

ANALYSIS OF DETERMINANTS OF DISPEPSIA AMONG FEMALE TEENAGERS AT THE Modern Islamic Boarding School Darul Ulum

Fitri An Nisa'A¹, Yullyzar², Angga Satria Pratama³

¹ Student of the Nursing Science Program, Faculty of Health Sciences, Abulyatama University, Aceh, Indonesia.

² Lecturer, Nursing Program, Faculty of Health Sciences, Abulyatama University,

³ Lecturer in the Nursing Science Program, Faculty of Health Sciences, Abulyatama University

Correspondence Email: yullyzar_psik@abulyatama.ac.id

Abstract: Dyspepsia is a health problem that is often experienced by various age groups, including adolescents, and can cause serious complications such as stomach ulcers and even cancer if not treated immediately. This condition is more likely to occur in adolescents who live in boarding schools because they have to deal with changes in diet, high levels of stress based on individual perceptions, and irregular sleep patterns. This study aims to determine the effect of knowledge, eating patterns, stress, and sleep quality on the incidence of dyspepsia in adolescent girls *in boarding schools*. The research method used a quantitative approach with a *cross-sectional* design. The population consisted of 53 students diagnosed with dyspepsia, with a sample size of 53 students, using the total sampling technique. Data were collected through DDR, PSS, and PSQI questionnaires and analyzed using the Chi-Square test. The results showed that knowledge ($p=0.001$), diet ($p=0.001$), stress ($p=0.021$), and sleep quality ($p=0.032$) were significantly associated with the incidence of dyspepsia ($p<0.05$). It was concluded that these four factors need to be the main focus in efforts to prevent and treat dyspepsia in *boarding schools*. It is hoped that modern Islamic boarding schools will be able to plan more effective and targeted health programs through education and healthy living behaviors to reduce cases of dyspepsia among female *boarding school* students.

Keywords: Dyspepsia, Adolescent Girls, Knowledge, Dietary Patterns, Stress, Sleep Quality

1. Introduction

Dyspepsia is a disorder of the digestive tract. This disease is generally characterized by pain or discomfort in the pit of the stomach, as well as other symptoms such as nausea, vomiting, flatulence, feeling full quickly, feeling bloated, frequent belching, regurgitation, and a burning sensation that spreads to the chest ⁽¹⁾. Dyspepsia is a health condition that has a serious impact in Indonesia, with an increasing incidence rate, affecting a large part of the population and ranking at the top of the list of most common diseases in various regions in Indonesia. Approximately 20-40% of the world's population experiences dyspepsia, with a fairly high incidence among adolescents due to unhealthy lifestyles and psychological stress ⁽²⁾. Furthermore, dyspepsia ranked 10th in the category of most common diseases among inpatients in hospitals in 2019, with 34,029 patients or 1.59% of the population.

Meanwhile, in Aceh, dyspepsia was the disease with the highest number of cases in the province in 2022, reaching 11,571,000 cases ³. Meanwhile, in the city of Banda Aceh, it was recorded that among the 10 most common diseases treated on an outpatient basis at community health centers in 2023, dyspepsia ranked 9th with a total of 2,543 cases. This figure shows that although dyspepsia is not among the most commonly reported diseases compared to hypertension, diabetes mellitus, or the common cold (), this condition remains a health problem that needs attention ⁽⁴⁾.

Dyspepsia is a digestive disorder influenced by various factors, including lifestyle, psychological aspects, and diet. Some of the main factors contributing to dyspepsia

include irregular eating habits, poor sleep quality, high stress levels, and low health literacy.

Based on preliminary studies conducted through discussions with the leaders of three boarding schools in Banda Aceh (Dayah Modern Darul Ulum, Dayah Modern Babun Najah, and Dayah Terpadu Inshafuddin), only Dayah Modern Darul Ulum has medical personnel in the form of doctors at the School Health Unit (UKS). The presence of medical personnel is important in the diagnosis and treatment of student health problems, including dyspepsia. Therefore, Dayah Modern Darul Ulum was chosen as the research location because the availability of health personnel can provide more accurate data on the effect of access to health services on students' health conditions.

