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ORIGINAL RESEARCH

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DARK CHOCOLATE'S EFFECT ON MENSTRUAL PAIN IN LATE ADOLESCENTS

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Abstract

Background: Menstrual pain can be severe enough to interfere with everyday activities for a few days every month, particularly in activities in homes and schools for late adolescents. Dark chocolate is considered effective in reducing menstrual pain. However, little is known about its effect.

Objective: This study aimed to examine the effect of dark chocolate on menstrual pain in late adolescents.

Methods: This was a true experiment study with randomized pretest-posttest with control group design. This study was conducted from September to November 2016 at the Bhakti Husada Boarding School of Poltekkes Kemenkes Semarang. There were 50 samples recruited by simple random sampling, with 25 randomly assigned to the experiment and control group. Numeric Rate Scale (NRS) was used to measure pain. Independent t-test and Mann-Whitney were used to examine the effect of intervention.

Results: There were significant differences in menstrual pain ($p < 0.001$) before and after treatment. The mean of menstrual pain in the treatment group (2.76) was lower than the menstrual pain in the control group (5.36) with $p < 0.001$.

Conclusion: Dark chocolate could reduce menstrual pain significantly in the late adolescents.

Keywords: adolescent; menstrual pain; dark chocolate

INTRODUCTION

A teenager is an individual who has already a mature anatomy and reproductive function. Adolescent puberty is characterized by elevated levels of hormone luteinizing (LH) and follicle stimulating hormone (FSH) so that sex hormones are formed ([Santrock & Santrock, 2007](#)). These hormones mature the reproductive organs such as the ovaries, uterus, vagina, breasts, and the appearance of secondary sexual features such as the appearance of hair on the armpits, genitals, fine hairs on the skin, face and so on. This is also the start of the first menstruation (menarche). Conditions that we then know

that menstruation will be faced by teenagers every month. Discomfort that is felt before the menstrual period and at the time of menstruation will accompany the teenagers despite different cycles and times ([Santrock & Santrock, 2007](#)).

Menstrual pain or dysmenorrhea is stiffness or seizures in the lower abdomen due to menstruation and production of prostaglandin substances that occur at the time of or during menstruation ([Widyastuti, Rahmawati, & Purnamaningrum, 2009](#)). Usually, pain is felt in the day before the menstrual period and

lasts for two days or until the end of menstruation. The prevalence of menstrual pain vary between 15.8 – 89.5%, with the high prevalence is in teenager ([Llewellyn-Jones, 2005](#)).

Data in Indonesia showed that primary menstrual pain is experienced by 60-75% of young women, with three-quarters of these suffering from mild to moderate pain and a further quarter of severe pain. The effects of primary menstrual pain include activity disorders such as high absence rates from school work, social life limitations, academic performance, and sport activities. The problem of dysmenorrhea also affects the decrease of quality of life due to not attending school or work ([Parker, Sneddon, & Arbon, 2010](#)). It also affects economic loss in women of childbearing age, and affects the national economic loss due to the decreasing quality of life. It can also cause infertility and impaired sexual functioning if untreated, depressed, and alteration of cardiac autonomic activity ([Stoelting-Gettelfinger, 2010](#)). Severe menstrual pain often disrupts women's activities and abilities in their daily activities and functions in homes, schools and workplaces. Dysmenorrhea can affect women's reproductive systems for years. In some teenagers, primary dysmenorrhea is a torture that must be experienced every month, so adolescents should be able to search the right solution to overcome them.

Some ways can be done to overcome the symptoms of discomfort during menstrual period, and the treatment is given by looking at the severity of symptoms caused, usually in the form of pharmacological and non-pharmacological therapy. Some of the things that can be done to deal with the pain of menstruation are using drug therapy, psychotherapy, lifestyle changes, and healthy diets such as consumption of vegetables, fruits, complex carbohydrates, exercise, adequate rest, avoidance of alcohol, high-fat foods, mineral therapy, vitamins and drugs ([Elvira, 2010](#)).

Science related to dysmenorrhea is still inadequate to provide specialized clinics, examining the potential benefits or risks to the

community about interventions such as the example above. However, there is an increasing interest in the use of herbs outside medical therapy derived from traditional Western countries. There is also evidence to suggest that not all herbs are safe and concern about undesirable side effects ([Puspitasari & Novia, 2008](#)). One therapy that can be used as an alternative to overcome the pain during pre-menstruation and menstruation time is dark chocolate.

