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# The Association Between Stress and Smoking Habits with Suspected Functional Dyspepsia Among Non-Health Students in South Tangerang City:

## A cross-sectional study

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## SUMMARY

**IMPORTANCE** Functional dyspepsia is a common digestive disorder found across various age groups, including university students. This condition is influenced by several risk factors, such as stress and smoking habits. Non-health students represent a relevant population to study, as they have received less attention in prior research despite exhibiting high stress levels and a notable prevalence of smoking.

**AIMS** This study aimed to examine the association between stress and smoking habits with suspected functional dyspepsia among non-health students in South Tangerang City.

**METHODS** This quantitative, non-experimental study employed a cross-sectional design. Data were collected through questionnaires from 442 respondents and analyzed bivariate using the Chi-Square test with SPSS version 30.

**FINDINGS** The findings showed a significant association between stress and suspected functional dyspepsia ($p < 0.001$), whereas no significant association was found between smoking habits and suspected functional dyspepsia ($p = 0.243$).

**CONCLUSION** This study highlights the important role of stress as a significant factor associated with suspected functional dyspepsia among university students, whereas smoking habits were not significantly associated with the condition.

**RELEVANCE TO CLINICAL PRACTICE** The findings support the integration of psychological assessment into nursing care for university students experiencing functional dyspepsia symptoms. Nurse-led health education, stress management programs, and timely referrals for psychological support may help reduce symptom severity and promote holistic student health.

**ETHICS APPROVAL AND FUNDING** This study was approved by the research ethic committee of Faculty of Nursing Universitas Indonesia and no specific funding.

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dyspepsia, smoking, stress, university student.

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## 1. INTRODUCTION

Dyspepsia is a cluster of symptoms affecting the upper gastrointestinal tract, such as abdominal pain, nausea, vomiting, and a sensation of excessive fullness (Koduru et al., 2018; Doenges et al., 2019). Etiologically, dyspepsia is classified as organic or functional, with approximately 80% of cases falling under functional dyspepsia (Ford et al., 2020). In Asia, 43–79.5% of patients with dyspepsia have the functional form (Syam et al., 2017). According to 2015 data from the World Health Organization (WHO), the global prevalence of dyspepsia ranges from 13% to 40% (Hidayat et al., 2023), with significant rates in the United States (23–25.8%), India (30.4%), and Indonesia (40–50%) (Putri et al., 2022; Prasetyo et al., 2023). In South Tangerang City, dyspepsia has ranked among the top five most common diseases over the past three years (South Tangerang City Health Department, 2023).

Functional dyspepsia is associated with various risk factors, including stress and smoking (Ford et al., 2020; Miwa et al., 2022). College students are a vulnerable group due to irregular lifestyles, academic pressure, and the consumption of irritating foods. Research indicates a link between stress, smoking, consumption of irritating foods, and the use of NSAIDs and functional dyspepsia (Syah et al., 2022). Stress disrupts the enteric nervous system through increased cortisol and inflammation, which exacerbate dyspepsia symptoms (Stuart, 2013; Guyton & Hall, 2016). An international survey even found that more than 60% of college students met the criteria for one or more mental health issues during the 2020–2021 academic year (Lipson et al., 2022).

Smoking also contributes to dyspepsia by increasing stomach acid and lowering pH, which can damage the mucosa (Berkowitz et al., 2018). Fujiwara et al. (2011) noted that the risk of gastrointestinal disorders is higher among smokers who consume ≥ one pack per day. According to the 2018 Riskesdas and 2022 BPS data, Banten has a high prevalence of smoking, including in South Tangerang City. Several studies have shown a significant association between stress and dyspepsia (Prasetyo et al., 2023; Ansari et al., 2023; Putri et al., 2022), though others have found no such association (Karyanah, 2018). A similar pattern is observed with the smoking variable, with inconsistent results across studies (Putri et al., 2022; Widya et al., 2023).