Initial observations at Dayah Modern Darul Ulum Banda Aceh showed that dyspepsia often occurs in boarding school teenagers. Of the total 432 female students (227 junior high school students and 205 high school students), discussions with the School Health Unit (UKS) revealed that the incidence of dyspepsia was higher in female students than in male students. A total of 73 junior high school students and 31 high school students experienced dyspepsia in the 2024-2025 academic year. The high prevalence of dyspepsia in female students may be influenced by a number of factors. Women are more susceptible to this disorder due to hormonal changes during menstruation (progesterone and estrogen), are more sensitive to stress and anxiety, have irregular eating patterns such as dieting to maintain weight and often skip meals, and tend to be more open in reporting symptoms to the UKS supervisor.

Based on the above description, the author is interested in conducting research on "Analysis of Determinants Affecting the Incidence of Dyspepsia in Female Boarding School Students at Dayah Modern Darul Ulum Banda Aceh."

2. Literature Review

2.1 Dyspepsia

Dyspepsia is defined as pain or discomfort centered in the upper abdomen, which may be accompanied by other complaints, such as feeling *full*, bloating, or feeling full quickly, even though you have eaten less than your usual portion (*early satiety*), and is not related to colon function⁵. Dyspepsia is a syndrome that includes a collection of symptoms such as pain or discomfort in the stomach area, such as nausea, vomiting, bloating, feeling full quickly, feeling of fullness in the stomach, and repeated or chronic belching. The symptoms experienced usually vary from person to person⁽⁶⁾.

Based on the above definitions, it can be concluded that dyspepsia is a collection of symptoms of pain or discomfort in the upper abdomen, especially the stomach and duodenum, with symptoms including feeling full, bloating, feeling full quickly, nausea, vomiting, and belching. Dyspepsia is not a disease, but a syndrome that can be recurrent or chronic and is associated with disorders of the upper digestive tract.

2.2 Adolescents

Based on Indonesian Minister of Health Regulation No. 25 of 2014, adolescents are defined as individuals aged 10-18 years. Adolescents are individuals aged 10-19 years who are undergoing physical, mental, emotional, and social development as part of the process of reaching adulthood. Meanwhile, according to the National Population and Family Planning Agency, the adolescent age range is 12-24 years old and unmarried⁽⁷⁾.

2.3 Knowledge

Knowledge is the result of human perception, or the result of a person's knowledge of an object through their senses (eyes, nose, ears, etc.). Naturally, the perception that produces this knowledge is greatly influenced by the intensity of attention and perception of the object⁸. A person's knowledge of an object has varying intensities or

levels. Thus, the more and the better the patient understands their illness, the more they will understand how to change their behavior and why it is necessary. Knowledge can be measured through interviews or questionnaires that ask about the content to be measured from the research subjects or respondents⁽⁹⁾

Good knowledge about dyspepsia is very important for patients experiencing dyspepsia. Good knowledge will encourage patients to maintain a regular diet, reduce spicy foods, avoid carbonated drinks and other foods that cause dyspepsia¹⁰.

2.4 Diet

Diet is an effort to regulate the type and amount of food intake for specific purposes, such as maintaining health, maintaining nutritional status, and preventing or assisting in the healing process of diseases. A healthy diet is based on the principle of balanced nutrition, which is the fulfillment of all nutritional needs in proportion to the body's needs. To meet nutritional needs optimally, it is necessary to consume a varied and diverse range of foods, because the more diverse the types of food consumed, the more complete the nutrients obtained by the body to support overall health⁽⁹⁾.

Diet or food consumption patterns are the types and amounts of food consumed by an individual or group of people at a given time. Habits of consuming foods and beverages such as spicy and sour foods increase the risk of dyspepsia symptoms. A highly acidic environment in the stomach can kill pathogenic organisms ingested with food. However, if the stomach barrier is damaged, the highly acidic environment in the stomach will aggravate irritation of the stomach wall⁽¹⁰⁾.

