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STRESS, PHYSICAL ACTIVITY, AND DIETARY INTAKE ARE ASSOCIATED WITH DYSMENORRHEA AMONG FEMALE STUDENTS

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Abstract

Background: The estimated prevalence of dysmenorrhea ranges from 45% to 93% of women of reproductive age. Approximately 10–15% of women complain about severe pain, resulting in a negative impact on their daily activities. Factors that cause dysmenorrhea are physical activity, nutritional status, dietary intake, stress, and body mass index. This study explores the prevalence of dysmenorrhea and investigates its correlation with physical activity, stress, and Dietary Intake among female students studying nutrition in Universitas Negeri Surabaya, Indonesia. **Method:** This research was cross sectional analytic descriptive study with minimum sample size of 114 female students. Primary data was collected using a set of questionnaires. Dysmenorrhea pain was assessed using the Numeric Rating Scale (NRS). Stress levels were measured by employing the Depression Anxiety Stress Scales 42 (DASS 42). Physical activity using The International Physical Activity Questionnaire (IPAQ). Dietary data including intakes of energy, iron, folate, and B12 was assessed using non-consecutive 3x24 hours food records, representing 2 weekdays and a weekend. The data were analyzed using chi-square for category data and one-way anova for continuous data. **Result:** Dietary intake especially vitamin B12 (p=0.02) were associated to the level of dysmenorrhea, whereas stress (p=0.36) and physical activity (p=0.82) was not associated of dysmenorrhea. **Conclusion:** This study emphasized the high prevalence of dysmenorrhea among female college students studying Nutrition, revealing important connections between stress, physical activity and dietary intake. Additionally, the research revealed a significant relationship between dietary intake (vitamin B12) and dysmenorrhea.

keyword: stress, physical activity, dietary intake, dysmenorrhea

INTRODUCTION

The overall prevalence of dysmenorrhea ranges between 50% and 90% in various population and it is considered to be one of the major problems in women's health (Matsas *et al.*, 2023). The estimated prevalence of dysmenorrhea ranges from 45% to 93% of women of reproductive age (Petraglia *et al.*, 2017). According to the World Health Organization (WHO), the global prevalence of dysmenorrhea

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ranges from 1.7% to 97%, with a higher prevalence in adolescents. Because it is accepted as a normal aspect of the menstrual cycle and therefore is tolerated, women do not report it and do not seek medical care. The prevalence of dysmenorrhea among adolescents in Indonesia is around 64.25%, consisting of 54.89% primary dysmenorrhea and 9.36% secondary dysmenorrhea (P Hernanto and Polim, 2023). WHO has identified the disease as the primary cause of persistent pelvic pain, which is significant (Matsas *et al.*, 2023). The severity of dysmenorrhea varies among women and usually improves after childbirth. Approximately 10–15% of women complain about severe pain, resulting in a negative impact on their daily activities and requiring absence from school or work (Matsas *et al.*, 2023). The high incidence of dysmenorrhea can have an impact on daily life resulting in a restriction of daily activities, a lower academic performance in adolescents, and poor quality of sleep, and has negative effects on mood, causing anxiety, depression and also interfere with one's activities .

Dysmenorrhea is defined as pain that starts just before menstruation and lasts during this period. The pain is most severe on the first and second days. Menstrual pain is caused by an excessive secretion of prostaglandins, vasopressin and leukotrienes due to uterine contractions (Naraoka *et al.*, 2023). It is caused due to an imbalance in the progesterone, the hormone which causes uterine contractions stimulate the pain response of each individual (Udayar, Jeergiyal and Kruthika, 2022). The pain is induced by menstruation which occurs at the site of the lower abdomen. Its incidence is usually within the first 6-12 months after menarche. It is also observed to occur within the first 2 years of menstruation (Monday *et al.*, 2019). Its aetiology the increase of myometrial production of prostaglandins, leukotrienes and vasopressin (Naraoka *et al.*, 2023). The end of ovulation triggers is the synthesis and accumulation of fatty acids in the cell membrane. Progesterone levels decrease to signal the beginning of menstruation, allowing the release of these fatty acids. One of the synthesised fatty acids is arachidonic acid which is a precursor to the production of prostaglandins like E2, F2α, and leukotrienes (Monday *et al.*, 2019). Prostaglandins derive from arachidonic acid through the enzymatic action of cyclooxygenase and lipoxygenase (Matsas *et al.*, 2023). Effects of the prostaglandins E2 and F2α creates pain due to

increased uterine contractility, decreased uterine blood flow, and increased sensitivity of peripheral nerves, which induce the symptoms of dysmenorrhea (Bajalan, Alimoradi and Moafi, 2019). Another interesting finding that vasopressin leads to ischemic pain by increasing the uterine contractility (Alateeq *et al.*, 2022).