Previous studies have generally focused on health science students. However, differences in lifestyle characteristics and environmental factors between health science and non-health science students can influence stress and smoking behavior. Marendic et al. (2024) found that non-health science students had higher stress scores (PSS-10), particularly among women and individuals with high anxiety. Rase et al. (2021) and Rahayu et al. (2017) also noted that the prevalence of smoking is higher among non-health students, partly due to weak enforcement of smoke-free zones. The study aim to assess the relationship between stress and smoking habits and suspected functional dyspepsia among non-health science students in South Tangerang, a topic that has not been specifically studied much previously.

## 2. METHODS

### 2.1 Study Design and Participants

A quantitative, non-experimental study with a cross-sectional design was conducted to investigate the associations between stress, smoking habits, and suspected functional dyspepsia among non-health university students.

Participants in this study were selected based on predetermined inclusion and exclusion criteria. The inclusion criteria were as follows: (1) active undergraduate students enrolled at Pamulang University; (2) residing in South Tangerang City; and (3) having no history of chronic gastrointestinal-related diseases, such as gastric cancer, gastrointestinal tract cancer, peptic ulcer disease, gallstones, or pancreatic disease, as confirmed by a physician’s diagnosis. The exclusion criteria included: (1) students who were unwilling to participate in the study; and (2) students who had previously undergone endoscopic examination with findings indicating gastric abnormalities or organic dyspepsia.

The study utilized a stratified random sampling technique. The sample size was determined using the proportion estimation formula with a 5% margin of error, plus a 10% dropout rate, resulting in a sample size of 442 students as respondents in this study. Data collection was conducted from February-May of 2025.

### 2.2 Features

The study variables included respondent characteristics, suspected functional dyspepsia, perceived stress, and smoking habits. Data were collected using a respondent characteristics questionnaire, the Rome IV Functional Dyspepsia Diagnostic Questionnaire (R4-FDDQ), the Perceived Stress Scale (PSS), and the Brinkman Index. The R4-FDDQ is designed to diagnose functional dyspepsia

based on international diagnostic criteria and is useful for distinguishing between functional dyspepsia and organic dyspepsia. Stress levels were measured using the PSS, a tool developed by Cohen in 1983 and still widely used today to assess individuals' perceptions of stress. Smoking habits are measured using the Brinkman Index, which classifies the level of smoking habits based on the number of cigarettes consumed per day and the duration of smoking in years.

### 2.3 Data Preparation

Data preparation involved data coding, cleaning, scoring, and categorization. Categorical variables were coded numerically according to their predefined categories, while stress and suspected functional dyspepsia were scored based on the respective questionnaire guidelines. Smoking habits were categorized according to the predetermined criteria. Data cleaning involved checking the completeness and consistency of responses and identifying missing or invalid values. Eligible data were subsequently categorized into the analytical groups required for the study variables.

### 2.4 Statistical Tests

The data were processed and analyzed using SPSS 30 through univariate and bivariate analyses, including the Chi-square test, to examine the relationship between the two categorical variables.

## 3. RESULTS

### 3.1 Basic Characteristic of Participants

This study analyzes the characteristics of the respondents, including categorical data (gender, faculty) and numerical data (age, semester). The data are presented in tables showing frequency, percentage, mean, standard deviation, minimum, and maximum values.

**Table 1. Demographic characteristics and distribution of suspected functional dyspepsia, stress levels, and smoking habits among non-health science students in South Tangerang City (n = 442)**

| Variable | | Frequency (n) | Percentage |
|---|---|---|---|
| **Gender** | Female | 285 | 64.5 |
| | Male | 157 | 35.5 |
| **Faculty** | Faculty of Economics and Business | 241 | 54.5 |
| | Faculty of Law | 61 | 13.8 |
| | Faculty of Computer Science | 88 | 19.9 |
| | Faculty of Engineering | 52 | 11.8 |
| | Faculty of Law | 61 | 13.8 |
| | Faculty of Computer Science | 88 | 19.9 |
| **Functional Dyspepsia** | Negative | 99 | 22.4 |
| | Positive | 343 | 77.6 |
| **Stress** | Low Stress | 92 | 20.8 |
| | Moderate Stress | 334 | 75.6 |
| | High Stress | 16 | 3.6 |
| **Smoking Habits** | Non-smoker | 333 | 75.3 |
| | Light Smoker | 103 | 23.3 |
| | Moderate Smoker | 6 | 1.4 |

