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ANALYSIS OF DYSPEPSIA INCIDENCE IN THE EMERGENCY DEPARTMENT

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ABSTRACT
Dyspepsia is a collection of upper gastrointestinal symptoms that can interfere with daily activities and reduce patients' quality of life. This study aimed to analyze factors associated with the incidence of dyspepsia in the Emergency Department of Palembang BARI Regional General Hospital. The study used an analytical observational design with a cross-sectional approach. The sample consisted of 85 respondents selected using consecutive sampling. Data were collected through questionnaires and medical records and were analyzed using the Chi-square test and multiple logistic regression. The results showed that 51 respondents (60.0%) experienced dyspepsia. Variables significantly associated with dyspepsia were dietary pattern (p=0.013; OR=3.656), smoking habit (p=0.024; OR=3.429), exercise activity (p=0.035; OR=3.327), and stress (p=0.021; OR=3.380). Age, sex, alcohol consumption, and medication use were not significantly associated with dyspepsia. Multivariate analysis showed that dietary pattern was the only factor independently associated with dyspepsia (p=0.048; OR=2.789; 95% CI 1.010-7.699). The model explained 14.0% of the variation in dyspepsia incidence. An unhealthy dietary pattern was the dominant factor associated with dyspepsia.

Keywords: dietary pattern; dyspepsia; exercise; smoking; stress

INTRODUCTION
Dyspepsia is a collection of upper gastrointestinal symptoms characterized by pain or discomfort in the epigastric region, early satiety after eating, postprandial fullness, bloating, and sometimes nausea and vomiting without a clearly identifiable organic abnormality (Djojoningrat & Pribadi, 2024). Dyspepsia, commonly known by the public as “maag,” frequently recurs and can affect patients' quality of life (Sidik, 2024). The term dyspepsia comes from Greek, in which dys means bad and pepsis means digestion. The global occurrence of dyspepsia remains high and is estimated to affect 13-40% of the population in various countries. In Indonesia, the prevalence of dyspepsia has been reported to reach approximately 50% in Jakarta, 46% in Denpasar, and 35% in Palembang (Zakiyah et al., 2021). Functional dyspepsia is the most frequently identified type, accounting for approximately 90%, whereas organic dyspepsia is estimated at around 6% (Simngam et al., 2025). Dyspepsia is also among the ten most common diseases in hospital outpatients in Indonesia.

According to the 2024 South Sumatra Health Profile, dyspepsia was among the ten most common diseases, with 10,082 outpatient visits and 10,652 inpatient cases (South Sumatra Provincial Health Office, 2025). In Palembang City, dyspepsia ranked fifth among the most common inpatient diseases in 2024, with 2,662 patients, consisting of 1,427 men and 1,235 women (Palembang City Health Office, 2024). These data indicate that dyspepsia remains a considerable public health problem.

Dyspepsia is often considered a mild disorder, but persistent or recurrent symptoms can reduce quality of life physically, psychologically, and socially. Approximately 10-25% of people with dyspepsia experience activity limitations and require medical attention, thereby increasing visits to health-care facilities (Francis & Zavala, 2024). Inadequately managed dyspepsia may also be associated with peptic ulcer disease, upper gastrointestinal bleeding, and the risk of gastric malignancy, particularly when related to Helicobacter pylori infection (Sidik, 2024).

The incidence of dyspepsia is influenced by various factors, including age, sex, dietary pattern, smoking habit, alcohol consumption, physical activity, stress, and the use of certain medications. Older age and female sex have been reported to be associated with a higher risk of dyspepsia. In addition, anxiety, depression, low educational level, and unhealthy lifestyles may increase the frequency and severity of dyspeptic symptoms and reduce patients' quality of life (Bayupurnama, 2023).

The Emergency Department of Palembang BARI Regional General Hospital is one of the health-care facilities that receives many patients with dyspeptic complaints. Based on medical record reports, the number of dyspepsia visits showed an increasing trend over the past three years: 504 visits in 2023, 544 visits in 2024, and 559 visits in 2025. In 2025, dyspepsia ranked first among the ten most common diseases in the Emergency Department of Palembang BARI Regional General Hospital, followed by bacterial infections and asthma.

The increase in the number of visits indicates that dyspepsia remains an important health problem in the Emergency Department of Palembang BARI Regional General Hospital. Although the number of cases has continued to increase, the factors associated with dyspepsia among patients visiting this department have not been comprehensively identified. Therefore, this study aimed to analyze factors associated with dyspepsia in the Emergency Department of Palembang BARI Regional General Hospital. The findings are expected to provide a basis for more appropriate prevention, education, and management of dyspepsia.