2.5 Stress

In general, stress can be understood as a condition in which a person experiences pressure, anxiety, and tension. In everyday use, stress is often interpreted as a stimulus or response that requires individuals to adjust themselves. According to Serafino, stress is a condition that arises from the interaction between individuals and their environment, which causes a perception of imbalance between the demands of the situation and the abilities possessed by individuals based on biological, psychological, and social aspects⁽¹⁰⁾. According to Lazarus and Folkman, stress is defined as a physical and psychological reaction to the demands of life that burden a person and disrupt their well-being⁽¹¹⁾.

The three main components of stress include the stimulus that is considered to be the trigger of stress, the individual's response to the stimulus, and the interaction between the two. These three elements provide a comprehensive picture of the nature of stress. Stress occurs when there is a mismatch, either real or perceived, between the demands of a situation and an individual's abilities or resources, whether biological, psychological, or social. In addition to affecting mental health, stress can also increase friction between food and the stomach wall, which can cause irritation or inflammation of the stomach⁽¹²⁾.

Stress levels can be measured using the Perceived Stress Scale (PSS). The PSS is a self-report questionnaire consisting of 10 questions that can evaluate the stress levels of research subjects over the past few months. The questions in the PSS ask about the feelings and thoughts of respondents over the past month. You will be asked to indicate how often you have had these feelings or thoughts by rounding off your answers to the questions.

2.6 Sleep quality

Sleep quality is an individual's ability to stay asleep and get adequate REM and N-REM sleep, so that they feel refreshed and fit when they wake up¹³. Dyspepsia is significantly associated with poor sleep quality. A person's well-being and longevity are influenced by how well they sleep⁽¹⁴⁾. Dyspepsia may be caused by several things, one of which is poor

sleep quality. Stomach discomfort (hyperalgesia) is a result of poor sleep quality caused by disruption of the circadian cycle ⁽¹⁵⁾.

Sleep quality can be assessed using the Pittsburgh Sleep Quality Index (PSQI), which evaluates seven components: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daily sleep function impairment. Poor sleep quality includes short sleep duration, difficulty falling asleep, and frequent waking during the night. The PSQI instrument was chosen to assess the respondents' sleep quality because its questions are easy to understand and widely used in Indonesia.

3. Method

This study used a quantitative approach with a *cross-sectional* design. The population and sample consisted of 53 female students at Dayah Modern Darul Ulum Banda Aceh Junior High School who had been diagnosed with dyspepsia. All of them became the sample using total sampling technique. Data collection was conducted on May 16, 2025, using the DDR, PSS, and PSQI questionnaires. The research data were analyzed using the SPSS program. There were two types of data analysis: univariate analysis to see the frequency distribution of the variables studied and bivariate analysis using *chi-square* to determine the relationship between the independent and dependent variables with a significance value of $p = 0.05$.

4. Results and Discussion

Research Results

Based on the results of data collection for the study, which began on May 16-19, 2025, at Dayah Modern Darul Ulum Banda Aceh with a total of 53 student respondents. The data collection technique was carried out by distributing an 18-question DDR questionnaire, a 10-question PSS questionnaire, and an 18-question PSQI questionnaire. The results of the data collection process are as follows:

Table 1. Frequency Distribution of Respondent Demographic Data

No	Characteristic	Frequency	Percentage (%)
1	Age		
	Early adolescence (10-13 years old)	12	22.64
	Middle adolescence (14-16 years old)	41	77.36
	Late adolescents (17-19 years old)	0	0
2	Education		
	Junior High School	53	100
	High School	0	0
3	Gender		
	Male	0	0
	Women	53	100

Table 2. Frequency Distribution of Respondents Based on Dyspepsia, Knowledge, Diet, Stress, and Sleep Quality at Dayah Modern Darul Ulum Banda Aceh

No	Dyspepsia	Frequency (f)	Percentage
1	Mild	15	28.30
2	Heavy	38	71.70
No	Knowledge	Frequency (f)	Percentage
1	Less	26	49.06
2	Good	27	50.94

