

Effect on calcium intake on pain intensity during menstruation

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ABSTRAK

Latar Belakang: Dismenore atau nyeri haid adalah nyeri yang dirasakan pada saat menstruasi yang ditandai oleh rasa kram dan tertusuk pada perut bagian bawah. Kalsium merupakan salah satu mineral yang mempengaruhi kinerja otot. Kalsium dibutuhkan oleh tubuh untuk proses kontraksi otot pada organ reproduksi saat menstruasi.

Tujuan: Penelitian ini bertujuan untuk menganalisis pengaruh konsumsi kalsium dalam mengurangi nyeri pada remaja.

Metode: Penelitian ini merupakan penelitian observasional terhadap mahasiswa Pendidikan Dokter dengan jumlah responden sebanyak 127 orang. Pengambilan sampel menggunakan simple random sampling. Status asupan konsumsi kalsium diukur dengan membandingkan konsumsi kalsium berdasarkan Recommended Dietary Allowance (RDA) yang diperoleh dengan menggunakan kuisioner Food Recall 24 Hours. Status asupan konsumsi kalsium dikategorikan kurang jika < 960 mg/hari dan cukup jika > 960 mg/hari. Intensitas nyeri haid diukur dengan menggunakan Universal Pain Assessment Tool. Data dianalisis dengan menggunakan uji Chi-square dan Independent-sample t-test.

Hasil: Hasil penelitian ini menunjukkan bahwa rata-rata asupan kalsium $731,46 \pm 211,24$ mg/hari. Sebanyak 73,2% responden mengonsumsi kurang dari 960 mg kalsium per hari. Terdapat hubungan signifikan antara asupan kalsium harian dengan nyeri haid (p -value $< 0,05$). Asupan kalsium lebih rendah pada responden dengan nyeri haid intensitas ringan ($679,82 \pm 179,79$) dibandingkan dengan nyeri intensitas sedang ($835,98 \pm 232,78$).

Kesimpulan: Asupan konsumsi kalsium yang lebih rendah berhubungan dengan tingkat intensitas nyeri haid.

KATA KUNCI: kalsium; dismenore; nyeri haid

ABSTRACT

Background: Dysmenorrhea or menstrual pain generally occurs in adolescents that characterized by such as spasmodic or stabbing pain of lower abdominal. Calcium is one of the essential minerals that can affect the performance of muscles in the body. It needed for the body to contract muscles, including muscles in the reproductive organs during menstruation.

Objectives: To determine the role of calcium intake in reducing menstrual pain among adolescents.

Methods: This study was an observational study of first-semester undergraduate medical students with 127 respondents. Sampling used the simple random sampling method. Calcium intake status was calculated by comparing calcium consumption with the Recommended Dietary Allowance (RDA) of Calcium that collected using Food Recall 24 Hours questionnaire. Calcium intake status then categorized into insufficient if calcium intake is < 960 mg/day and adequate if calcium intake is > 960 mg/day. Menstrual pain intensity was measured using Universal Pain Assessment Tool. Chi-square and independent-sample t-test were used in analyzing data.

Results: Our results showed that the average calcium intake was 731.46 ± 211.24 mg/day. About 73.2% of respondents consumed less than 960 mg per day. There was a statistically association between level of calcium intake daily and menstrual pain (p -value < 0.05). Calcium intake was lower in respondents with mild menstrual pain (679.82 ± 179.79) than moderate pain (835.98 ± 232.78).

Conclusions: *It can be concluded that lower calcium intake had association with severity of menstrual pain.*

KEYWORDS : *calcium; dysmenorrhea; menstrual pain*

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INTRODUCTION

Dysmenorrhea or menstrual pain generally occurs in adolescents; symptoms usually begin 6 to 12 months after menarche. Patients complain of lower abdominal pain, such as spasmodic or stabbing pain that usually occurs during menstruation but can begin a day or two earlier as long as other menstrual symptoms include nausea, vomiting, and diarrhea. (1). Dysmenorrhea is a condition that has an impact on the daily activities and quality of life of adolescents. (2). Dysmenorrhea consists of primary and secondary dysmenorrhea. Primary dysmenorrhea usually occurs in women aged 20 years old and is not associated with gynecological disorders, while secondary dysmenorrhea occurs in women older than 20 years old and is often associated with gynecological abnormalities. (3)(4).