Dark chocolate contains many benefits in the health field. Substances contained in chocolate are rich in vitamin A, B1, C, D, and vitamin E. In addition, chocolate also contains anti-oxidants of phenol and flavonoids, rich in minerals such as calcium, potassium, iron, a little omega 3 and 6, and high magnesium ([Nurazizah, Tih, & Suwindere, 2015](#)), which can reduce menstrual pain and premenstrual occurrence in women. Chocolate, in all of its forms, starts at the same source: the *Theobroma cacao* tree that has been cultivated over 3,000 years ago by Native Americans of Central and North America of South America ([cacaoweb, 2016](#)).

The direct effect of magnesium will put pressure on the blood vessels and will help to regulate the entry of calcium into the smooth muscle cells in the body, so that it can affect the occurrence of contraction, stress and relaxation of smooth muscle of the uterus. Therefore, changes that occur in dietary habits tend to modulate the metabolic status of individuals who have a free lifestyle that is closely related to long-term health consequences. Dark chocolates can reduce menstrual pain because it has a variety of ingredients that qualify as a person ([Arfailasufandi, 2015](#)). Data obtained from the Community Health Center of Pandanaran showed that the incidence of women who came with menstrual pain amounted 31 patients in 2015. Of the 31 patients, 11 patients were teenagers. At the time the patient check, particularly patients who are still in school, must be accompanied by one of her parents and ask permission not to attend the school. Thus, the perceived pain interferes with their activity. The therapy used is in accordance with the standards of the health center, i.e. the provision of Fe tablets, Vitamin

K and mefenamic acid, but not yet for the consumption of dark chocolate.

Preliminary study conducted on 20 female students living in Bakti Husada Dormitory of Poltekkes Kemenkes Semarang in March 2016 found that 10 people (50%) said experiencing menstrual pain every month, especially from the first day until the second menstrual period. Because they have not received the materials in the lectures on pain management and reproductive health, students overcome their pain with sleep, rest and some people drink yogurt or tamarind. Although the pain does not affect their attendance to school, but almost all respondents stated that they have activity disorder when experiencing menstrual pain. Therefore, with this phenomenon and the benefit of dark chocolate. This study aimed to examine the effect of dark chocolate on menstrual pain in teenagers.

METHODS

Study Design

This was a true experiment study with randomized pretest-posttest with control group design.

Setting

This study was conducted from September to November 2016 at the Bakti Husada Boarding School of Poltekkes Kemenkes Semarang.

Research Subjects

There were 50 samples recruited by simple random sampling, with 25 randomly assigned to the experiment and control group. The inclusion criteria of the samples included: 1) young woman aged 18-21 years, 2) experiencing pre-menstrual pain and menstrual pain in the last 3 months, 3) regular menstrual cycle, 4) single, 5) not taking analgesic medication in the last 24 hours, 6) and willing to be a respondent. The exclusion criteria included: young woman diagnosed with certain gynecologic disease or secondary dysmenorrhea, and allergic to chocolate.

Instruments

Numeric Rate Scale (NRS) was used to

measure pain. The 10-point numeric scale ranges from '0' representing one pain extreme (e.g. "no pain") to '10' representing the other pain extreme (e.g. "pain as bad as you can imagine" or "worst pain imaginable") (Judha & Sudarti, 2012). Pain was measured before and after intervention.

Intervention

Intervention was performed by giving dark chocolate as much as 40gr / day during the first 3 days after the menstrual date in the intervention group, with the assistance of an enumerator (a housemother). Dark chocolate was given in the form of a bar that has been processed in a chocolate-making factory in Yogyakarta City. Given immediately after the first day menstruation. While control group was given 40gr / day of milk chocolate during the first 3 days after the menstrual date. Chocolate milk was given because the milk chocolate provided contains only 20% chocolate and the rest is made from other ingredients such as milk, sugar and vegetable fat as well as other ingredients.

Ethical consideration

Ethical clearance research number: 023 / KEPK / Poltekkes-SMG / EC / 2017. Prior to data collection, prospective respondents were given an explanation of the purpose and benefits of research, and asked to sign a written informed consent.

Data Analysis

Descriptive statistics were used in this study to describe the mean and frequency distribution in the experiment and control group. Independent t-test and Mann-Whitney were used to examine the effect of intervention.