According to Table 1, most respondents were female (64.5%), while 35.5% were male. Most respondents were from the Faculty of Economics and Business (54.5%), followed by the Faculty of Computer Science (19.9%), Law (13.8%), and Engineering (11.8%). Most respondents suspected functional dyspepsia, totaling 343 respondents (77.6%). Meanwhile, respondents without suspected functional dyspepsia numbered 99 (22.4%). These findings indicate that the prevalence of suspected functional dyspepsia is quite high among non-health science students in South Tangerang City. Additionally, most respondents fell into the moderate stress category (75.6%), while 20.8% experienced low stress and 3.6% experienced high stress. These findings indicate that most non-health science students in South Tangerang experience moderate stress levels. In context of smoking habits, all respondents were dominated by non-smokers (75.3%), while 23.3%

were light smokers and 1.4% were moderate smokers. These findings indicate that most non-health science students in South Tangerang City do not smoke.

### 3.2. Primary Analysis

**Table 2. Analysis of the Relationship Between Stress and Smoking Habit with Suspected Functional Dyspepsia Among Non-Health Science Students in South Tangerang City.**

| Variable | Category | Functional Dyspepsia Negative n (%) | Functional Dyspepsia Positive n (%) | Total n (%) | p-value |
|---|---|---|---|---|---|
| **Stress** | Low Stress | 36 (36.4) | 56 (16.3) | 92 (20.8) | |
| | Moderate Stress | 61 (61.6) | 273 (79.6) | 334 (75.6) | <0.001 |
| | High Stress | 2 (2.0) | 14 (4.1) | 16 (3.6) | |
| **Smoking Habits** | Non-smoker | 79 (79.8) | 254 (74.1) | 333 (75.3) | |
| | Smoker | 20 (20.2) | 89 (25.9) | 109 (24.7) | 0.243 |

Table 2 above shows that respondents with moderate stress had the highest proportion of suspected functional dyspepsia (79.6%), followed by those with low stress (16.3%) and high stress (4.1%). Statistical tests revealed a significant association between stress levels and suspected functional dyspepsia ($p < 0.001$); the higher stress level, the greater the risk of experiencing functional dyspepsia. Table 3 also shows that non-smoking respondents had a 74.1% prevalence of suspected functional dyspepsia, whereas smokers had a 25.9% prevalence. Statistical analysis yielded a p-value of 0.243, indicating no significant association between smoking habits and suspected functional dyspepsia among non-health science students in South Tangerang City. These findings suggest that smoking is not a dominant factor in this population.

## 4. DISCUSSION

### 4.1 Principal Findings

This study examined the associations between stress and smoking habits with suspected functional dyspepsia among non-health science students in South Tangerang City. The findings revealed a high prevalence of suspected functional dyspepsia, affecting more than three-quarters of the respondents (77.6%). Most participants also reported moderate levels of perceived stress (75.6%), while approximately one-quarter had smoking habits.

The primary finding of this study is that stress was significantly associated with suspected functional dyspepsia. Students with higher stress levels were more likely to experience symptoms suggestive of functional dyspepsia. In contrast, smoking habits were not significantly associated with suspected functional dyspepsia. These findings suggest that psychological factors may play a more prominent role than smoking behavior in the occurrence of functional dyspepsia among non-health university students.