No	Diet	Frequency (f)	Percentage
1	Irregular	29	54.72
2	Regular	24	45.28
No	Stress	Frequency (f)	Percentage (%)
1	Mild	10	18.87
2	Moderate	30	56.60
3	Weight	13	24.53
No	Sleep Quality	Frequency (f)	Percentage (%)
1	Good	23	43.30
2	Poor	30	56.60

Table 3. The influence of knowledge, eating patterns, stress, and sleep quality on the incidence of dyspepsia at Dayah Modern Darul Ulum Bnada Aceh

Dyspepsia at Day 1: History Data: Gastric Discomfort								
No	Knowledge	Dyspepsia				Total		p Value
		Mild		Severe				
		F	%	f	%	f	%	
1	Good	15	28.32	12	22.64	27	50.94	0.001
2	Less	0	0.00	26	49.06	26	49.06	
Total		15	28.32	38	71.70	53	100	

No	Diet	Dyspepsia				Number		p Value
		Mild		Severe				
		f	%	F	%	f	%	
1	Regular	12	22.64	12	22.64	24	45.28	0.001
2	Irregular	3	5.66	26	49.06	29	54.72	
Total		15	28.30	38	71.70	53	100	

No	Stress	Dyspepsia				Total		p Value
		Mild		Weight				
		f	%	F	%	f	%	
1	Light	6	11.32	4	7.55	10	18.87	0.021
2	Moderate	8	15.09	22	41.51	30	56.60	
3	Weight	1	1.89	12	22.64	13	24.53	
Total		15	28.30	38	71.70	53	100	

No	Sleep Quality	Dyspepsia				Number		p Value
		Mild		Severe				
		f	%	F	%	f	%	
1	Good	10	18.87	13	24.53	23	43.40	0.032
2	Poor	5	9.48	25	47.12	30	56.60	
Total		15	28.30	38	71.70	53	100	

Discussion

4.1.1 The influence of knowledge on the occurrence of dyspepsia

From the results of the above study conducted on adolescent girls at Dayah Modern Darul Ulum Banda Aceh, it was found that of the 27 respondents who had good knowledge, 15 respondents (28.32%) experienced mild dyspepsia and 12 respondents (22.64%) experienced severe dyspepsia, while of the 26 respondents

who had poor knowledge, most experienced severe dyspepsia. Based on the results of the *Chi-Square* test, the *p-value* was 0.001, indicating that knowledge has an effect on the incidence of dyspepsia. The majority of respondents (77.36%) were in the middle adolescent category, a group that is in the stage of cognitive and emotional development, where understanding of health information has begun to form but is not yet fully mature. In addition, the respondents were still in junior high school, where they were generally just being introduced to basic concepts related to health, which could affect their level of knowledge. The composition of female respondents may also have contributed to these results, because although adolescent girls tend to be more open to health information, they are also usually more critical in assessing their knowledge.

Knowledge is the result of the process of knowing after a person perceives an object through the five senses¹⁶. Good knowledge about digestive health can help individuals prevent dyspepsia, such as regulating diet, avoiding trigger foods, and managing stress.

The results obtained in this study support previous research that students with good knowledge of healthy eating patterns have a 40% lower risk of dyspepsia compared to students with low knowledge¹⁷. Good knowledge of digestive health contributes to individual decision-making to adopt a healthy lifestyle, such as eating regularly, avoiding spicy foods, and managing stress well, all of which can prevent dyspepsia¹⁸. In addition, there is a significant relationship between knowledge about diet and the incidence of dyspepsia among nursing students in Yogyakarta. The study shows that respondents with high knowledge tend to be more aware of healthy eating patterns and are able to avoid foods that trigger dyspepsia⁽¹⁹⁾.

According to the author, the better a teenager's knowledge, the lower their tendency to experience dyspepsia, so it can be concluded that a good level of knowledge plays an important role in preventing and reducing the severity and incidence of dyspepsia. Teenagers with good knowledge tend to have a better understanding of healthy eating patterns, stress management, and the early signs and symptoms of digestive disorders.