According to WHO, the incidence of primary dysmenorrhea is relatively high in the world. The incidence of primary dysmenorrhea in young women is between 16.8-81%. In several studies, severe pain during menstruation impacts student absenteeism at school/campus and even interferes with daily activities. One-third of adolescents with dysmenorrhea will be absent from school/college or the workplace at least once per menstrual cycle. (2). In some European countries, primary dysmenorrhea occurs in 45-97% of women. (5). The incidence of dysmenorrhea in Indonesia is not known with certainty. Primary dysmenorrhea without pelvic pathology is experienced by 50% of women and severe pain that causes the woman's inability to work for 1 to 3 days each month (6).

Calcium is a substance needed for the body to contract muscles, including muscles in the reproductive organs. When muscles contract, calcium plays an essential role in protein interactions in the body. Lack of calcium causes muscles to be unable to relax after contractions, which can lead to muscle cramps (7). Previous study provided compelling evidence that neuronal calcium signaling involved in the processes that mediated chronic pain (8). Evidence from other study suggests that level of calcium presented positive correlation with the pain threshold (9).

Based on the Recommendation Dietary Allowance (RDA), calcium consumed by adolescents aged 18-20 years old is 1.000 – 1.200 mg/day (10). The average consumption of calcium in adolescents in Italy is only 829 mg/day, and in the UK, it is around 750-900 mg/day from the recommended 800-1000 mg/day (11). Some countries in Asia consume less than 500 mg of calcium per day. On the other hand, countries in Africa and South America generally consume around 400 to 700 mg of calcium per day. (12).

Based on the results of the SEAMIC survey, the calcium intake of Indonesian people is only 254 mg/day. The results of a study of high school students (SMUN) in Bogor, showed that calcium intake from milk and its processed products plus calcium supplements in adolescents was still less than the recommended adequacy rate, which was only 526.9 mg/day or 52.7% of the nutritional adequacy rate (13). Based on the tendency of low calcium intake, which is still less than the Recommended Dietary Allowance (RDA), this study aims to determine the

role of calcium intake in reducing menstrual pain among adolescents.

MATERIAL AND METHODS

Study Design

This research is an analytic study with the cross-sectional method. Respondents consisted of 127 undergraduate students, 6th semester, Faculty of Medicine and Health Sciences, University of Muhammadiyah Makassar. Study took place from October to December 2020. Sampling used the simple random sampling method. The sampling technique is done by first counting the number of subjects in the population, then selecting a sample randomly based on the inclusion and exclusion criteria. Exclusion criteria were samples that did not experience pain during menstruation or suffered from gynecological diseases that caused secondary dysmenorrhea symptoms.

The independent variable in this study was the amount of calcium intake consumed during the previous 24 hours. Calcium intake status was calculated by comparing calcium consumption with the Recommended Dietary Allowance (RDA) of Calcium that collected using Food Recall 24 Hours questionnaire. Calcium intake status categorized into insufficient if calcium intake is < 960 mg/day and adequate if calcium intake is > 960 mg/day (14). The dependent variable in this study is the intensity of pain felt during menstruation as measured by the Universal Pain Assessment Tool (15). Menstrual pain intensity categorized into mild and moderate pain. Data about age group, age of menarche and when was dysmenorrhea happens were collected using a questionnaire.

Statistical analysis

This research was a quantitative study. Our study aims to determine the role of calcium intake in reducing menstrual pain. Categorical data such as age group, age of menarche, when was dysmenorrhea happens, menstrual pain intensity, and calcium intake status were presented in number and percentages. While, numerical data such as pain scale and level of calcium intake were presented as mean and its

standard deviation. Numerical data were normally distributed throughout the study population. Data were obtained directly from interview with respondents using questionnaire. Chi-square test was used to test the difference in proportion of calcium intake status and menstrual pain intensity. An independent-sample t-test was run to determine if there were difference in level of calcium intake between mild and moderate pain. All statistical test were considered as significant if p-value <0.05. The data obtained was processed using SPSS 23 (IBM Corporation, New York, USA) for Macbook.