RESULTS

Characteristics of the respondents

Table 1 shows that the mean age of the respondents was 18-19 years old in the experiment and control group. There were no significant differences of age, nutrient intake and BMI between the two groups with p-value >0.05. It could be said the characteristics of the respondents between the two groups were homogenous.

Table 1 Characteristics of the respondents based on age, nutrient intake, and BMI

Characteristics of respondent	Experiment group	Control group	p-value
Age			
Mean (SD)	18.20 (0.408)	18.16 (0.374)	
Median	18.00	18.00	0.716
Min	18	18	
Max	19	19	
Nutrient intake			
Carbohydrate			
Mean (SD)	104.18 (26.06)	119.06 (26.38)	
Median	112.2	118.9	
Min	44.8	56.5	0.074
Max	137.9	187.5	
Magnesium			
Mean (SD)	149.75 (72.57)	158.17 (62.36)	
Median	124.7	173.1	
Min	49.7	51.3	0.614
Max	326.1	254.9	
Calcium			
Mean (SD)	211.53 (180.28)	207.84 (96.84)	
Median	162.9	201	
Min	26.5	30.4	0.404
Max	964.2	399.9	
Phosphor			
Mean (SD)	473.01 (158.7)	501.48 (122.3)	
Median	406.4	540.1	
Minimum	205.9	205.9	0.426
Max	766	667.5	
Iron			
Mean (SD)	7.61 (1.07)	6.07 (2.83)	
Median	4.6	7.30	0.573
Minimum	2.0	2.0	
Max	57.2	11.5	
Body Mass index (BMI)			
Mean (SD)	19.44 (2.27)	19.91 (2.01)	
Median	18.90	19.25	0.347
Minimum	16.42	17.09	
Max	24.97	25.89	

Table 2 Menstrual pain in the experiment and control group

Group	Frequency distribution	Pretest	Posttest	p
Experiment	Mean (SD)	7.44 (0.92)	2.76 (1.20)	
	Median	7	3	0.001
	Min	6	1	
	Max	9	6	
Control	Mean (SD)	6.20 (1.04)	5.36 (1.11)	
	Median	6	5	
	Min	5	3	
	Max	8	7	

Table 2 shows that the mean of menstrual pain in the experiment group before given intervention was 7.44 and decreased to 2.76 after given intervention. While in the control group the mean of menstrual pain before given intervention was 6.20 and decreased to 5.36 after given intervention. There was a significant difference in menstrual pain before and after given intervention in the two groups with p-value 0.001 (<0.05). However, the

experiment group shows a higher decrease of pain compared to the control group.

DISCUSSION

Respondent's Characteristic

The age characteristics of both groups were the same. The average age was 18.2 years up to 18.16 years. In this study, the respondent's age was the late adolescent age (18 to 21

years). The late adolescents were selected as respondents because the age group mostly took education in college, and were more prone to experiencing pain during menstruation, with busy activities and easy to stress and lack of a number of nutrients due to have poor diet especially during menstruation, especially minerals and micro substances. Menstrual pain also reduces the concentration of adolescents in learning and daily activities each month.

Food intake of respondents was assessed by processing the daily menu into the *Nutrisurvey 2007* application in cooperation with the nutrition section. The application was used to calculate the amount of nutrients especially carbohydrates, magnesium, calcium, iron and phosphorus consumed. The results obtained show the value or content of respondent's nutrients in accordance with what is consumed. In this study, the average carbohydrate intake of respondents was 104.18 g for the treatment group and 119.06 grams for the control group. Carbohydrates in teenagers needed is 309 grams ([Indonesia, 2013](#)), so it can be seen that the carbohydrate intake in the respondents was still lacking. This is because the respondents who were all women choose to reduce the rice so that their body weight does not rise. Source of respondent carbohydrate comes from basic food such as rice, bread interlude, crackers and others. In this study, carbohydrate consumption of respondents was assessed because carbohydrates are a source of energy that can also contribute high enough calories and sugar that could inhibit the absorption of magnesium and calcium needed by the body during menstruation, so investigated was done whether it has a relationship with the incidence of menstrual pain. However, after calculated using *nutrisurvey2007* application and processed data using SPSS16, it turns out carbohydrate intake in both respondents from the treatment and control group did not have a significant difference so it can be ascertained that the carbohydrate intake of the respondents did not interfere with the absorption of micronutrients magnesium and calcium.