4.1.2 The influence of eating patterns on the incidence of dyspepsia

From the results of the above study conducted on female adolescents at Dayah Modern Darul Ulum Banda Aceh, it was found that 29 respondents who had irregular eating patterns, 26 respondents (49.06%) experienced severe dyspepsia and 3 respondents (5.66%) experienced mild dyspepsia. while among the 24 respondents (42.28%) who had regular eating patterns, 12 respondents (22.64%) experienced mild and severe dyspepsia. Based on the results of the *Chi-Square* test, the *p-value* was 0.001, indicating that there is an effect of eating patterns on the incidence of dyspepsia. The characteristics of the respondents were that they were in their mid-adolescence and were still in junior high school. At this stage of development, the ability to manage time and healthy living habits, including eating patterns, is still in the process of formation. In addition, the proportion of female respondents may also influence eating patterns, given that adolescent girls tend to be more susceptible to changes in appetite due to emotional factors, stress, or menstrual cycles.

Irregular eating patterns can increase the risk of dyspepsia because they disrupt the rhythm of gastric acid secretion and digestive function. Eating too quickly,

skipping meals, or consuming high-fat foods can worsen the symptoms of dyspepsia²⁰.

This study shows results that are comparable to previous studies, namely that respondents with irregular eating patterns have a higher risk of experiencing dyspepsia than those with regular eating patterns. The study confirms that regular meal times and food choices are very important in preventing digestive disorders⁽²¹⁾. There is a significant relationship between irregular eating habits and the incidence of dyspepsia in adolescents, where factors such as frequently skipping breakfast, eating late dinners, and eating excessive portions are the main triggers⁽²²⁾.

Based on the observed results, the author assumes that even though the Islamic boarding school has set a schedule of three meals a day, there is a lack of control in monitoring compliance with this schedule, there are no specific staff members assigned to monitor attendance in the dining hall, and appropriate sanctions need to be imposed on respondents who are late or skip meals. As a result, many students choose to delay eating due to busy study schedules, extracurricular activities, or simply snacking in the boarding school canteen at irregular times. A lack of variety in the menu can also affect the quality of their diet, as well as the need for more supervision in the boarding school environment. These conditions reinforce irregular eating patterns, which then have the potential to worsen the symptoms of dyspepsia they experience.

4.1.3 The influence of stress on the occurrence of dyspepsia

From the results of the above study conducted on adolescent girls at Dayah Modern Darul Ulum Banda Aceh, it was found that 30 respondents experienced moderate stress, 22 respondents (41.51%) experienced severe dyspepsia, and 8 respondents (15.09%) experienced mild dyspepsia. while of the 10 respondents (18.87%) who experienced mild stress, 6 respondents (11.32%) experienced mild dyspepsia and 4 respondents (7.55%) experienced severe dyspepsia. Based on the results of the *Chi-Square* test, the *p value* was 0.021, indicating that there was an influence of stress on the occurrence of dyspepsia. In terms of respondent characteristics, most respondents were in the mid-adolescent age range (14-16 years). This age is a phase of complex emotional development, in which adolescents are more sensitive to various pressures, both from their social environment and academics at boarding school. In addition, women are generally more expressive in expressing their feelings and are more vulnerable to stress than men, so this can reinforce the tendency for stress to appear in this group.

Stress affects the digestive system through the brain-gut axis mechanism, which can increase gastric acid secretion and slow gastric emptying. When a person experiences stress, the sympathetic nervous system becomes active and increases the production of stress hormones such as cortisol and adrenaline, which can disrupt gastrointestinal motility, increase gastric acid production, and lower the pain threshold in the gastrointestinal tract²³. Theoretically, the Rome Foundation guidelines state that psychological stress is one of the main factors that exacerbates or triggers functional dyspepsia. Stress management and psychotherapy are recommended as part of the treatment of dyspepsia in addition to pharmacological treatment⁽²⁴⁾.

The findings in this study are in line with previous research results that high stress levels are significantly associated with the incidence of dyspepsia in nursing students²⁵. They found that respondents with severe stress were twice as likely to

experience dyspepsia compared to respondents with mild or normal stress. Emotional stress due to academic workload, family problems, or social pressure contributes to an increase in dyspepsia complaints among adolescents and young adults⁽¹⁾.