METHOD

This study used an analytical observational design with a cross-sectional approach to analyze factors associated with dyspepsia. The study was conducted in the Emergency Department of Palembang BARI Regional General Hospital in 2026. The study population consisted of all patients visiting the Emergency Department of Palembang BARI Regional General Hospital during the study period. The sample consisted of 85 respondents selected using consecutive sampling, whereby all patients meeting the study criteria were included sequentially until the required sample size was reached. Inclusion criteria were patients aged at least 18 years, conscious, able to communicate, and willing to participate. Patients in critical condition, those with communication disorders, or those with incomplete data were excluded.

The dependent variable was dyspepsia incidence, categorized as dyspepsia and no dyspepsia based on physician diagnosis and medical-record data. Independent variables included age, sex, dietary pattern, smoking habit, alcohol consumption, exercise activity, stress, and medication use. Age was categorized as >40 years and ≤40 years. Dietary pattern was categorized as good and poor based on meal-time regularity, frequency of main meals and snacks, and consumption of trigger foods. Smoking habit and alcohol consumption were categorized as yes or no. Exercise activity was categorized as exercising if performed at least once per week during the previous month and not exercising if this criterion was not met.

Stress was measured using seven questions derived from the stress subscale of the Depression Anxiety Stress Scales-21 (DASS-21). DASS-21 is a standardized instrument developed by Lovibond and Lovibond to measure negative emotional states consisting of depression, anxiety, and stress. Each item was scored from 0 to 3, and the total score was multiplied by two. Respondents were categorized as not stressed if they obtained a score of 0-14 and stressed if the score was ≥15. Medication use was measured based on the history of consuming medications with the potential to cause gastrointestinal disorders and was categorized as yes or no.

Primary data were collected through interviews using a structured questionnaire, whereas secondary data were obtained from patient medical records and Emergency Department visit reports. Data

collection was conducted after respondents had received an explanation of the study objectives and procedures and had indicated their willingness to participate by signing an informed-consent form. Data processing included editing, coding, entry, cleaning, and tabulation. Univariate analysis was used to describe the frequency and percentage distribution of each variable. Bivariate analysis used the Chi-square test or Fisher's exact test to analyze associations between independent variables and dyspepsia. The magnitude of association was expressed as an odds ratio and 95% confidence interval, with statistical significance set at $p<0.05$.

Variables with $p<0.25$ in the initial selection were entered into multiple logistic regression analysis using the backward elimination method. Multivariate results were presented as regression coefficients, p-values, adjusted odds ratios or Exp(B), and 95% confidence intervals. The variable with the largest statistically significant Exp(B) was designated as the dominant factor. The model's ability to explain dyspepsia incidence was assessed using the Nagelkerke R Square and Cox and Snell R Square values. The probability of dyspepsia was calculated based on the final logistic regression model. The original source contained an equation image that was not available in the pasted file. In the accompanying explanation, P represents the probability of liver-function impairment, e is the exponential number (approximately 2.718), and y is the linear combination of predictor factors, written as:

$$y = \beta 0 + \beta 1X1 + \beta 2X2 + \ldots + \beta nXn$$

In this equation, β0 denotes the intercept, while βi represents the regression coefficient for each independent variable (Xi). A positive β value indicates that the variable increases the probability of dyspepsia, whereas a negative value indicates a protective effect.

