

Article

Nutrition, BMI and Dysmenorrhea in Adolescent Girls at Lembata's Senior High School 1: A Cross-Sectional Study

Anna Henny Talahatu^{1*}, Maria Magdalena Ina Bewa², Daniela LA Boeky³

¹Faculty of Public Health University of Nusa Cendana; annalahatu@staf.undana.ac.id

²Faculty of Public Health University of Nusa Cendana; mariabewa@gmail.com

³Faculty of Public Health University of Nusa Cendana; danielaboeky@staf.undana.ac.id

*Correspondence: annalahatu@staf.undana.ac.id

Abstract

Background: Dysmenorrhea, which refers to painful menstrual periods, is a widespread gynecological issue that affects teenage girls and may influence their academic achievements and overall quality of life. **Objective:** This research sought to explore the relationship between dietary habits, body mass index (BMI), and the occurrence of painful menstrual periods among teenage girls at Senior High School. **Methods:** A quantitative, cross-sectional approach was employed. The research involved female students between the ages of 15 and 18, who were chosen using stratified random sampling methods. Information regarding nutritional intake was gathered through a validated food frequency questionnaire (FFQ), and BMI was determined using the recorded height and weight measurements. **Results:** Energy intake had no relationship with the incidence of dysmenorrhea, while protein and fe intake were found to be associated with the incidence of dysmenorrhea. (the p-value of protein is 0.006 OR=0.237 and the p-value of fe is 0.004=OR=0.252). BMI has a relationship with the incidence of dysmenorrhea with a p-value = 0.014 OR= 0.811. The research concludes that insufficient nutrition and unusual BMI are strongly linked to the prevalence of dysmenorrhea in adolescent females. **Conclusions:** Encouraging a balanced diet and maintaining a healthy body weight may assist in lowering the risk and effects of dysmenorrhea in teenagers.

Keywords: dysmenorrhea, nutrient intake, BMI, Lembata Regency

1. Introduction

Dysmenorrheais part of the physical growth and development process experienced by adolescent girls. Dysmenorrhea is one of the most common complaints experienced during menstruation and can interfere with activities. Dysmenorrhea can occur due to intense contractions in the uterine muscles due to high levels of a substance called prostaglandin. The higher this substance, the greater the pain that can be felt. In some cases, dysmenorrhea can occur due to abnormalities in the reproductive organs of women who experience it ¹.

Various factors can affect the occurrence of dysmenorrhea, one of which is nutritional status which plays a role in influencing the growth and function of reproductive organs. This nutritional status can be measured using BMI (body mass index)². Women with excess nutrition / obesity can increase the risk of developing primary dysmenorrhea. This is because the more fat in the body, the more prostaglandin levels are formed. The high production of prostaglandins causes uterine contractions to become more intense so that it can increase inflammation and pain experienced during menstruation.

Nutritional status in female adolescents, both lacking (malnutrition) and excessive (obesity) can occur due to an imbalance between nutritional intake and recommended nutritional adequacy³. In the case of dysmenorrhea, several nutrients that are related to dysmenorrhea are calcium, iron and magnesium. Calcium deficiency causes muscles to ⁴be unable to relax after contractions, resulting in muscle cramps, while iron deficiency disrupts hemoglobin formation and anemia occurs. Anemia causes a lack of body resistance to pain during menstruation ⁵.

Dysmenorrheaexperienced by adolescent girls can have a negative impact on disrupting daily activities, especially learning activities at school⁶. Dysmenorrhea causes adolescent girls to have difficulty concentrating, lack enthusiasm, and often makes them

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absent from the teaching and learning process. Therefore, dysmenorrhea experienced by adolescent girls must be treated so that there are no worse impacts⁷.

Based on data from the World Health Organization (WHO) in 2020, it was found that the incidence of dysmenorrhea was 1,769,425 people (90%) of women who experienced dysmenorrhea, 10-15% of whom experienced severe dysmenorrhea⁸. In Indonesia, the incidence of dysmenorrhea is 64.25% consisting of 54.89% primary dysmenorrhea and 9.36% secondary dysmenorrhea⁹. There are no exact figures regarding the number of dysmenorrhea sufferers. This is because many women who experience dysmenorrhea do not report or do not visit health service centers. The feeling of shame or the tendency to underestimate certain diseases in Indonesia cannot be ascertained absolutely. It can be said that 90% of Indonesian women have experienced dysmenorrhea¹⁰.