### 4.2 Interpretation of Findings

The results of the study indicate that the prevalence of suspected functional dyspepsia is quite high among non-health science students in South Tangerang City. This high figure suggests that students, regardless of their field of study, are a group vulnerable to functional dyspepsia. The transition to university life, academic demands, irregular eating patterns, sleep disturbances may contribute to gastrointestinal problems among students (Nugrahani & Edison, 2023). These findings are consistent with several previous studies. Praeesetyo et al. (2023) reported a prevalence of 75.4% among medical students at Udayana University; Putri, Izhar, & Sitanggang (2022) found a rate of 53.8% among public health students at Jambi University, while Nuraini, Shahab, and Zahra (2023) recorded a rate of 71.9% among pre-clinical medical students. Although the subjects of these studies came from health-related backgrounds, the similarity in results indicates a risk comparable to that of non-health students. This finding confirmed the assumption that functional dyspepsia among university students is not only related to academic issues, but also with psychosocial commonly experienced during higher education.

However, not all studies have shown similar results. Karyanah (2018) reported a prevalence of only 15.6% among nursing students at Esa Unggul University, whereas Widya et al. (2023) found a rate of 44.4% among workers at PT. Hamsina Jaya MPPG in Cirebon. These differences are likely

influenced by measurement methods, diagnostic criteria, and subject characteristics. Overall, functional dyspepsia appears to be a common problem among students, influenced by various factors such as diet, stress, and lifestyle. The high prevalence in this study reflects the complexity of dyspepsia, which varies depending on the population studied.

This study found a significant association between stress and suspected functional dyspepsia among non-health science students in South Tangerang City. Students with moderate to high stress levels tended to experience more symptoms of functional dyspepsia than those who were not experiencing stress. These results are consistent with the study by Prasetyo et al. (2023), which demonstrated a significant association between stress and dyspepsia among medical students at Udayana University, using a similar PSS instrument and finding that moderate stress levels were predominant. Studies by Syahputra & Siregar (2021) on UISU medical students and Dinata, Irwan, & Siregar (2021) also support these findings, where high stress is associated with symptoms such as epigastric pain, nausea, and a feeling of fullness. Psychological stress is believed to affect the enteric nervous system and the physiological balance of the gastrointestinal tract. Increased sympathetic nervous system activity and stress hormones such as cortisol can slow gastric emptying, increase visceral sensitivity, and disrupt gastric acid secretion, which triggers the characteristic symptoms of functional dyspepsia (Guyton & Hall, 2016; Chu et al., 2022).

However, not all studies support this association. Anggraini (2020) found no significant association between stress and dyspepsia among senior students at the Medistra School of Public Health, nor did Nugrahani & Edison (2023) among health science students at the University of Indonesia. These differences suggest the presence of other variables that may influence the relationship between stress and dyspepsia. Differences in coping mechanisms, social support and individual stress perception may partly explain these inconsistent findings across studies. Widya et al. (2023) emphasize that dyspepsia can also be influenced by other factors such as NSAID use, a history of gastric disease, dietary habits, alcohol consumption, smoking, age, gender, and coffee consumption. Therefore, although stress is an important factor, a more comprehensive understanding is needed to fully explain the etiology of functional dyspepsia.

Additionally, the findings revealed that there was no significant association between smoking habits and suspected functional dyspepsia among non-health science students in South Tangerang City. This is likely influenced by the predominance of non-smoking respondents, as well as the fact that the majority of smokers fall into the light-to-moderate intensity category, meaning the physiological effects of nicotine are not yet strongly felt. Findings are consistent with the study by Putri et al. (2022), which also found no significant association between smoking and dyspepsia syndrome among public health students. This suggests that the low intensity and duration of smoking among the student population may account for the weak association with dyspepsia symptoms.