RESULTS AND DISCUSSION

Analysis of Factors Associated with Dyspepsia Incidence

Table 1.
Analysis of Factors Associated with Dyspepsia Incidence

Variable	Category	Dyspepsia n (%)	No dyspepsia n (%)	Total n (%)	p-value	OR (95% CI)
Age	>40 years	34 (58.6%)	24 (41.4%)	58 (100.0%)	0.887	0.833 (0.326-2.133)
	<40 years	17 (63.0%)	10 (37.0%)	27 (100.0%)		
Sex	Male	21 (56.8%)	16 (43.2%)	37 (100.0%)	0.755	0.788 (0.328-1.888)
	Female	30 (62.5%)	18 (37.5%)	48 (100.0%)		
Dietary pattern	Poor	27 (77.1%)	8 (22.9%)	35 (100.0%)	0.013	3.656 (1.394-9.592)
	Good	24 (48.0%)	26 (52.0%)	50 (100.0%)		
Smoking	Smoker	24 (77.4%)	7 (22.6%)	31 (100.0%)	0.024	3.429 (1.265-9.289)
	Non-smoker	27 (50.0%)	27 (50.0%)	54 (100.0%)		
Alcohol	Consumes alcohol	11 (64.7%)	6 (35.3%)	17 (100.0%)	0.868	1.283 (0.425-3.878)
	Does not consume alcohol	40 (58.8%)	28 (41.2%)	68 (100.0%)		
Exercise	No exercise	43 (67.2%)	21 (32.8%)	64 (100.0%)	0.035	3.327 (1.195-9.262)
	Exercise	8 (38.1%)	13 (61.9%)	21 (100.0%)		
Stress	Stressed	26 (76.5%)	8 (23.5%)	34 (100.0%)	0.021	3.380 (1.289-8.863)
	Not stressed	25 (49.0%)	26 (51.0%)	51 (100.0%)		
Medication	Yes	9 (64.3%)	5 (35.7%)	14 (100.0%)	0.952	1.243 (0.378-4.090)
	No	42 (59.2%)	29 (40.8%)	71 (100.0%)		

The analysis showed that age, sex, alcohol consumption, and medication use were not significantly associated with dyspepsia because their p-values were >0.05. In contrast, dietary pattern was significantly associated with dyspepsia (p=0.013; OR=3.656; 95% CI 1.394-9.592), indicating that respondents with a poor dietary pattern had 3.656 times greater odds of dyspepsia than those with a good dietary pattern. Smoking habit was also significantly associated with dyspepsia (p=0.024; OR=3.429; 95% CI 1.265-9.289), meaning that smokers had 3.429 times greater odds of dyspepsia than non-smokers. Exercise activity was significantly associated with dyspepsia (p=0.035; OR=3.327; 95% CI 1.195-9.262), such that respondents who did not exercise had 3.327 times greater odds of dyspepsia than those who exercised. Stress was also significantly associated with dyspepsia (p=0.021; OR=3.380; 95% CI 1.289-8.863), indicating that stressed respondents had 3.380 times

greater odds of dyspepsia than respondents without stress. Thus, variables associated with dyspepsia were dietary pattern, smoking habit, exercise activity, and stress, with poor dietary pattern having the largest OR in the bivariate analysis.

Multivariate Analysis

Candidate Variable Selection for the Model

Table 2.
Candidate Variable Selection for Multivariate Analysis

Variable	p-value	Decision
Age	0.703	Not entered into model
Sex	0.592	Not entered into model
Dietary pattern	0.125	Entered into model
Smoking	0.026	Entered into model
Alcohol	0.656	Not entered into model
Exercise	0.019	Entered into model
Stress	0.016	Entered into model
Medication	0.719	Not entered into model

Based on the candidate-variable selection for multivariate analysis, variables with $p<0.25$ were entered into the model, while variables with $p>0.25$ were not entered. The variables that met the criteria and entered the multivariate model were attitude with $p=0.010$, facilities and infrastructure with $p=0.004$, training with $p=0.004$, SOP with $p=0.002$, and supervision with $p=0.004$. Meanwhile, age with $p=0.703$, sex with $p=0.633$, education with $p=0.979$, knowledge with $p=0.391$, and length of employment with $p=0.801$ had p-values >0.25 and therefore were not entered into the multivariate model. Thus, five variables became candidates for multivariate analysis: attitude, facilities and infrastructure, training, SOP, and supervision.

Multivariate Logistic Regression Analysis

Table 3.
Multivariate Logistic Regression Analysis

Step	Variable	B	Sig.	Exp(B)	95% CI Lower	95% CI Upper
Step 1a	Dietary pattern	.997	.058	2.711	.968	7.596
	Smoking	.862	.117	2.367	.807	6.945
	Exercise	.791	.162	2.206	.729	6.677
	Stress	.767	.152	2.153	.753	6.154
	Constant	-5.727	.000	.003		
Step 2a	Dietary pattern	1.026	.048	2.789	1.010	7.699
	Smoking	.953	.077	2.594	.903	7.451
	Stress	.904	.084	2.469	.887	6.870
	Constant	-5.152	.000	.006		

Based on the multivariate logistic regression analysis, exercise was removed from the model because in Step 1 it had the largest significance value, $p=0.162$, with Exp(B)=2.206 and a 95% CI of 0.729-6.677. This p-value was greater than 0.05 and the confidence interval included 1, indicating that exercise did not show a significant independent effect on dyspepsia after controlling for dietary pattern, smoking, and stress. In Step 2, dietary pattern was the only variable significantly associated with dyspepsia, with $p=0.048$, Exp(B)=2.789, and 95% CI 1.010-7.699. Thus, respondents with a poor dietary pattern had 2.789 times greater odds of dyspepsia than respondents with a good dietary pattern after controlling for smoking habit and stress. Smoking and stress remained in the model but did not yet show statistically significant associations.

