive-age group, particularly college students, is vulnerable to functional dyspepsia due to the interaction of biological, lifestyle, and psychological factors (Gallas et al., 2022; Huang et al., 2020; Pradana, 2026). Medical students are at higher risk compared to students from other disciplines due to heavy academic workloads, complex learning materials, and demanding clinical competency requirements that must be achieved within a limited timeframe (Lenga et al., 2022; Anas et al., 2026).

In medical education, students are exposed to various academic stressors such as dense lecture schedules, repeated examinations, clinical skill requirements, and pressure to achieve high academic performance (Ahmad et al., 2024; Lisnyj et al., 2021; Sani et al., 2020). These conditions can trigger chronic academic stress, defined as prolonged psychological strain due to sustained academic demands (Randini et al., 2024). In addition, students often experience academic anxiety, characterized by excessive worry, emotional tension, and fear of failure in the learning process (Sackbani et al., 2019).

Physiologically, stress and anxiety are known to affect the gastrointestinal system through the brain–gut axis, which involves complex interactions between the central nervous system, the autonomic nervous system, and the endocrine system. Activation of the hypothalamic–pituitary–adrenal (HPA) axis due to psychological stress leads to increased cortisol secretion, which contributes to increased gastric acid secretion, impaired gastrointestinal motility, and heightened visceral sensitivity (Galih et al., 2024; Adibi et al., 2016). This mechanism forms the biological basis for the development of functional dyspepsia symptoms in individuals experiencing stress and anxiety.

Various studies have reported an association between anxiety, academic stress, and the incidence of functional dyspepsia among medical students; however, the findings remain inconsistent across studies. Some studies report a significant relationship, while others show inconclusive results (Saeed et al., 2024; Zabrina & Ong, 2025). Therefore, a more comprehensive literature review is required to synthesize existing evidence and provide a clearer understanding of this relationship.

METHODS

This study was a literature review that aimed to analyze the relationship between anxiety, academic stress, and the incidence of functional dyspepsia in medical students based on published studies. The method was used to synthesize evidence from relevant research to provide a comprehensive overview of the associations between the studied variables.

Literature sources were identified through searches in scientific databases, including PubMed and ScienceDirect. The search strategy used the keywords “functional dyspepsia,” “anxiety,” “academic stress,” and “medical students,” in English and Indonesian, combined using Boolean operators (AND, OR). The search was limited to articles published between 2016 and 2026 to ensure relevance and alignment with recent developments.

The inclusion criteria comprised original research articles examining the relationship between anxiety, academic stress, and functional dyspepsia among student populations. Eligible studies focused on anxiety and academic stress as exposure variables and functional dyspepsia as the outcome. Included articles used observational designs, were available in full text, and applied validated measurement instruments. Exclusion criteria included non-original articles (such as reviews, editorials, opinions, and case reports), studies not related to the main variables, and articles with incomplete or inaccessible data.

The selected articles were analyzed using narrative synthesis by grouping and comparing findings based on the main variables: anxiety, academic stress, and functional dyspepsia. Extracted data included author, year of publication, study design, sample size, instruments used, and key findings.

The results of the analysis were presented descriptively to identify patterns of association between psychological factors and functional dyspepsia in medical students, as well as to highlight similarities and differences across the included studies.

RESULTS AND DISCUSSION

The results of this literature review include a number of studies that evaluate the relationship between anxiety, academic stress, and functional dyspepsia in medical students and related populations. In general, the findings suggest that psychological factors have a meaningful association with the incidence of functional dyspepsia, although there are variations in the strength of the relationship between studies.

The majority of the studies analyzed used a cross-sectional design to assess the association between anxiety, academic stress, and functional dyspepsia in college students. The instruments used were standardized, Anxiety was measured using instruments such as *HADS* and *GAD-7*, academic stress using *PSS-10*, while functional dyspepsia was assessed based on *R4-FDDQ* or *Rome IV criteria*. The variation in methodology between studies reflects the heterogeneity of approaches, but still shows consistency in the direction of the findings.