Ethical clearance

This study was approved by the Health Medical Research Ethics Committee at the Faculty of Medicine and Health Sciences, University of Muhammadiyah Makassar (Makassar, Indonesia) with registration number 035/UM.PKE/X/43/2020.

RESULT AND DISCUSSION

The study included 127 respondents. Data on the characteristics of the respondents can be seen in **Table 1**. Results illustrated in Table 1 shows that most of the menarche experienced at the age older than 12 years old (68.5%). The table also describe that menstrual pain mainly happens on the first day of menstruation (78.7%). In this study, we reported that average level of calcium intake was 731.46 ± 211.24 mg/day. Approximately 73.2% of respondents consumed calcium less than 960 mg/day.

The data obtained reported that the age of menarche mainly was > 12 years (68.5%). Other study found significant differences in menstrual pain regarding the age of menarche. Menarche occurs at an earlier age than causes the reproductive organs not to be ready, and there is still a narrowing of the cervix, which will cause pain during menstruation (16). The study results informed that most menstrual pains occurred on the first menstruation (78.7%). Based on the degree of pain, respondents with mild pain were found the most (66.9%). In addition, the results of the study reported that the number of respondents who consumed calcium 960 mg/day (73.2%) was more than those who consumed

Table 1. Participant's characteristics

Variables	Frequency (n=127)	Percentage (%)	Mean \pm SD
Age (years old)			
18 – 20	92	72.4	
21 – 25	35	27.6	
Age menarche (years)			
\leq 12 years old	40	31.5	
$>$ 12 years old	87	68.5	
Dysmenorrhea happens			
Before menstruation	20	15.7	
1 st day of menstruation	100	78.7	
During menstruation	7	5.5	
Menstrual pain intensity			
Mild pain	85	66.9	3.08 \pm 1.25
Moderate pain	42	33.1	
Pain scale	127		
Calcium Intake (mg/day)			
\leq 960 mg/day	93	73.2	731.46 \pm 211.24
$>$ 960 mg/day	34	26.8	
Calcium intake (mg/day)	127		

Table 2. Correlation between calcium intake with level of menstrual pain

Calcium intake status (mg/day)	Menstrual pain intensity				Frequency		p-Value
	Mild pain		Moderate pain		n	%	
	n	%	n	%			
\leq 960 mg/day	75	88.2	18	42.9	93	73.2	0.000*
$>$ 960 mg/day	10	11.8	24	57.1	34	26.8	

*Data expressed as frequency (percentages) and p-value with Chi-square test

calcium $>$ 960 mg/day (26.8%). As an average, reported calcium intake was 731.46 \pm 211.24 mg/day (Table 1).

A chi-square test for association was conducted between level of calcium intake daily and menstrual pain intensity. All expected cell frequencies were greater than five. On statistical analysis significant association was found between level of calcium intake daily and menstrual pain (p-value $<$ 0.05) (Table 2).

Calcium is one of the essential minerals that can affect the performance of muscles in the body. Low calcium levels in the body can cause hyperactive muscles that cause stomach cramps; taking calcium supplements can help to reduce the possibility of cramps during menstruation. Several studies have reported relationship between calcium intake and menstrual pain. These studies shown that calcium impairment was a contributing factor in increasing

the incidence and severity of menstrual pain. The current incidence of spasms and contraction of the uterine muscles may now associated with lower calcium levels, which can cause pain following a decrease in uterine blood flow (17,18).

A greater percentage of respondents reported mild pain during menstruation (66.9%). An independent-sample t-test was run to determine if there were difference in level of calcium intake between mild and moderate pain. Level of calcium intake was lower in respondents experienced mild pain (679.82 \pm 179.79) than moderate pain (835.98 \pm 232.78), with a statistically difference (p-value $<$ 0.05) (Table 3).