The author's assumption based on the results of the analysis of the distribution of stress questionnaire responses shows that the two most dominant questions felt by respondents were number 4 (low self-confidence in overcoming personal problems) and number 5 (the feeling that things often do not go as expected). The high frequency of these two statements indicates that many respondents feel unable to solve the problems they face and are often confronted with situations that are far from their expectations. This combination of helplessness and disappointment increases psychological burden, heightens vulnerability to stress, and thus has the potential to increase overall stress levels and trigger physical complaints such as dyspepsia. The author assumes that the majority of stress conditions in the moderate category may be caused by academic burdens, adjustment to the boarding school environment, and high activity demands. This makes individuals more prone to digestive disorders such as dyspepsia.

4.1.4 The influence of sleep quality on the incidence of dyspepsia

From the results of the above study conducted on adolescent girls at Dayah Modern Darul Ulum Banda Aceh, it was found that 30 respondents experienced poor quality sleep, 25 respondents (47.12%) experienced severe dyspepsia, and 5 respondents (9.48%) experienced mild dyspepsia. while of the 23 respondents who experienced good sleep quality, 10 respondents (18.87%) experienced mild dyspepsia and 13 respondents (24.53%) experienced severe dyspepsia. Based on the results of the *Chi-Square* test, the *p value* was 0.032, indicating that there is an influence of sleep quality on the incidence of dyspepsia. With a *p-value* of 0.032, the characteristics of the respondents were in the 14-16 age range. In mid-adolescence, sleep needs tend to be high, but are often disrupted by biological changes, academic pressure, and daily activities in the boarding school environment. In addition, adolescent girls tend to be more susceptible to sleep disorders due to emotional factors such as stress and anxiety. The combination of developmental phase, gender, and boarding school dynamics is likely to be a contributing factor to the high prevalence of poor sleep quality among respondents.

Poor sleep quality can affect the digestive system through increased sympathetic activity and decreased gastric motility. Adequate and quality sleep can help maintain hormonal balance and gastrointestinal function²⁶.

The results of this study are consistent with previous studies that found a significant relationship between sleep quality and the incidence of dyspepsia among students. Students with poor sleep quality had a three times higher risk of experiencing dyspepsia compared to students with good sleep ⁽²⁷⁾. Sleep disturbances such as insomnia and restless sleep were significantly associated with an increase in the incidence of functional dyspepsia. They found that poor sleep quality increased nerve sensitivity in the stomach, thereby exacerbating dyspepsia symptoms ⁽²⁸⁾.

According to the authors, poor sleep quality not only causes fatigue, but also has a direct impact on the digestive system through neuroendocrine mechanisms and stress responses that can be caused by short sleep schedules and busy nighttime activities. Insufficient or poor sleep can increase the production of stress

hormones and disrupt autonomic nerve function, which can ultimately exacerbate dyspepsia symptoms such as heartburn, nausea, and flatulence.

5. Conclusion and Recommendations

Knowledge, diet, stress, and sleep quality significantly influence the incidence of dyspepsia among female boarding school students at Dayah Modern Darul Ulum Banda Aceh. Recommendations: Regular digestive health education, development of a healthy and regular meal schedule, stress management programs at school, and increased awareness of the importance of sufficient and quality sleep.