Based on the underlying pathophysiology, there are two types of dysmenorrhea, namely primary dysmenorrhea and secondary dysmenorrhea. Primary dysmenorrhea defined as spasmodic and painful cramps in the lower abdomen that begin shortly before or at the onset of menses in the absence of any pelvic pathology. Its onset occurs mainly during adolescence, within 6 to 24 months after menarche. The pain has a clear and cyclic pattern, which is typically severe during the first day of menses and lasts up to 72 hours (Itani *et al.*, 2022). Secondary Dysmenorrhea is a condition which occurs as a symptom of an existing pelvic pathology. Possible causes of this condition include but are not limited to; Endometriosis, Pelvic inflammatory diseases, adhesions, abscesses, Mullerian anomalies, and ovarian cysts (Monday *et al.*, 2019).

Factors that cause dysmenorrhea are physical activity, nutritional status, dietary intake (Pratiwi, Putri and Wilujeng, 2019), body mass index (BMI) (Naraoka *et al.*, 2023), and stress (Bolkar, Sanap and Shelke, 2023). Physical activity can reduce the risk of menstrual disorders, exercise can be one of the interventions to reduce the risk of dysmenorrhea events. Exercise can be beneficial in order to increase blood flow to the pelvic part and will also stimulate endorphins that act as non-specific analgesics. Exercise can reduce stress, fatigue, and depressive mood that can usually occur in primary dysmenorrhea. The diet that often causes dysmenorrhoea is the pattern of consumption of fast food. They have an impact on increasing the cascade of prostaglandins which result in hypertonus and vasoconstriction in the myometrium so that ischemia occurs (Mentari and Nurwanti, 2022). Deficiency of Vitamins like B1, B2, B5, B12, D and E and omega three adipose acid and folic acid play an important part in painful menstrual cramps as some vitamins part in constricting muscles and conducting whim-whams signals (Bolkar, Sanap and Shelke, 2023). Under stressful conditions, the human body produces excessive estrogen and prostaglandin hormones which causes excessive

contractions in the uterus, resulting in menstrual pain (Triwahyuningsih *et al.*, 2024).

Thus, this study explores the prevalence of dysmenorrhea and investigates its correlation with physical activity, stress, and Dietary Intake among female students studying nutrition in Universitas Negeri Surabaya, Indonesia.

METHOD

In this cross-sectional study, involving 114 female college students who enrolled in Department of Nutrition. This study included young women who had never given birth (nullipara), aged 17–25 years old, and had menstruated. Respondents with a history of reproductive disease or chronic disease, were excluded from the study. The respondent selection was based on cluster random sampling, in which each class contributed to a similar number of participants, ensuring the representativeness of all classes in this study. The number of respondents was calculated to achieve a significance of 0.05. Informed consent was obtained from the respondent prior to recruitment.

Primary data was collected using a set of questionnaires. Dysmenorrhea pain was assessed using the Numeric Rating Scale (NRS) and was categorized into no pain (0), mild pain (1−3), moderate pain (4−6), and severe pain (7−10) (Rodrigues *et al.*, 2022). Stress levels were measured by employing the Depression Anxiety Stress Scales 42 (DASS 42) and were classified into normal (0−14), mild (15−18), moderate (19−25), and severe (26−33) (Makara-Studzińska *et al.*, 2022). The International Physical Activity Questionnaire (IPAQ) was utilized to determine physical activity and its interpretations were divided into mild activities (<600 MET), moderate activities (600−<1500 metabolic equivalents (MET)-minutes/week) and high activities (1500−3000 MET-minutes/week or more) (Triwahyuningsih *et al.*, 2024). Dietary data including intakes of energy, iron, folate, and B12 was assessed using non-consecutive 3x24 hours food records, representing 2 weekdays and a weekend. A briefing on how to administer self-food record intake was carried out before data collection among the respondents assisted by the researcher. Energy and iron intakes were categorized according to Indonesian RDA sufficiency while folate and vitamin B12 intakes were categorized

into lower and equal or more than the mean value. The mean value was used as the cut-off since the distribution of folate and vitamin B12 intakes was skewed to the left and almost all of them were below the RDA.