Nutrition could play a supportive role in affecting and maintaining quality of life. As for menstrual pain, it was proven can be relieved with nourish food and supplement (19,20). In a study of 127 female subjects found that dysmenorrhea significantly associated with consumption of more

Table 3. Comparison of level calcium intake between participants that experiencing menstrual pain with mild and moderate pain

Menstrual pain intensity	Frequency (n = 127)	Calcium Intake (mg/day)			p-value
		Mean±SD	Max	Min	
Mild pain	85 (66.9%)	679.82±179.79	1002	342	<0.001*
Moderate pain	42 (33.1%)	835.98±232.78	1082	342	

*Data are expressed in mean±SD, p-value <0.05 for comparison of level calcium intake among mild dan moderate pain with independent-sample t-test

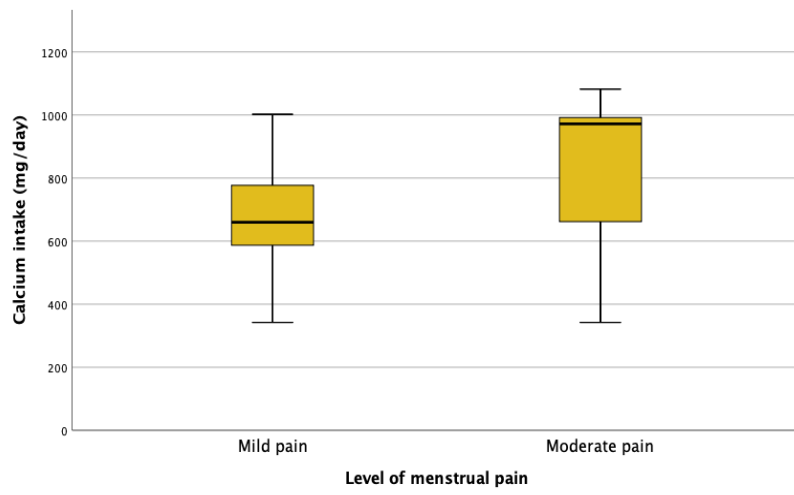


Figure 1. Comparison of calcium intake between participants that experiencing menstrual pain with mild and moderate pain. Respondent with mild pain had significantly lower level of calcium intake than respondent with moderate pain.

servicing of dairy products per day (21). In previous study, menstrual pain can be reduced by consuming 1.2000 mg/day of calcium carbonate (22). Other study had explored the effects of calcium-vitamin D on the pain and blood loss during menstruation. This study indicated that consumption of the calcium-alone was effective in reducing menstrual pain (23).

Because of our limitation, we had no laboratory assessment of calcium status as standard parameter for respondents with mild and moderate pain. This considered as a limitation for this study, Therefore, further studies should consider to check for the calcium status.

CONCLUSIONS AND RECOMMENDATION

Based on our study, the severity of menstrual pain was affected by calcium intake. For most adolescents, it’s recommended to consume at

least 960 mg of calcium per day, in order to reduce menstrual pain. However, further studies with the assessment of calcium status and biochemical parameters are needed.

REFERENCES

1. Osayande AS, Mehulic S. Diagnosis and initial management of dysmenorrhea. *Am Fam Physician*. 2014 Mar;89(5):341–6.
2. De Sanctis V, Soliman A, Bernasconi S, Bianchin L, Bona G, Bozzola M, et al. Primary Dysmenorrhea in Adolescents: Prevalence, Impact and Recent Knowledge. *Pediatr Endocrinol Rev*. 2015 Dec;13(2):512–20.
3. Sachedina A, Todd N. Dysmenorrhea, Endometriosis and Chronic Pelvic Pain in Adolescents. *J Clin Res Pediatr Endocrinol*. 2020 Feb;12(Suppl 1):7–17.