SMA Negeri 1 Nubatukan is one of the schools located in Lewoleba Selatan Village, Nubatukan District, Lembata Regency. Based on a preliminary survey conducted on 10 female teenagers in grade XI of SMA Negeri 1 Nubatukan, the results showed that the 10 teenagers had experienced dysmenorrhea, where seven experienced moderate pain and three others experienced severe pain. Of the 10 teenagers who experienced dysmenorrhea, five of them said that they had difficulty concentrating on lessons at school, and two teenagers often left school if the pain they felt was unbearable.

Based on the description above, the purpose of this study was to determine the relationship between nutritional intake and BMI with the incidence of dysmenorrhea in female adolescents at SMA Negeri 1 Nubatukan, Lembata Regency..

2. Materials and Methods

The design of this study is an analytical survey using a Cross Sectional approach. This study was conducted at SMA Negeri 1 Nubatukan, Lembata Regency from June 2022 to July 2022. The population in this study were all female high school students in grade XI at SMA Negeri 1 Nubatukan, Lembata Regency, totaling 226 people. The sample in this study amounted to 133 people obtained using a formula in accordance with the cross sectional research design. The sampling technique was taken by cluster sampling or sampling in groups/clusters. Sampling was carried out based on class, where samples would be taken from several classes in grade XI of SMA Negeri 1 Nubatukan.

The types of data used in this study are primary and secondary data. The instruments used include questionnaires, mictotoises and scales. The data collected were then processed, and analyzed, namely univariate and bivariate analysis. The results of the study obtained are presented in the form of tables and narratives. rity that provided approval and the corresponding ethical approval code.

3. Results

Respondent Characteristics

Table 1. Distribution of Respondents Based on Respondents' Age and Education Age, Food Expenditure, Energy Protein Fe Intake, Body Mass Index and Dysmenorrhea

Variables	n	%
Age		
16 years	68	51
17 years	58	44
18 years	7	5
Parent Education		
Low	55	41
Tall	78	59
Food Expenditure		
Enough	76	57
Not enough	57	43
Energy Intake		
Enough	114	85
Not enough	19	15
Protein Intake		
Enough	62	47
Not enough	90	53
Fe intake		
Enough	43	32
Not enough	90	68
Body Mass Index		
Normal	106	80
Malnutrition	27	20

Variables	n	%
Dysmenorrhea Occurrence		
<i>Dysmenorrhea</i>	113	85
No dysmenorrhea	20	15

Table 1. Shows that the age distribution of respondents is the most at the age of 16 years (51%) and the least at the age of 18 years (5%). It is also known that most of the parents of respondents are highly educated, namely at the high school and bachelor's level (59%). Family food expenditure is on average sufficient (57%), energy intake is mostly sufficient (85%), protein intake is still lacking (53%) and iron intake is mostly still lacking (68%). Body mass index is mostly normal (80%), and on average (85%) respondents have experienced dysmenorrhea

4. Discussion

4.1 Family Characteristics (Parental Education, Food and Non-Food Expenditure) of Adolescent Girls at SMA Negeri 1 Nubatukan, Lembata Regency

Based on the research results, the average education of parents (mothers) of female adolescents at SMA Negeri 1 Nubatukan, Lembata Regency is relatively high, namely 59% at the high school-bachelor's level, and 41% at the elementary-junior high school level. The level of parental education indirectly influences the habit of managing family expenses, namely food and non-food expenses. The higher the education, the mother is assumed to have the mindset to prioritize food needs that are guaranteed in quality. The food expenditure of respondents is known based on the results of the study to be sufficient on average, namely 57% and the other 43% are still lacking. According¹¹ when viewed from the tree of factors that cause nutritional problems, the level of education directly or indirectly is the main problem that also influences the occurrence of nutritional problems, especially in children where the level of education of the mother can affect the level of understanding and knowledge in accessing information about good care for toddlers in order to improve good nutritional status in the child¹².