R Square Analysis

Table 4.
R Square Analysis

Description	Value
Nagelkerke R Square	0.140
Cox & Snell R Square	0.104

The logistic regression analysis yielded a Nagelkerke R Square value of 0.140. This indicates that the variables included in the model were able to explain 14.0% of the variation in dyspepsia incidence, while the remaining 86.0% was influenced by other factors not included in this study. The Cox & Snell R Square value of 0.104

indicates that the independent variables in the model explained 10.4% of the variation in dyspepsia incidence. In logistic regression, Nagelkerke R Square is more commonly used because it has been adjusted to range from 0 to 1. Therefore, the model's explanatory ability for dyspepsia incidence was relatively low, at 14.0%. Other potentially relevant factors include a history of gastric disease, consumption of spicy or acidic foods, use of certain medications, sleep patterns, caffeine consumption, and other psychological and biological factors.

Compliance Probability Analysis

This logistic regression model describes the relationship between the independent variables and the probability of compliance, using a linear combination of predictor factors written as:

Y = -5.152 + 1.026 (Dietary Pattern) + 0.953 (Smoking) + 0.904 (Stress)

Table 5.
Compliance Probability Analysis

No.	Dietary Pattern	Smoking	Stress	Probability of Dyspepsia
1	Poor	Smoker	Stressed	9.37%
2	Poor	Smoker	Not stressed	4.02%
3	Poor	Non-smoker	Stressed	3.83%
4	Poor	Non-smoker	Not stressed	1.59%
5	Good	Smoker	Stressed	3.57%
6	Good	Smoker	Not stressed	1.48%
7	Good	Non-smoker	Stressed	1.41%
8	Good	Non-smoker	Not stressed	0.58%

Based on the predictions, the highest probability of dyspepsia was found among respondents with a poor dietary pattern who smoked and experienced stress, at 9.37%. Conversely, the lowest probability was found among respondents with a good dietary pattern who did not smoke and did not experience stress, at 0.58%. In general, the combination of a poor dietary pattern, smoking habit, and stress increased the probability of dyspepsia. The greater the number of risk factors present, the higher the likelihood of dyspepsia. Poor dietary pattern appeared to produce the largest increase in probability compared with smoking habit and stress.

Dyspepsia results from interactions among biological, psychological, dietary, and lifestyle factors through disturbances in gastroduodenal motility, gastric accommodation, visceral sensitivity, mucosal inflammation, microbiota, and communication along the gut-brain axis (Wang et al., 2025). Functional dyspepsia is also heterogeneous, so factors associated with it in one population may not show the same findings in different populations or health-care settings (Tack et al., 2025).

Association Between Age and Dyspepsia

The study showed that the incidence of dyspepsia was 58.6% among respondents aged over 40 years and 63.0% among respondents aged under 40 years (Primary study data, 2026). Statistical testing yielded p=0.887 and OR=0.833 with a 95% CI of 0.326-2.133, indicating no significant association between age and dyspepsia (Primary study data, 2026). Theoretically, increasing age may be accompanied by changes in gastrointestinal motility, greater medication use, increased comorbidities, and changes in gastric sensory and motor responses (Wang et al., 2025). However, global epidemiological research using Rome IV criteria indicates that the prevalence of functional dyspepsia tends to decrease with increasing age, although findings may vary depending on the population and diagnostic method (Tack et al., 2025). Other research has found that older age may be associated with certain dyspepsia subgroups when accompanied by anxiety, depression, sleep disorders, or comorbid disease (Kim et al., 2024).

In the field setting, patients presenting to the Emergency Department of Palembang BARI Regional General Hospital were individuals with acute or recurrent complaints requiring immediate care, so their characteristics differed from those of the general population. The difference in dyspepsia proportions between age groups was only 4.4%, which was not large enough to produce a statistically significant association (Primary study data, 2026). The use of a 40-year age cut-off may also have combined respondents with diverse biological conditions and risks into the same category. The researchers assume that age was not associated with dyspepsia because dyspepsia is not determined

directly by age but by interactions among dietary pattern, stress, smoking habit, Helicobacter pylori infection, medication use, sleep disorders, and other gastroduodenal mechanisms (Wang et al., 2025). Younger respondents may still develop dyspepsia if they have an unhealthy diet, smoke, and experience stress, whereas older respondents may remain free of dyspepsia if these factors are controlled.