The average of magnesium of respondents for the treatment group was 149.75 mg and

158.17 mg in the control group. At the time of menstruation occurs, women will lose a number of minerals and micronutrients in the body. Magnesium has a natural benefit for reducing menstrual pain. Magnesium can help smooth muscle contraction in the uterus become more relaxed. The need for magnesium in adolescents based on Nutritional Adequacy Rate (AKG) is 300 mg / day. By consuming dark chocolate 69% as much as 40 grams per day is expected to increase the amount of magnesium in the body and reduce pain during menstruation. Dose of dark chocolate 69% as much as 40 gr contains enough magnesium that is equal to 115 mg which will help increase the amount of magnesium in body obtained from food. In the previous study we found out that menstrual pain can be overcome by consuming magnesium as much as 300 mg during pain ([Wulandari & Afriliana, 2017](#)).

In addition to magnesium, a mineral that is important during menstruation is calcium. Calcium is able to activate the nerves and muscle contraction, blood vessel launched during menstruation, reduce cramps and keep balance of body fluids. Giving chocolate to the respondent provides additional calcium in the body of the respondents amounted 32 mg . While the need for calcium in adolescents according to Nutritional Adequacy Rate (AKG) is 1100 mg ([Wulandari & Afriliana, 2017](#)). So consuming dark chocolate in this study did not affect the decrease of menstrual pain in the respondents because of the small amount to be consumed. The results of the analysis of food intake into the assessment material again is iron and phosphorus. Iron and phosphorus become micronutrients that aid in transporting or transporting processes for core minerals such as magnesium and calcium. The results of iron and phosphorus intake of the respondents were found to be less than the coverage of nutritional needs based on AKG.

The average of phosphorus was 473.01 mg for the treatment group and 501.48 for control group, which was not in accordance with the requirement of phosphorus based on AKG that is 700 mg for phosphorus and 13 mg for iron. But after having the addition of phosphorus of dark chocolate consumed

during menstruation, it was able to add as much as 132 mg of phosphorus and 3.1 mg iron. The iron in the treatment group obtained amounted to 7.61 mg and 6.07 for the control group. However, the reduction in menstrual pain indirectly influenced by the consumption of iron and phosphorus. In addition, respondents who experienced menstrual pain in this study had normal nutritional status with an average BMI of 19.44 (treatment) and 19.91 (control).

Menstrual Pain in the experiment and control

The results showed an average of menstrual pain before intervention was 7.44, with maximum pain score of 9 and minimum pain score of 6. After given intervention, the average pain was 2.76, with maximum pain score of 6 and minimum pain score of 1. The mean difference before and after given intervention was 4.68 in the treatment group and 0.84 in the control group.

Pathophysiologically, menstrual pain is also often accompanied by headache, nausea, constipation or diarrhea and frequent urination, and sometimes until vomiting. Symptoms and signs of dysmenorrhea are pain in the lower part that can spread to the lower back and legs. Pain is felt as a loss of cramp or as a continuous dull pain. The giving of dark chocolate decreases menstrual pain in the respondents. This corresponds to the theory of dark chocolate containing complex carbohydrates, antioxidants (flavonoid polyphenols), vitamin B6, unsaturated fatty acids (omega 3 and omega 6) and minerals (magnesium, calcium, iron) that influence in regulating menstrual cycle by balance the levels of the estrogen and progesterone hormones in the blood during the luteal phase during the menstrual cycle ([Speroff & Fritz, 2005](#)).

In a previous study examining the benefits of dark chocolate to reduce menstrual pain stated that the chocolate content of GABA (Gamma-Amino Butyric acid) is an amino acid that has a major function as a neurotransmitter in the central nervous system. Gamma aminobutyric acid inhibits nerve transmission in the brain, calming nervous activity. The 5-hydroxytryptophan creates a sense of comfort

and increase serotonin levels. L-tyrosine gives rise to body-wide relaxation. L-glutamine can be utilized directly by the brain for energy production in brain cells. Thus it can improve brain function and facilitate the utilization of GABA and 5-HTP ([Smith & Smith, 2012](#)). In theory, magnesium has a direct effect on vascular pressure and can regulate the entry of calcium into the smooth muscle cells of the uterus, so magnesium affects contraction and relaxation of smooth muscle of the uterus. Magnesium can also suppress inflammation by inhibiting the formation of prostaglandins. So in the group treated with dark chocolate states menstrual pain is reduced significantly ([Smith & Smith, 2012](#)).