4.2 Energy, Protein, and Fe Intake of Female Adolescents at SMA Negeri 1 Nubatukan, Lembata Regency

The results of the 2 x 24-hour food recall showed that the average energy consumption of respondents was sufficient, namely 1680-2200 kilocalories (80-110% AKG), where 85% were in the sufficient category while the other 15% were in the insufficient category. This fulfilled energy was obtained more from carbohydrate consumption than from fat and protein consumption¹³. From the results of the food recall, it was also known that the type of staple food most consumed was rice. Staple food consumption is relatively high because a number of respondents are accustomed to consuming staple foods in large quantities. Energy is the result of carbohydrate, fat and protein metabolism. The function of energy is as a source of energy for metabolism, body temperature regulation, growth and physical activity¹⁴. Energy intake in the body is very important, if the energy intake needed by the body is lacking, the body's energy reserves will be used which are stored in the muscles. Lack of energy intake if it lasts for a long time will result in weight loss and other nutritional deficiencies¹⁵. This condition if continued can result in decreased work productivity, decreased learning achievement, and creativity. Continued weight loss will cause malnutrition¹⁶.

Based on the results of the 2 x 24 hour food recall, it is known that the average protein consumption of respondents is still lacking, namely 46-51 grams by 53%, while respondents with sufficient protein consumption are 52-65 grams by 47%. It is also known that the types of protein most consumed by respondents are fish (animal protein) and tempeh (vegetable protein). Protein is an important food intake for the body, because protein is the foundation of cells in humans, which functions as a substance that builds body tissue. Lack of protein intake in adolescents can disrupt the growth of the adolescent's body. If energy intake is lacking, protein intake will be used to meet energy needs, so that protein is not available enough to form new tissue or to repair damaged tissue.

Based on the food recall, the respondents' iron intake is still relatively low, with an average consumption of 10-12 mg (68%). It can be seen from the food recall that the average respondent consumes more rice than meat, fruits and vegetables. The average types of vegetables and fruits consumed are mustard greens and bananas. This consumption pattern can be influenced by many factors, one of which is family income, which if its income is limited will serve simple food without considering the quantity and quality of the food. Basically, a. Normal nutritional status indicates that the quality and quantity of food has met the body's needs. A person who is below normal weight has a

risk of infectious diseases, while a person who is above normal weight has a high risk of degenerative diseases¹⁷.

4.3 The Relationship between Energy, Protein, and Fe Intake with the Incidence of Dysmenorrhea in Adolescent Girls at SMA Negeri 1 Nubatukan, Lembata Regency

The results of statistical tests showed that there was no effect between energy intake and the incidence of dysmenorrhea, while protein and iron person's nutritional status is determined based on nutritional consumption and the body's ability to use these nutrients intake had an effect on the incidence of dysmenorrhea¹⁸ with a p-value of protein intake of 0.006 and iron intake of 0.004¹⁹. The results of this study are in line with research²⁰ where there was no significant relationship between energy intake and the incidence of dysmenorrhea.

Research conducted by²¹ concluded that the level of protein adequacy has no significant relationship to the degree of primary dysmenorrhea. Protein is one of the nutrients that can be obtained from food and drink. Protein in the body plays an active role in supporting the development and growth process, the formation of erythrocytes, endurance, hormones, enzymes, transport tools, muscle and membrane formation. The amino acid tryptophan can stimulate the release of endorphins and serotonin which can activate the analgesic system of the brain by inhibiting prostaglandins so that it can reduce primary dysmenorrhea pain. Isoleucine is needed by the body to help form hemoglobin and muscle strength. If hemoglobin levels are high in red blood cells, the oxygen carried and circulated throughout the body is also high, so that oxygen can be distributed optimally to the blood vessels in the reproductive organs that experience vasoconstriction so that it can reduce primary dysmenorrhea.

The results of this study are in line with research conducted by²² where there was a significant relationship between iron intake and the incidence of dysmenorrhea with a p-value of 0.014. Iron plays a role in the formation of hemoglobin. Lack of iron intake can disrupt the formation of hemoglobin, so that the amount of hemoglobin in red blood cells will decrease. Low hemoglobin conditions in red blood cells will cause anemia²³. In addition, hemoglobin also functions to bind oxygen which will be circulated throughout the body. If hemoglobin is lacking, then only a little oxygen is bound and circulated throughout the body, as a result oxygen cannot be distributed to the blood vessels in the reproductive organs that experience vasoconstriction, which will cause pain.