Association Between Sex and Dyspepsia

The incidence of dyspepsia was 56.8% among men and 62.5% among women (Primary study data, 2026). Statistical testing yielded p=0.755 and OR=0.788 with a 95% CI of 0.328-1.888, indicating no significant association between sex and dyspepsia (Primary study data, 2026). Theoretically, women may be more susceptible to disorders of gut-brain interaction due to hormonal influences, visceral sensitivity, stress responses, anxiety, and differences in the perception of gastrointestinal symptoms (Wang et al., 2025). Rome IV epidemiological studies across several countries found that functional dyspepsia was significantly more common in women than in men (Tack et al., 2025). Nevertheless, sex is not always an independent factor because its association may be influenced by anxiety, depression, sleep patterns, diet, social status, and health-care-seeking behavior (Tack et al., 2025).

In this study, the incidence of dyspepsia was indeed higher among women, but the difference was only 5.7% and therefore was not strong enough to produce a meaningful association (Primary study data, 2026). In addition, the numbers of female and male respondents were relatively similar, at 48 women and 37 men, meaning the two groups may have had relatively similar exposure to lifestyle factors (Primary study data, 2026). The researchers assume that the absence of an association was due to dietary pattern, smoking, physical activity, and stress having a more direct influence on symptom occurrence than sex. Sex is a non-modifiable biological characteristic, whereas dyspeptic symptoms are more strongly influenced by the combination of physiological, psychological, and environmental disturbances in each individual (Wang et al., 2025).

Association Between Dietary Pattern and Dyspepsia

The incidence of dyspepsia was 77.1% among respondents with a poor dietary pattern and 48.0% among respondents with a good dietary pattern (Primary study data, 2026). Statistical testing yielded p=0.013 and OR=3.656 with a 95% CI of 1.394-9.592, indicating a significant association between dietary pattern and dyspepsia (Primary study data, 2026). Respondents with a poor dietary pattern had 3.656 times greater odds of dyspepsia than respondents with a good dietary pattern (Primary study data, 2026). Irregular eating, skipping meals, long intervals between meals, eating large portions, eating too quickly, and consuming spicy, fatty, caffeinated, and other irritant foods may trigger or worsen dyspeptic symptoms (García-Cedillo, 2025). High-fat foods can slow gastric emptying and increase postprandial fullness, whereas capsaicin in spicy foods can activate sensory nerves and increase epigastric pain or burning (García-Cedillo, 2025). Irregular eating may also disturb motility, gastric accommodation, acid secretion, and gastrointestinal hormonal regulation involved in early satiety and postprandial fullness (Ostadsharif et al., 2026).

A recent meta-analysis of 11 studies involving 21,220 participants showed that spicy-food consumption increased the risk of functional dyspepsia by 32%, while a higher meal frequency was associated with lower risk (Ostadsharif et al., 2026). Panggabean et al. also found a significant association between dietary pattern and dyspepsia recurrence and identified dietary pattern as the dominant factor (Panggabean et al., 2025). In the field setting, Emergency Department patients may delay eating because of work, household activities, travel, or other commitments. Patients may also present after consuming spicy, acidic, fatty foods, coffee, or large meals that subsequently trigger epigastric pain, nausea, bloating, and early satiety. The markedly higher proportion of dyspepsia in the poor-diet group indicates that eating behavior was a real problem among study respondents (Primary study data, 2026). The researchers assume that the association exists because dietary pattern interacts directly with gastric and duodenal function. Irregular eating and consumption of trigger

foods can increase symptoms in individuals who already have visceral hypersensitivity, impaired gastric accommodation, or delayed gastric emptying (Wang et al., 2025). The significant multivariate result indicates that dietary pattern was an independent factor with a stronger association than the other lifestyle variables in this study.

Association Between Smoking and Dyspepsia

The incidence of dyspepsia was 77.4% among smokers and 50.0% among non-smokers (Primary study data, 2026). Statistical testing yielded p=0.024 and OR=3.429 with a 95% CI of 1.265-9.289, indicating a significant association between smoking and dyspepsia in bivariate analysis (Primary study data, 2026). Smokers had 3.429 times greater odds of dyspepsia than non-smokers (Primary study data, 2026). Nicotine and other chemicals in cigarettes can affect acid secretion, mucosal blood flow, gastrointestinal motility, mucosal defenses, and perception of upper gastrointestinal symptoms (Mahadeva et al., 2026). Smoking may also be associated with irregular eating, coffee consumption, sleep disturbances, and stress, so its effect on dyspepsia may occur directly or through other behavioral factors (García-Cedillo, 2025). The latest Asian consensus identifies smoking as one of the demographic and lifestyle factors that may increase the risk of functional dyspepsia (Mahadeva et al., 2026).