Data was statistically analyzed using IBM SPSS Statistics ver. 22.0 (IBM Co., Chicago, IL, USA). P-value is analyzed using chi-square for category data and one-way Anova for continuous data. Data categories are presented in quantities and percentages (percentages on the same dysmenorrhea group), while continuous information is presented as mean and standard deviations (SD).

RESULT AND DISCUSSION

A total of 114 respondents were included in the study, as presented in Table 1. The majority of dysmenorrhea, 41.23% experienced moderate pain while mild pain affecting 32.46% of respondents (Table 1). More than half (58.77%) of the respondents had no stress, while 28.95% and 7.89% of the respondents had mild and moderate stress. Among all of them, 114 respondents (39.48%) engaged in moderate physical activity and 24.56% in high physical activity. The vitamin B12 intakes among the respondents were majority below the RDA and thus the classification was made by using mean value as the cut-off.

Table 1. Characteristics of Respondents

Characteristics	***N***	***%***
Body Mass Index (BMI)		
10-14	1	0,9
15-19	45	39,5
20-24	57	50
25-29	9	7,9
30-34	2	1,8
Total Body Fat (%)		
20-24	17	14,9
25-29	52	45,6
30-34	32	28,1
35-39	12	10,5
40-44	1	0,9
Dysmenorrhea		
No pain (0)	10	8.77
Mild pain (1-3)	37	32.46
Moderate pain (4-6)	47	41.23
Severe pain (7-10)	20	17.54
Stress		
normal (0−14)	67	58.77
mild (15−18)	33	28.95
moderate (19−25)	9	7.89
severe (26−33)	5	4.39
Physical Activity		
Mild (<600 MET)	41	35.96

Moderate (600-1500 MET)	45	39.48
High (1500-3000MET)	28	24.56

Furthermore, the stress, physical activity and dietary intakes were compared to examine whether there was any difference in those variables between no pain, mild pain, moderate pain, and severe pain respondents as depicted from Table 2. In general, there was no statistically difference can be found in stress and physical activity between no pain, mild pain, moderate pain, and severe pain groups. Only vitamin B12 that was statistically significant.

Table 2. *Mean (SD)* values of Stress, Physical Activity and Dietary Intakes according to Dysmenorrhea Pain Level

Categories	Dysmenorrhea Pain Level (SD)				
	No pain (n=10)	Mild pain (n=37)	Moderate pain (n=47)	Severe pain (n=20)	*P*
Stress					0,36
Normal	7 (70.0)	26 (70.3)	22 (46.8)	12 (60.0)	
Mild	2 (20.0)	5 (13.5)	20 (42.6)	6 (30.0)	
Moderate	1 (10.0)	4 (10.8)	3 (6.4)	1 (5.0)	
Severe	0 (0.0)	2 (5.4)	2 (4.3)	1 (5.0)	
Physical Activity					0,82
Mild (MET)	2 (20.0)	13 (35.1)	18 (38.3)	8 (40.0)	
Moderate (MET)	4 (40.0)	14 (37.8)	18 (38.3)	9 (45.0)	
High (MET)	4 (40.0)	10 (27.0)	11 (23.4)	3 (15.0)	
Dietary Intake					
Energy (kcal)	1575.99 (333.45)	1520.22 (422.23)	1415.81 (459.48)	1457.16 (374.42)	0,59
Fe (mg)	7.10 (1.43)	7.25 (3.43)	6.68 (2.91)	7.37 (4.20)	0,82
Folate (µg)	114.91 (49.70)	126.51 (80.88)	108.30 (65.70)	113.36 (51.15)	0,68
B12(mcg)	2.49 (1.95)	3.53 (4.40)	1.66 (1.48)	1.65 (0.91)	0,02

This present study aimed to investigate the pain level of dysmenorrhea among female college students who enrolled in Department of Nutrition and to determine if there is any connection between stress level, physical activity level and dietary intake with dysmenorrhea.

The estimated prevalence of dysmenorrhea ranges from 45% to 93% of women of reproductive age (Petraglia *et al.*, 2017). According to the World Health Organization (WHO), the global prevalence of dysmenorrhea ranges from 1.7% to 97%, with a higher prevalence in adolescents. In line with that statement, this

present study suggested that the dysmenorrhea among adolescents remains high, which was 91.23%. Approximately 10–15% of women complain about severe pain, resulting in a negative impact on their daily activities and requiring absence from school or work (Matsas *et al.,* 2023). Indeed, the severe pain level of this present study remains high, which were 17.54%. Moreover, the number of dysmenorrhea in this study was higher if compared to other studies.