4. Prawirohardjo S. Ilmu Kandungan. H. Wiknjosastro, S. Sumpradja and ABS, editor. Jakarta, Indonesia: Yayasan Bina Pustaka Sarwono Prawirohardjo; 2014.
5. Rogerio Lobo, David Gershenson GL. Gyneology, Comprehensive. Elsevier; 2016.
6. Dito Anurogo AW. Cara jitu mengatasi nyeri haid. P H, editor. Yogyakarta: Yogyakarta Andi; 2011.
7. Sherwood L. Human physiology: from cells to systems. Cengage learning; 2015.
8. Hagenston AM, Simonetti M. Neuronal calcium signaling in chronic pain. *Cell Tissue Res* [Internet]. 2014;357(2):407–26. Available from: <https://doi.org/10.1007/s00441-014-1942-5>
9. Pickering G, Morel V, Simen E, Cardot J-M, Moustafa F, Delage N, et al. Oral magnesium treatment in patients with neuropathic pain: a randomized clinical trial. *Magnes Res*. 2011 Jun;24(2):28–35.
10. Departemen Kesehatan. Permenkes No. 75 tahun 2013 tentang AKG 2013. Indonesia; 2013.
11. Montomoli M, Gonnelli S, Giacchi M, Mattei R, Cuda C, Rossi S, et al. Validation of a food frequency questionnaire for nutritional calcium intake assessment in Italian women. *Eur J Clin Nutr*. 2002 Jan;56(1):21–30.
12. Balk EM, Adam GP, Langberg VN, Earley A, Clark P, Ebeling PR, et al. Global dietary calcium intake among adults: a systematic review. *Osteoporos Int a J Establ as result Coop between Eur Found Osteoporos Natl Osteoporos Found USA*. 2017 Dec;28(12):3315–24.
13. Fikawati S, Syafiq A, Puspasari P, Gizi J, Masyarakat K. Faktor-faktor yang berhubungan dengan asupan kalsium pada remaja di Kota Bandung. 2005;24(1).
14. Taken D, Nursing YN, No Y, No Y, Level A, Exit E, et al. Client ' s 24 □ Hour Diet Recall. Available from: [https://www2.ag.purdue.edu/programs/hhs/efnep/Resource/24 Hour Food Recall.pdf](https://www2.ag.purdue.edu/programs/hhs/efnep/Resource/24%20Hour%20Food%20Recall.pdf)
15. Dugashvili G, Van den Berghe L, Menabde G, Janelidze M, Marks L. Use of the universal pain assessment tool for evaluating pain associated with TMD in youngsters with an intellectual disability. *Med Oral Patol Oral y Cir Bucal*. 2017;22(1):e88–94.
16. Yoshimi K, Shiina M, Takeda T. Lifestyle Factors Associated with Premenstrual Syndrome: A Cross-sectional Study of Japanese High School Students. *J Pediatr Adolesc Gynecol*. 2019 Dec;32(6):590–5.
17. Thys-Jacobs S. Micronutrients and the premenstrual syndrome: the case for calcium. *J Am Coll Nutr*. 2000 Apr;19(2):220–7.
18. Thys-Jacobs S, McMahon D, Bilezikian JP. Cyclical Changes in Calcium Metabolism across the Menstrual Cycle in Women with Premenstrual Dysphoric Disorder. *J Clin Endocrinol Metab* [Internet]. 2007 Aug 1;92(8):2952–9. Available from: <https://academic.oup.com/jcem/article/92/8/2952/2597535>
19. Das B, Samanta S, Mallick AK, Sowmya MK. Serum inorganic phosphorus, uric acid, calcium, magnesium and sodium status during uterine changes of menstrual cycle. *Int J Biomed Res*. 2012;3(4):209–13.
20. Saei Ghare Naz M, Kiani Z, Rashidi Fakari F, Ghasemi V, Abed M, Ozgoli G. The Effect of Micronutrients on Pain Management of Primary Dysmenorrhea: a Systematic Review and Meta-Analysis. *J caring Sci*. 2020 Mar;9(1):47–56.
21. Abdul-Razzak KK, Ayoub NM, Abu-Taleb AA, Obeidat BA. Influence of dietary intake of dairy products on dysmenorrhea. *J Obstet Gynaecol Res*. 2010 Apr;36(2):377–83.
22. Thys-Jacobs S, Starkey P, Bernstein D, Tian J. Calcium carbonate and the premenstrual syndrome: effects on premenstrual and menstrual symptoms. *Premenstrual Syndrome Study Group*. *Am J Obstet Gynecol*. 1998 Aug;179(2):444–52.
23. Zarei S, Mohammad-Alizadeh-Charandabi S, Mirghafourvand M, Javadzadeh Y, Effati-Daryani F. Effects of Calcium-Vitamin D and Calcium-Along on Pain Intensity and Menstrual Blood Loss in Women with Primary Dysmenorrhea: A Randomized Controlled Trial. *Pain Med*. 2017 Jan;18(1):3–13.