In multivariate analysis, smoking had p=0.077 and Exp(B)=2.594 and therefore did not show a significant association after controlling for dietary pattern and stress (Primary study data, 2026). The loss of statistical significance suggests that part of the effect of smoking may overlap with dietary pattern or stress among respondents. The number of smokers was also only 31, resulting in a relatively wide confidence interval. The researchers assume that smoking was associated with dyspepsia in bivariate analysis because cigarette exposure can worsen mucosal condition and gastrointestinal function, but it was not an independent factor after other variables were controlled. Measuring smoking only as smoker versus non-smoker also did not capture the number of cigarettes smoked per day, duration of smoking, cigarette type, or nicotine dependence, all of which may determine exposure intensity.

Association Between Alcohol Consumption and Dyspepsia

The incidence of dyspepsia was 64.7% among respondents who consumed alcohol and 58.8% among those who did not (Primary study data, 2026). Statistical testing yielded p=0.868 and OR=1.283 with a 95% CI of 0.425-3.878, indicating no significant association between alcohol consumption and dyspepsia (Primary study data, 2026). Alcohol can irritate the gastric mucosa, affect motility, increase mucosal permeability, and exacerbate pain or burning in some individuals with dyspepsia (García-Cedillo, 2025). However, evidence regarding the association between alcohol and dyspepsia remains inconsistent because its effects may depend on beverage type, alcohol concentration, amount, frequency, timing of consumption, dietary pattern, and individual susceptibility (García-Cedillo, 2025). The Asian consensus also recommends limiting alcohol consumption as part of lifestyle modification, although the strength of association is not consistent across studies (Mahadeva et al., 2026).

In the field setting, only 17 respondents consumed alcohol, while 68 did not (Primary study data, 2026). The small size of the exposed group reduced the statistical power to detect an association. The category 'consumes alcohol' also did not distinguish light, moderate, heavy, regular, or occasional consumption. The researchers assume that the absence of an association was due to the small number of respondents who consumed alcohol and the possibility that their consumption frequency was insufficient to produce a meaningful difference. Measuring alcohol consumption using only two categories may also have grouped respondents with very different exposure levels together.

Association Between Exercise and Dyspepsia

The incidence of dyspepsia was 67.2% among respondents who did not exercise and 38.1% among those who exercised (Primary study data, 2026). Statistical testing yielded p=0.035 and OR=3.327 with a 95% CI of 1.195-9.262, indicating a significant association between exercise and dyspepsia in bivariate analysis (Primary study data, 2026). Respondents who did not exercise had 3.327 times greater odds of dyspepsia than respondents who exercised (Primary study data, 2026). Physical activity can support gastrointestinal motility, intestinal gas transit, weight control, sleep quality, and reductions in stress and systemic inflammation (Tavasoli et al., 2025). Research in adults has shown that lower physical activity is associated with increased functional dyspepsia, particularly in individuals with overweight or obesity (Tavasoli et al., 2025). Recent lifestyle reviews also suggest that moderate-intensity exercise may be associated with a lower prevalence of dyspepsia, although available evidence is not fully consistent (García-Cedillo, 2025).

In Step 1 of the multivariate analysis, exercise had p=0.162 and Exp(B)=2.206 and was therefore removed from the model because it was not independently associated with dyspepsia after controlling for dietary pattern, smoking, and stress (Primary study data, 2026). This result suggests that the bivariate association between exercise and dyspepsia may have been influenced by other behaviors. People who exercise regularly may also have better dietary patterns, avoid smoking, sleep better, and manage stress more effectively. The researchers assume that not exercising increased dyspepsia in the initial analysis because physical activity is related to gastrointestinal function and psychological health. However, exercise was not an independent factor because its benefits may be mediated or influenced by dietary pattern and stress. Categorizing exercise only as exercise versus no exercise also did not capture the type, intensity, duration, or frequency of physical activity.