Limitations of the study

The results of this study can only be generalized in Bhakti Husada Dormitory as the setting of the study. At the time of data collection, menstrual conditions in each respondent were not at the same time so that data collection could not be done simultaneously. In addition, to diagnose secondary menstrual pain was difficult if only using anamnesis and screening because it has a low accuracy.

CONCLUSION

In conclusion, there was a significant effect of dark chocolate in reducing menstrual pain in the late adolescents (18-21 years). Therefore, the dark chocolate is recommended to reduce pain in young women during menstruation. Further study is needed to have bigger sample size to generalize the results.

Declaration of Conflicting Interest

None declared.

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Author Contribution

All authors contributed equally in this study.

References

- Arfailasufandi, R. (2015). *Pengaruh pemberian coklat hitam terhadap penurunan nyeri haid pada dismenorhea primer mahasiswi PSIK Muhammadiyah Malang [Effect of giving dark chocolate in reducing menstrual pain of primary dysmenorrhea in students of PSIK Muhammadiyah*

- Malang]. Malang, Indonesia: University of Muhammadiyah Malang.
- cacaoweb. (2016). About cacao beans, cocoa and chocolate. Retrieved January 16, 2016, from <http://www.cacaoweb.net/cocoa-chocolate.html>
- Elvira, S. D. (2010). *Sindrom pra-menstruasi normalkah? [Is pre-menstruation syndrom normal?]*. Jakarta: Balai Penerbit FK UI.
- Ministry of Health of Indonesia. (2013). *Permenkes RI nomor 75 tahun 2013 tentang angka kecukupan gizi yang dianjurkan bagi bangsa Indonesia [Regulation of Ministry of Health of Indonesia no 75 year 2013 on nutritional adequacy rates recommended for Indonesian people]*. Jakarta: Ministry of Health of Indonesia.
- Judha, M., & Sudarti, A. F. (2012). *Teori pengukuran nyeri dan nyeri persalinan [Measurement theory and labor pain]*. Yogyakarta: Nuha Medika.
- Llewellyn-Jones, D. (2005). *Setiap wanita: Panduan terlengkap tentang kesehatan, kebidanan & kandungan [Every woman: Complete guideline for health, midwifery and pregnancy]*. Jakarta: Delapratasa Publishing.
- Nurazizah, E., Tih, F., & Suwindere, W. (2015). Black chocolate consumption reduces subjective symptoms in 18-22 years old females with premenstrual syndrome. *Journal of Medicine and Health, 1*(1).
- Parker, M. A., Sneddon, A. E., & Arbon, P. (2010). The menstrual disorder of teenagers (MDOT) study: Determining typical menstrual patterns and menstrual disturbance in a large population-based study of Australian teenagers. *BJOG: An International Journal of Obstetrics & Gynaecology, 117*(2), 185-192.
- Puspitasari, N., & Novia, I. (2008). Faktor risiko yang mempengaruhi kejadian dismenore primer [Risk factors that influence primary dysmenorrhea]. *Indonesian Journal of Public Health, 4*(3), 96-103.
- Santrock, J. W., & Santrock, J. W. (2007). *Psikologi pendidikan [Educational psychology]* (2nd ed.). Jakarta: Kencana Prenada Media Group.
- Smith, G. Z., & Smith, C. C. (2012). Chocolate candies fortified with natural amino acids and/or herbal nutrients for relief of insomnia, pms, and difficulty concentrating. U.S. Patent Application No. 13/485,864.
- Speroff, L., & Fritz, M. A. (2005). *Clinical gynecologic endocrinology and infertility*. Philadelphia: Lippincott Williams & Wilkins.
- Stoelting-Gettelfinger, W. (2010). A case study and comprehensive differential diagnosis and care plan for the three Ds of women's health: primary dysmenorrhea, secondary dysmenorrhea, and dyspareunia. *Journal of the American Association of Nurse Practitioners, 22*(10), 513-522.
- Widyastuti, Y., Rahmawati, A., & Purnamaningrum, Y. E. (2009). *Kesehatan reproduksi [Reproduction health]*. Yogyakarta: Fitramay.
- Wulandari, S., & Afriliana, F. D. (2017). The effect of consumption dark chocolate against primary dismenore pain for girls teenager at Kkediri 5 high School. *Indian Journal of Medical Research and Pharmaceutical Sciences, 4*(2), 17-24.

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