Table 1. Study Characteristics

Yes	Author	Year	Study Design	Population	Instruments	Key Variables	Key Results	Semester	Age-Sensitive	Region
1	Lenga <i>et al.</i>	2022	Cross-sectional	FK Students	Anxiety questionnaire	Anxiety, functional dyspepsia	Significant relationships	Preclinical Phase (Semester I, III, V)	17 – 22 Years	Kupang (Nusa Cendana University)
2	Sarwati <i>et al.</i>	2025	Cross-sectional	FK Students	GAD-7, Rome IV	Anxiety, functional dyspepsia	Significant (p<0.05)	Preclinical Phase (Semester II / Class of 2023)	18 – 20 Years	Makassar (Muslim University of Indonesia)
3	Anas <i>et al.</i>	2026	Cross-sectional	FK Students	Academic stress scale	Stress, functional dyspepsia	Significant (p=0.014)	Preclinical Phase (Semester II / Class of 2022)	18 – 21 Years	Surabaya (Hang Tuah University)
4	Sackbani <i>et al.</i>	2019	Cross-sectional	FK Students	Anxiety scale	Anxiety, functional dyspepsia	Positive correlation	Semester I (New Students)	17 – 19 Years	Cirebon (Gunung Jati Swadaya University)
5	Galih <i>et al.</i>	2024	Cross-sectional	FK Students	Stress questionnaire	Stress, functional dyspepsia	r=0.541 significant	Preclinical Phase (Semester I - VII)	18 – 22 Years	Gorontalo (Gorontalo State University)
6	Randini <i>et al.</i>	2024	Cross-sectional	FK Students	Stress scale	Stress, functional dyspepsia	Significant relationships	Preclinical Phase (Class of 2019–2021)	18 – 23 Years	Makassar (Bosowa University)
7	Adibi <i>et al.</i>	2016	Cross-sectional	General population	Rome III, HADS	Anxiety, DF	Significant relationships	Not taking a semester	Unclear	Iran (Isfahan)

Yes	Author	Year	Study Design	Population	Instruments	Key Variables	Key Results	Semester	Age-Sensitive	Region
8	Saeed et al.	2024	Cross-sectional	DF Patients	SF-LDQ, HADS	Anxiety, DF	Higher anxiety score	Not taking a semester	Unclear	Pakistan (Faisalabad)

Table 2. Synthesis of the Effects of Anxiety, Academic Stress, and Functional Dyspepsia

Yes	Author	Year	Variable	Direction of Contact	Significance	Power of Effect	Conclusion
1	Lenga <i>et al.</i>	2022	Anxiety, functional dyspepsia	Positive	Significant	Moderate	Consistent
2	Sarwati <i>et al.</i>	2025	Anxiety, functional dyspepsia	Positive	Significant	Strong	Strong means
3	Anas <i>et al.</i>	2026	Stress, functional dyspepsia	Positive	Significant	Strong	Strong means
4	Sackbani <i>et al.</i>	2019	Anxiety, functional dyspepsia	Positive	Significant	Moderate	Consistent
5	Galih <i>et al.</i>	2024	Stress, functional dyspepsia	Positive	Significant	Strong	Strong correlation
6	Randini <i>et al.</i>	2024	Stress, functional dyspepsia	Positive	Significant	Moderate	Consistent
7	Adibi <i>et al.</i>	2016	Anxiety, functional dyspepsia	Positive	Significant	Strong	Meaningful associations
8	Saeed <i>et al.</i>	2024	Anxiety, functional dyspepsia	Positive	Significant	Moderate	Consistent

Synthesis of Results

Of the total 11 journals from several scientific databases, namely PubMed, and ScienceDirect analyzed in this literature review, as many as 8 main journals were included in the study characteristics table for in-depth evaluation (Lenga *et al.*, 2022; Sarwati *et al.*, 2025; Anas *et al.*, 2026; Sackbani *et al.*, 2019; Galih *et al.*, 2024; Randini *et al.*, 2024; Sunday *et al.*, 2026; and Ruan *et al.*, 2024). Of the 8 journals, as many as 6 journals focus on the subject of the preclinical phase medical student population with an accumulated sample ranging from 80 to 200+ respondents per study. The results of the analysis in this group of students consistently showed a positive correlation and a statistically significant relationship between academic stress levels (measured by PSS-10) and anxiety (measured by HADS or GAD-7) to the incidence and severity of functional dyspepsia symptoms diagnosed based on the Rome IV *Functional Dyspepsia Diagnostic Questionnaire* criteria / R4-FDDQ). Meanwhile, the other 2 journals in the group used general population subjects and outpatient clinicians as case-control groups (reaching 255 subjects) suggesting that symptoms of anxiety and depression were found to be much more common and significantly more severe ($p < 0.05$) in the functional dyspepsia patient group compared to the healthy control population.