Association Between Stress and Dyspepsia

The incidence of dyspepsia was 76.5% among respondents experiencing stress and 49.0% among those without stress (Primary study data, 2026). Statistical testing yielded p=0.021 and OR=3.380 with a 95% CI of 1.289-8.863, indicating a significant association between stress and dyspepsia in bivariate analysis (Primary study data, 2026). Respondents experiencing stress had 3.380 times greater odds of dyspepsia than respondents without stress (Primary study data, 2026). Functional dyspepsia is currently understood as a disorder of gut-brain interaction, making psychological factors important in symptom onset, perception, and persistence (Aquino-Matus, 2025). Chronic stress can disrupt the hypothalamic-pituitary-adrenal axis, autonomic nervous system function, gastric motility, fundic accommodation, immune responses, and visceral sensitivity (Aquino-Matus, 2025). Stress responses may also increase sensitivity to gastric distension so that normal postprandial sensations are perceived as fullness, pain, nausea, or early satiety (Aquino-Matus, 2025).

Panggabean et al. found a significant association between stress level and dyspepsia recurrence among patients at Dalu X Tanjung Morawa Community Health Center (Panggabean et al., 2025). A study of Emergency Department patients also found an association between stress level and the severity of dyspeptic symptoms (Sinabutar et al., 2025). In multivariate analysis, stress had p=0.084 and Exp(B)=2.469 and therefore did not show a significant association after controlling for dietary pattern and smoking habit (Primary study data, 2026). The reduction in statistical significance may occur because stress is associated with changes in eating behavior, increased smoking, caffeine consumption, and reduced physical activity. Stress may also cause individuals to eat irregularly or choose foods that more readily trigger symptoms.

The researchers assume that stress was associated with dyspepsia in bivariate analysis because it affects gastrointestinal function through the gut-brain axis. However, its effect was no longer significant in the final model because part of the effect of stress may operate through changes in dietary pattern and smoking behavior. The limited sample size may also have prevented the p-value from reaching statistical significance even though Exp(B) still indicated a substantial increase in odds.

Association Between Medication Use and Dyspepsia

The incidence of dyspepsia was 64.3% among respondents who used medication and 59.2% among those who did not (Primary study data, 2026). Statistical testing yielded p=0.952 and OR=1.243 with a 95% CI of 0.378-4.090, indicating no significant association between medication use and dyspepsia (Primary study data, 2026). Several medications, particularly nonsteroidal anti-inflammatory drugs (NSAIDs), may cause dyspeptic complaints through inhibition of cyclooxygenase-1, reduction of mucosa-protective prostaglandins, reduction in mucosal blood flow, and increased susceptibility to gastric erosion or ulceration (Wahidah et al., 2025). The risk of gastrointestinal disorders is higher when NSAIDs are used at high doses, over a long period, or in individuals with a history of gastric disease and other risk factors (Ko et al., 2025).

In this study, only 14 respondents used medication, so the exposed group was relatively small (Primary study data, 2026). The medication-use variable also did not distinguish NSAIDs, antibiotics, corticosteroids, glucose-lowering medications, supplements, or other medicines with different gastrointestinal effects. Duration, dose, frequency, timing of use, and use of gastric-protective medication were also not analyzed. The researchers assume that the absence of an association was more likely due to overly broad measurement of medication use and the small number of medication users. The association may differ if future research specifically measures NSAID use, dose, duration of use, history of gastric disease, and use of acid-suppressive medication.

Candidate Selection for Multivariate Analysis

Variables meeting the $p<0.25$ criterion and entered into multivariate analysis were dietary pattern, smoking, exercise, and stress, whereas age, sex, alcohol, and medication use were not entered into the model (Primary study data, 2026). The use of $p<0.25$ in the initial selection was intended to retain variables that might not yet be significant in bivariate analysis but could potentially act as predictors or confounders when analyzed simultaneously.

In Step 1, exercise had the largest p-value, 0.162, and was therefore removed from the model using backward elimination (Primary study data, 2026). The final model consisted of dietary pattern, smoking, and stress, but only dietary pattern showed a significant association at $p<0.05$ (Primary study data, 2026). These results indicate that lifestyle factors are interrelated and do not operate separately. Smoking and stress can influence meal regularity, food choices, meal timing, sleep, and physical activity, so the magnitude of each variable's effect may decrease when they are entered into the model simultaneously.

Multivariate Logistic Regression Results

In the final model, dietary pattern had p=0.048, Exp(B)=2.789, and a 95% CI of 1.010-7.699 and was therefore the only factor independently associated with dyspepsia (Primary study data, 2026). Respondents with a poor dietary pattern had 2.789 times greater odds of dyspepsia than respondents with a good dietary pattern after controlling for smoking habit and stress (Primary study data, 2026). These findings are supported by a recent meta-analysis showing that food type and consumption patterns are associated with the incidence and symptoms of functional dyspepsia (Ostadsharif et al., 2026). Panggabean et al. also found that dietary pattern was the dominant factor in dyspepsia recurrence after considering lifestyle factors and stress (Panggabean et al., 2025).