The data analysis showed that there were no significant relationship between stress and dysmenorrhea. The same studies also found that there were no significant relationship between the severity of stress and the presence of last menstrual cramps (p=0.745) (Amarullah Ritonga, 2016). There are several possibilities that influenced the outcome of this study. The different method used in this research may be one of the possibilities, stress obtained in this research use DASS-42 is a self-report tool designed to maximize the differences between symptoms of depression and anxiety and to reveal their common features called stress. The procedure used in the long form of questionnaire (DASS-42) analysis was repeated, checking the modified three correlated factors model and the second-order three factors with cross-loading model (Makara-Studzińska *et al.*, 2022).

The data analysis showed that there were no significant relationship between physical activity and dysmenorrhea. The same studies also found that there were no significant relationship between physical activity and dysmenorrhea intensity (p=0.225) (P Hernanto and Polim, 2023). Another research on medical students in Cairo and discovered that there were also no significant relationship between physical activity and dysmenorrhea (p=0.064) (Kamel, Tantawy and Abdelsamea, 2017). There are several possibilities that influenced the outcome of this study. The different method used in this research may be one of the possibilities, physical activity obtained in this research were only a weekly physical activity history and were not differentiated between exercise and non-exercise through the International Physical Activity Questionnaire (IPAQ) that might give rise to recall bias. The studies that are significant were more likely to carry out interventions methods or by doing exercise such as stretching exercises. The IPAQ incorporates daily activities such as mopping, washing, walking as physical activities and did not explore aspects of a certain exercise or sports that were routinely carried out. The

lack of sample variation in this study may also be one of the factors that contributes to the outcome possibilities of this research.

Diet is a way to regulate the quantity of food types so that it can improve the quality of health, psychology, prevention and the process of healing pain (Mentari and Nurwanti, 2022). It has been known that female young adults are at risk to suffer from undernutrition and micronutrient deficiency (Tesema *et al.*, 2021). In line with that statement, this present study suggested that the underweight among reproductive age remains high, which was 48.24%. Indeed, the dietary intake (Fe, Folate, Vitamin B12) among reproductive age remains under RDA, which were 83.33%, 61.4%, and 66.67%. Its show that almost all reproductive age suffering from micronutrient deficiency. In general, micronutrients include necessary vitamins and minerals. Vitamin deficiency is the main contributor towards the cause of menstrual cramps in women and pain during periods. It is also found that a variety of dietary supplement along with Vitamin intake during and after cycles has been found affective in ameliorating the pain. Vitamin B1, B2, B5, B6, B12, D and E are the major contributors in the pain (Bolkar, Sanap and Shelke, 2023). In this study, dietary intake especially vitamin B12 was significantly associated with dysmenorrhea. Deficiency of vitamins B12 and folic acid plays an important part in painful menstrual cramps as some vitamins part in constricting muscles and conducting whim-whams signals. The Muscular system and nervous system are nearly linked in the uterus- the Muscular organ where period cramps be (Bolkar, Sanap and Shelke, 2023).

CONCLUSION AND SUGGESTION

In summary, this study emphasized the high prevalence of dysmenorrhea among female college students studying Nutrition, revealing important connections between stress, physical activity and dietary intake. Additionally, the research revealed a significant link between dietary intake (vitamin B12) and dysmenorrhea. These findings emphasized the importance of considering dietary quality in addressing dysmenorrhea among female college students, suggest the need for personalized dietary and lifestyle interventions in this population. Recommendations for educational institutions include organizing individual

dysmenorrhea counseling activities in collaboration with healthcare providers. Future studies could explore sample variation, research use DASS-42, DASS-21, and also DASS-12.

DECLARATION

Conflict of Interest

There is no conflict of interest in this research.

Authors' Contribution

Nur Anindya Syamsudi, conceptualised and designed the study, prepared the draft of the manuscript and reviewed the manuscript; Noor Rohmah Mayasari, led the data collection in Female Students, advised on the data analysis and interpretation and reviewed the manuscript; Lini Anisfatus Sholihah led the data collection in Female Students, assisted in drafting of the manuscript and reviewed the manuscript.

Ethical Approval

This research was approved by the Ethical Committee of Polytechnic Health Ministry of Surabaya number EA/2209/KEPK-Poltekkes_Sby/V/2024.

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Data Availability

Informed consent was obtained from the respondent prior to recruitment. Primary data was collected using a set of questionnaires.

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