In contrast, Widya et al. (2023) found a significant association between smoking and dyspepsia among industrial workers, who had more intense smoking habits, were older, and experienced higher levels of work-related stress. This is consistent with Fujiwara et al. (2011), who stated that the risk of dyspepsia increases significantly among heavy smokers (≥ one pack per day) and long-term smokers (>2 years), due to cumulative effects such as increased gastric acid secretion and mucosal damage.

In addition to smoking, other factors such as diet, sleep quality, caffeine intake, and a history of gastric disorders may serve as confounding factors that have not been fully accounted for in this study. Although smoking can biologically trigger dyspepsia by increasing stomach acid and impairing gastric motility, this effect has not been found to be significant among non-health science students. Therefore, further research is needed with a more diverse population, more detailed measurements of smoking intensity and duration, and multivariate analysis to evaluate the interaction between smoking and other risk factors for functional dyspepsia.

### 4.3 Strengths and Limitations

This study has several strengths. Firstly, it specifically focused on non-health science students, which are relatively rarely populations to be explored in previous studies. Secondly, the study involved a relatively large sample size that can increase the statistical power of the analysis. Third, the study simultaneously examined both psychological and behavioral factors associated with suspected functional dyspepsia. However, it must be noted that this study also has some limitations. The first weakness was the cross-sectional design that may limit the ability to build causal relationships between variables. Moreover, this study relied on self-reported questionnaires which may introduce the recall bias and response bias.

However, several limitations should be acknowledged. The cross-sectional design precludes the establishment of causal relationships between stress, smoking habits, and suspected functional dyspepsia. Data were collected using self-reported questionnaires, which may be subject to recall bias and social desirability bias. In addition, the study was conducted only among non-health science students in South Tangerang City, limiting the generalizability of the findings to other

student populations or regions. Potential confounding factors, such as dietary habits, sleep quality, physical activity, caffeine consumption, and Helicobacter pylori infection, were also not examined.

### 4.4 Implications for Practice and Policy

The findings of this study have important implications for nursing practice, higher education, and health policy. Nurses working in university health services should routinely assess psychological stress among students presenting with gastrointestinal complaints and provide appropriate stress management interventions. Nurse-led health education programs focusing on stress reduction, healthy lifestyles, and early recognition of dyspeptic symptoms may help improve students' overall well-being. Educational institutions should integrate mental health promotion into student support services by providing stress management workshops, counseling services, and psychological screening programs. Such initiatives may contribute to reducing psychological distress and its associated physical symptoms. From a policy perspective, universities should strengthen campus-based health promotion policies that emphasize both mental and physical health. Future research should employ longitudinal or prospective study designs to clarify the temporal relationship between stress and functional dyspepsia while incorporating additional lifestyle and clinical variables to better understand the multifactorial nature of this condition.

## 5. CONCLUSION

This study showed that there was a high prevalence of suspected functional dyspepsia among non-health science students. Stress was found to have a significant association with suspected functional dyspepsia, which means students experiencing moderate to high level of stress were intend to have symptoms of dyspepsia. However, smoking habits were not significantly associated with suspected functional dyspepsia. These findings highlight the importance of stress management among students to reduce the risk of dyspepsia incidents. Universities should consider improving the mental health counseling services and the health promotion programs related to dyspepsia.

## Author Contributions

All authors contributed substantially to the study conception and design. Material preparation and data collection were performed by first authors. The data analysis and first draft of manuscripts were conducted by both authors.

## Ethical Approval and Consent

This study was approved by the research ethic committee of Faculty of Nursing Universitas Indonesia. All participants provided informed consent prior to participation. Participation was voluntary, and respondents were informed that they could withdraw from the study at any time without any consequences. Participant confidentiality and anonymity were maintained throughout the study.

## Generative AI Transparency Statement

Generative AI tools were used solely to assist with language translation, editing and grammar improvement. All scientific content, data interpretation and final decision regarding the manuscript remain the full responsibility of the authors.

## Conflict of Interest Disclosure

The authors declare that there are no conflicts of interest related to this study.

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## Data Availability Statement

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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