Then, as additional strong data to support the findings, data from 3 international journals (Saeed *et al.*, 2024; Adibi *et al.*, 2016; and Lee *et al.*, 2024) which is also based on the subjects of the outpatient clinical population and the general population at large scale to involve thousands of participants. The results of this clinical study in this supporting population reinforce the evidence of a very high level of psychological comorbidity in functional dyspepsia patients. This reciprocal relationship on *the brain-gut axis* proves that emotional distress and psychological somatization at the macro scale linearly exacerbate the degree of gastrointestinal clinical manifestations, thus supporting the final conclusion that mental and academic stress in the student group massively escalates the risk of functional dyspepsia.

The relationship between psychological factors and functional dyspepsia can be explained through the mechanism *of the brain gut axis*, which is the bidirectional communication system between the central nervous system, the enteric nervous system, the endocrine system, and the immune system. The activation of this system due to psychological stress significantly affects the regulation of gastrointestinal function (Adibi *et al.*, 2016).

Stress and anxiety activate the *hypothalamic axis of the pituitary adrenal* (HPA axis), which increases the secretion of cortisol. Chronic activation of these axes contributes to increased gastric acid secretion, changes in gastrointestinal motility, as well as increased visceral sensitivity which is the main mechanism of the appearance of symptoms of functional dyspepsia (Galih *et al.*, 2024). Dysregulation of the autonomic nervous system, specifically increased sympathetic activity, also plays a role in impaired gastrointestinal function. This condition leads to a slowdown in gastric emptying and disruption of gastric accommodation, which clinically manifests as postprandial fullness and early satiety (Saeed *et al.*, 2024).

In the medical student population, chronic exposure to academic stress is an important predisposing factor. Sustained academic stress leads to the activation of persistent psychological stress that impacts physiological dysregulation of the gastrointestinal system (Lenga *et al.*, 2022). Academic anxiety also amplifies these physiological responses through an increase in the arousal of the autonomic nervous system. This condition worsens gastrointestinal symptoms through increased visceral sensitivity and disruption of neurohormonal regulation (Sackbani *et al.*, 2019).

The results of the synthesis showed that anxiety had a higher association consistency than academic stress. This indicates that internal emotional factors have a more dominant contribution to gastrointestinal dysregulation than academic external factors (Sarwati *et al.*, 2025). Variation in results between studies can be influenced by methodological heterogeneity, differences in measurement instruments, and population characteristics. In addition, the dominance of *cross-sectional* design limits the ability to definitively enforce causal relationships (Sunday *et al.*, 2026).

Clinically, these findings confirm that the therapeutic approach to functional dyspepsia needs to be multidimensional, not only focusing on pharmacological therapies, but also including psychological interventions such as stress management, behavioral therapy, and coping strategy education.

CONCLUSION

Based on the results of the literature review of 11 scientific articles analyzed, it can be concluded that there is a consistent and significant relationship between academic stress and

anxiety and the incidence of functional dyspepsia in students, particularly medical students in the preclinical phase. The majority of studies showed that increased levels of academic stress and anxiety were associated with a higher risk and greater severity of functional dyspepsia symptoms. These effects were thought to occur through the brain–gut axis mechanism, involving activation of the hypothalamic–pituitary–adrenal (HPA) axis and the autonomic nervous system, thereby influencing gastrointestinal function.

These findings indicate that psychological factors are an important component to consider in the prevention and management of functional dyspepsia in students. Therefore, integrated approaches combining psychological screening, stress management, and conventional medical therapies should be considered. In addition, further studies are recommended using longitudinal or cohort designs with larger sample sizes and more diverse populations to strengthen evidence of causality and to evaluate the effectiveness of psychological interventions in reducing the incidence and severity of functional dyspepsia.

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