The relationship between BMI and the incidence of dysmenorrhea in adolescent girls at SMA Negeri 1 Nubatukan, Lembata Regency. It is known that of the 27 respondents with malnutrition, all of them have experienced dysmenorrhea. The results of the study between BMI and the incidence of dysmenorrhea showed that there was a significant influence between BMI and the incidence of dysmenorrhea in female adolescents at SMA Negeri 1 Nubatukan, Lembata Regency with a p-value of 0.014. The results of this study are in line with the research conducted by²⁴ where there was a significant relationship between BMI and the incidence of dysmenorrhea with a p-value of 0.001.

In a person with a body mass index above normal, the concentration of serum sex hormone binding globulin (SHBG) which inactivates estrogen will decrease, resulting in an increased percentage of free serum estradiol, and SHBG decreases or there is an increase in serum estrogen which has the potential to increase estrogen stimulation to the endometrium, encouraging tissue proliferation that produces prostaglandins, especially PGF 2 α which will trigger excessive uterine contractions resulting in dysmenorrhea^{25,26}.

In underweight, it will affect the function of reproductive organs, which will have an impact on the decline in reproductive function and as a result, there will be disorders in the hypothalamus. If gonadotropin levels decrease, the secretion of FSH (Follicle Stimulating Hormone) and estrogen and progesterone hormones will also decrease, where low progesterone levels cause the formation of many prostaglandins so that uterine muscle contractility increases and dysmenorrhea occurs²⁷⁻²⁸.

5. Conclusions

The education of parents of teenage girls at SMA Negeri 1 Nubatukan, Lembata Regency is classified as good, namely 59% at the SMA-Bachelor level. Energy intake in female adolescents at SMA Negeri 1 Nubatukan, Lembata Regency is generally good at 85%. Protein intake of 53% of them is not sufficient, and Fe intake of 68% is in the insufficient category. There is no influence between energy intake and the incidence of dysmenorrhea, while protein and iron intake have an influence on the incidence of dysmenorrhea in female adolescents at SMA Negeri 1 Nubatukan, Lembata Regency. There is a significant influence between BMI and the incidence of dysmenorrhea in female adolescents at SMA Negeri 1 Nubatukan, Lembata Regency.

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7. Conflicts of Interest

“The authors declare no conflict of interest.”