Smoking and stress retained Exp(B) values of 2.594 and 2.469, respectively, but were not significant because $p>0.05$ and the confidence intervals included 1 (Primary study data, 2026). This does not mean that smoking and stress play no role at all; rather, the evidence in this study sample was not strong enough to identify them as independent factors. Sample size, respondent distribution, measurement error, and relationships among variables may influence statistical significance. The researchers assume that dietary pattern became the dominant factor because food has direct contact with and direct effects on the stomach at every meal. Food and consumption patterns can trigger

disturbances in gastric emptying, gastric accommodation, gastrointestinal secretion, and mucosal sensitivity that produce dyspeptic symptoms (Wang et al., 2025; García-Cedillo, 2025).

Ability of the Model to Explain Dyspepsia Incidence

The Nagelkerke R Square value of 0.140 indicates that dietary pattern, smoking, and stress explained 14.0% of the variation in dyspepsia incidence (Primary study data, 2026). The remaining 86.0% of variation was influenced by factors not included in the study model (Primary study data, 2026). The model's relatively low explanatory ability is understandable because dyspepsia is a multifactorial condition influenced by impaired gastric accommodation, delayed gastric emptying, visceral hypersensitivity, mucosal immune activation, microbiota changes, psychological factors, and environmental factors (Wang et al., 2025). Other factors to consider include H. pylori infection, body mass index, sleep quality, anxiety, depression, coffee and caffeine consumption, spicy or fatty foods, history of gastritis, and NSAID use (Tack et al., 2025; García-Cedillo, 2025; Wahidah et al., 2025). The researchers assume that the low R Square was also influenced by the use of simple categories for several variables. Smoking was not measured according to number of cigarettes and duration of smoking; alcohol was not measured according to dose and frequency; exercise was not measured according to intensity and duration; and medication was not separated by type and duration of use.

Probability of Dyspepsia

The highest probability of dyspepsia, 9.37%, was found among respondents with a poor dietary pattern who smoked and experienced stress (Primary study data, 2026). The lowest probability, 0.58%, was found among respondents with a good dietary pattern who did not smoke and did not experience stress (Primary study data, 2026). These results show an increase in probability when several risk factors are present simultaneously. Dietary pattern produced the largest increase in probability because it had the highest regression coefficient and was the only significant variable in the final model (Primary study data, 2026). The biological interaction among food, smoking, and stress may affect gastroduodenal function, mucosal integrity, motility, visceral sensitivity, and the gut-brain axis (Wang et al., 2025). The researchers assume that improving dietary pattern would provide greater benefit when accompanied by smoking cessation and stress management. Nevertheless, these probability values are internal predictions based on the study model and sample characteristics and therefore cannot be applied directly to other populations before model testing and validation.

Research Implications

The findings indicate that patient education should prioritize regular meal timing, smaller meal portions, an appropriate eating pace, and limiting spicy, fatty, caffeinated, and other foods that trigger symptoms (García-Cedillo, 2025). Patients should also receive education about smoking cessation, regular physical activity, stress management, sleep quality, and safe use of NSAIDs (Aquino-Matus, 2025; Wahidah et al., 2025). Patients with recurrent complaints or alarm features require further evaluation to distinguish functional dyspepsia from organic causes. Future research should include H. pylori infection, coffee consumption, spicy and fatty food intake, sleep quality, anxiety, depression, body mass index, and the type and duration of medication use to improve the model's explanatory ability (Wang et al., 2025).

CONCLUSION

Most respondents experienced dyspepsia, totaling 51 people (60.0%). Bivariate analysis showed that dietary pattern, smoking habit, exercise activity, and stress were significantly associated with dyspepsia. In contrast, age, sex, alcohol consumption, and medication use did not show significant associations. Multivariate analysis showed that dietary pattern was the only factor independently associated with dyspepsia after controlling for smoking habit and stress. Respondents with a poor dietary pattern had 2.789 times greater odds of dyspepsia than respondents with a good dietary pattern. Therefore, dietary pattern was the most dominant factor associated with dyspepsia in the

Emergency Department of Palembang BARI Regional General Hospital. Dietary pattern, smoking, and stress together explained 14.0% of the variation in dyspepsia incidence, while the remaining 86.0% was influenced by other factors not examined in this study.

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