References

1. Dewi SP. The effect of emotional stress on the incidence of dyspepsia in adolescents and young adults. *J Health Psychology*. 2021;9(3):210-8.
2. World Health Organization. Global health report on gastrointestinal disorders. Geneva: WHO Press; 2022.
3. Aceh Provincial Central Statistics Agency. Number of cases of 10 diseases in Aceh Province in 2022. Aceh: BPS; 2024.
4. Central Statistics Agency of Banda Aceh City. List of the 10 most common diseases treated on an outpatient basis at community health centers in 2023. Banda Aceh: BPS; 2024.
5. Bayupurnama P. *Dyspepsia & Gastroesophageal Reflux Disease*. Jakarta: EGC; 2020.
6. Zakiyah W, Agustin AE, Fauziah A, Sa'diyyah N, Mukti GI. Definition, causes, classification, and treatment of dyspepsia syndrome. *J Health Sains*. 2021;2(7):978-85.
7. National Population and Family Planning Agency. Guidelines for the development of productive youth. Jakarta: BKKBN; 2020.
8. Notoatmodjo S. *Health behavior science*. Jakarta: Rineka Cipta; 2014.
9. Putri IS, Widyatuti. Stress and functional dyspepsia symptoms in adolescents. *Journal of Mental Health Nursing*. 2019;1(2):203-14.
10. Aprillia S, Arbi A, Andria D. Factors associated with the incidence of dyspepsia in patients in the working area of the Batoh Community Health Center, Banda Aceh City, in 2023. *Tambusai Health Journal*. 2024;5(1):358-64.
11. Aryani F. *Academic stress: an approach and counseling intervention*. Makassar: Edukasi Mitra Grafika; 2016.
12. Yunanda FT. Overview of factors causing gastritis in Tlogowaru Village, Temandang Community Health Center, Tuban Regency. *J Multidisiplin Indones*. 2023;2(8):1742-57.
13. Kozier B. *Fundamentals of Nursing: Concepts, Process, & Practice*. 7th ed., vol. 2. Jakarta: EGC; 2011.
14. Khairunisa, S., & Nasution, H. N. (2024). Sleep Quality is Related to Functional Dyspepsia in Final Year Students of the Faculty of Medicine, University of Muhammadiyah North Sumatra. *Pandu Husada*. 5(3), 28–35
15. Wuestenberghs F, Melchior C, Desprez C, Leroi AM, Netchitailo M, Gourcerol G. Sleep quality and insomnia are associated with quality of life in functional dyspepsia. *Front Neurosci*. 2022;16:82991.
16. Notoatmodjo S. *Health research methodology*. 3rd edition. Jakarta: Rineka Cipta; 2018.
17. Lestari D, Putri A, Sari D. Nutrition knowledge and the incidence of dyspepsia among high school students. *J Gizi Indones*. 2020;8(2):89-97.
18. Putri RA, Hartati S. The relationship between digestive health knowledge and dyspepsia prevention behavior in adolescents. *J Public Health*. 2020;8(2):112-20.
19. Widyastuti N. The relationship between knowledge about dietary patterns and the incidence of dyspepsia among nursing students in Yogyakarta. *Indonesian Journal of Nursing Science*. 2021;9(1):35-42.

20. Tack, J., & Camilleri, M. (2018). Functional Dyspepsia and Irritable Bowel Syndrome. *New England Journal of Medicine*, 378(6), 565–575.
21. Safitri, L., & Handayani, R. (2020). *The effect of dietary patterns on the incidence of dyspepsia among students*. *Journal of Nutrition and Health*, 10(1), 45–52.
22. Rahmawati D. The relationship between irregular eating habits and the incidence of dyspepsia in adolescents. *J Nutrition and Adolescent Health*. 2021;7(2):88-95.
23. Dinan TG, Cryan JF. The microbiome-gut-brain axis in health and disease. *Gastroenterology Clinics*. 2017;46(1):77-89.
24. Drossman DA, Hasler WL. Rome IV—functional GI disorders: disorders of gut–brain interaction. *Gastroenterology*. 2021;160(7):1679-88.
25. Utami R, Nurhidayah L. The relationship between stress levels and the incidence of dyspepsia in nursing students. *J Keperawatan Indones*. 2020;11(2):85-92.
26. Kim H, Lee E, Kim Y. Association between sleep quality and functional dyspepsia. *Sleep Med*. 2018;67:105-12.
27. Pratiwi AR, Astuti N. Relationship between sleep quality and dyspepsia among students. *J Student Health*. 2021;6(1):45-52.
28. Kumar R, Sharma P, Singh A. Impact of poor sleep quality on functional dyspepsia symptoms among college students. *J Gastroenterol Hepatol Res*. 2022;11(4):1023-9.
29. Astuti R, Nugraheni D, Sari R. Prevalence and risk factors of dyspepsia among boarding school adolescents. *J Public Health*. 2021;9(1):45-52.