References

1. Nurwana N, Sabilu Y, Fachlevy AF. Analisis faktor yang berhubungan dengan kejadian disminorea pada remaja putri di SMA Negeri 8 Kendari Tahun 2016. Haluoleo University; 2017.
2. Mohajan D, Mohajan HK. Body mass index (BMI) is a popular anthropometric tool to measure obesity among adults. *J Innov Med Res*. 2023;2(4):25–33.
3. Manyanga T, El-Sayed H, Doku DT, Randall JR. The prevalence of underweight, overweight, obesity and associated risk factors among school-going adolescents in seven African countries. *BMC Public Health*. 2014;14:1–11.
4. Kho KA, Shields JK. Diagnosis and management of primary dysmenorrhea. *Jama*. 2020;323(3):268–9.
5. Donnez J, Carmona F, Maitrot-Mantelet L, Dolmans M-M, Chapron C. Uterine disorders and iron deficiency anemia. *Fertil Steril*. 2022;118(4):615–24.
6. Halitopo Y. The relationship of the dysmenorrhea a in students with learning activities. *Sci Midwifery*. 2022;10(5):4149–54.
7. Yasar O. Dysmenorrhea Experiences of Young Girls: A Phenomenological Study. *Int J Caring Sci*. 2021;14(2):1343–51.
8. Serrahima C, Martínez M. The experience of dysmenorrhea. *Synthese*. 2023;201(5):173.
9. Kemenkes RI. Buku Saku Hasil Survei Status Gizi Indonesia (SSGI) 2022. 2023.
10. Anurogo D, Wulandari A. Cara jitu mengatasi nyeri haid. *Yogyakarta Andi*. 2011;194.
11. Supariasa I. Pendidikan dan konsultasi gizi. 2012;
12. Marinković B, Čorluka B, Vukajlović M, Bjelica B, Aksović N, Bubanj S, et al. The Relationship Between Psychological Factors and Nutritional Status in Adolescence. *Children*. 2024;11(11):1365.
13. Raben A, Agerholm-Larsen L, Flint A, Holst JJ, Astrup A. Meals with similar energy densities but rich in protein, fat, carbohydrate, or alcohol have different effects on energy expenditure and substrate metabolism but not on appetite and energy intake. *Am J Clin Nutr*. 2003;77(1):91–100.
14. Parker J. Glucose metabolism, energy production and regulation of cellular and whole-body metabolism. *J Australas Coll Nutr Environ Med*. 2020;39(1):29–33.
15. Kondrup J, Johansen N, Plum LM, Bak L, Larsen IH, Martinsen A, et al. Incidence of nutritional risk and causes of inadequate nutritional care in hospitals. *Clin Nutr*. 2002;21(6):461–8.
16. Parrott J, Frank L, Rabena R, Craggs-Dino L, Isom KA, Greiman L. American Society for Metabolic and Bariatric Surgery integrated health nutritional guidelines for the surgical weight loss patient 2016 update: micronutrients. *Surg Obes Relat Dis*. 2017;13(5):727–41.
17. Petrakis D, Margină D, Tsarouhas K, Tekos F, Stan M, Nikitovic D, et al. Obesity-a risk factor for increased COVID-19 prevalence, severity and lethality. *Mol Med Rep*. 2020;22(1):9–19.
18. Bajalan Z, Alimoradi Z, Moafi F. Nutrition as a potential factor of primary dysmenorrhea: a systematic review of observational studies. *Gynecol Obstet Invest*. 2019;84(3):209–24.
19. Krabbe P. The measurement of health and health status: concepts, methods and applications from a multidisciplinary perspective. Academic Press; 2016.
20. Sundari N, Sari DNA, Timiyatun E, Kusumasari V. Dietary habit is associated with dysmenorrhea among adolescent. *Str J Ilm Kesehat*. 2020;9(2):1359–69.
21. Rahayuningsih D, Melani V, Angkasa D, Harna H, Nadiyah N. The Correlation of Animal Protein and Calcium Adequacy Level, Stress Level with Exercise Habits towards Primary Dysmenorrhea Pain in Female Students of SMAN 1 Sukabumi City. *Amerta Nutr*. 2023;7(4).
22. Muawanah N, Kurniawati M, Alamsyah PR, Widhi, Anisa SekaMuawanah N, Kurniawati M, Alamsyah PR, et al. IRON INTAKE AND STRESS LEVEL WITH PRIMARY DYSMENORRHEA IN HIGH SCHOOL STUDENTS. *Natl Nutr Journal/ Media Gizi Indones*. 2025;20(1).
23. Syamsudi NA, Mayasari NR, Solihah LA. Stress, physical activity, and dietary intake are associated with dysmenorrhea among female students. *Indones Midwifery Heal Sci J*. 2024;8(3):289–99.
24. Janapriya GR, Antari NKAJ, Wahyuni N. Relationship between hemoglobin level and incidence of primary dysmenorrhea among high school students. *Phys Ther J Indones*. 2024;5(2):151–8.
25. Fu Q, Yang J, Jiang H, Lin S, Qin H, Zhao J, et al. Effect of photobiomodulation on alleviating primary dysmenorrhea caused by PGF2α. *J Biophotonics*. 2024;17(5):e202300448.
26. Núñez-Troconis J, Carvallo D, Martínez-Núñez E. Primary Dysmenorrhea: pathophysiology. *Invest Clin*. 2021;4:378–406.
27. Barcikowska Z, Rajkowska-Labon E, Grzybowska ME, Hansdorfer-Korzon R, Zorena K. Inflammatory markers

- in dysmenorrhea and therapeutic options. *Int J Environ Res Public Health*. 2020;17(4):1191.
28. Fajrin I, Alam G, Usman AN. Prostaglandin level of primary dysmenorrhea pain sufferers. *Enfermería Clínica*. 2020;30:5–9.