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The Effectiveness of Consuming Young Green Coconut Water on Dysmenorrhea Pain in Adolescent Girls

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Abstract: Dysmenorrhea, characterized by stabbing menstrual pain, affects up to 90% of women globally, impacting adolescent girls' activities and concentration in school. To manage this pain, both pharmacological and non-pharmacological methods are essential. One accessible non-pharmacological method is consuming young green coconut water. This study aimed to assess the effectiveness of young green coconut water in alleviating dysmenorrhea in adolescent girls. Conducted at five junior high schools on Java and Sumatra from May to June 2024, the quasi-experimental study used a pretest-posttest control group design. The population included 126 female students with dysmenorrhea, with a sample of 56 divided into experimental and control groups. Data were collected using the Numeric Rating Scale (NRS) and analyzed. Results showed that the mean menstrual pain before intervention was 5.18 (moderate pain) in the experimental group and 4.68 (moderate pain) in the control group. Post-intervention, the experimental group's mean pain was 1.00 (mild pain), while the control group's was 3.43 (mild pain). Statistical analysis indicated significant pain reduction in the experimental group ($p = 0.000$). The study concluded that young green coconut water effectively reduces dysmenorrhea pain in adolescent girls. Schools are encouraged to educate students about non-pharmacological pain management methods like this.

Keywords: Adolescent girls; Dysmenorrhea; Pain; Young green coconut water

Introduction

Adolescence is an important stage in human development. One of the biological signs of female adolescents is menstruation. Menstruation is a natural process in adolescent girls, marked by the regular monthly release of blood. Discomfort often occurs during menstruation, especially in women of reproductive age. This condition not only impacts reproductive health but can also affect daily productivity (Rifiana et al., 2021).

Many menstrual disorders are faced by women. These disorders usually cause physical discomfort and can affect their activities. Among the menstrual disorders causing physical discomfort is dysmenorrhea (Irianti, 2018). Dysmenorrhea is pain during menstruation, characterized by stabbing pain (Ilmi et al., 2017).

The prevalence of dysmenorrhea is quite high, with an occurrence rate of up to 90% worldwide. A study conducted in America showed that almost 95% of women suffer from dysmenorrhea (Swandari, 2022). According to the Association of Southeast Asian Nations (ASEAN) in 2018, the prevalence of dysmenorrhea is around 10–15% in Singapore, 35–40% in Malaysia, and 65% in Thailand (Ariendha et al., 2022). In Indonesia, the prevalence of dysmenorrhea is 64%, with 54.89% being primary dysmenorrhea and 9.36% secondary dysmenorrhea (Swandari, 2022).

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Dysmenorrhea includes primary and secondary dysmenorrhea. Primary dysmenorrhea is cramp-like pain in the abdomen with accompanying symptoms such as gastrointestinal pain (stomach), headache, nausea, and vomiting. Secondary dysmenorrhea is a menstrual problem related to pathology and usually occurs years after menarche (Amiritha, 2017). There are direct and indirect causes of dysmenorrhea in adolescent girls. Direct causes include endocrine factors and fibroids, while indirect causes include age at menarche, family history, and exercise habits (Potter et al., 2018).

Risk factors for dysmenorrhea include psychological factors, body mass index (BMI), family history, exercise, age at menarche, menstrual cycle, alcohol intake, and the influence of prostaglandin hormones as evidenced by malondialdehyde levels in the body (Swandari, 2018). Dysmenorrhea decreases with age and disappears on its own (Proverawati, 2017).

However, there is concern that dysmenorrhea can affect the activities of adolescents who are in the learning process at school. Therefore, dysmenorrhea can make adolescent girls feel unwell and difficult to concentrate. Adolescents experiencing dysmenorrhea require treatment to prevent it from worsening. Dysmenorrhea also has psychological impacts such as emotional conflicts, anxiety, and tension. This can create feelings of alienation and discomfort. Even slight discomfort accompanied by anger can quickly escalate into a significant problem (Swandari, 2022).

Dysmenorrhea treatment can be done pharmacologically with pain relievers, hormonal therapy, steroid prostaglandin drugs, and non-pharmacologically with acupuncture, green coconut water, massage or Mozart massage therapy, and relaxation (Wiknjosastro et al., 2017). One way to reduce menstrual pain and dysmenorrhea is through non-drug treatment, specifically green coconut water. Green coconut water contains 14.11mg/100ml of calcium, 9.11mg/100ml of magnesium, and 8.59mg/100ml of vitamin C. The calcium and magnesium in green coconut water reduce muscle tension, and vitamin C is a natural anti-inflammatory. It helps alleviate pain caused by menstrual cramps by inhibiting the cyclooxygenase enzyme involved in the formation of prostaglandin cyclooxygenase enzymes (Abdullah, 2021).

Green coconut water is one of the healthiest, nutrient-rich drinks, containing glucose, vitamins, hormones, and minerals, and does not contain natural preservatives. Green coconut water is easily absorbed by the body because its fluid content is isotonic to the human body (Dehzad et al., 2024; Schiano et al., 2021). Green coconut water can help relax muscles affected by prostaglandin activity since, during menstruation, the damaged endometrium is expelled and replaced with a new one, releasing molecules called prostaglandins. This relationship causes the uterine muscles to contract. When the uterine muscles contract, the blood supply to the endometrium narrows (vasoconstriction), causing menstrual pain. Other substances known as leukotrienes, chemicals involved in the inflammatory response, also increase during this time and are related to menstrual pain development (Abdullah, 2021).

Based on research conducted by Tarigan (2021) on the effect of young coconut water on reducing menstrual pain, a p-value of $0.000 < 0.05$ was obtained. This means that consuming young coconut water is effective in reducing menstrual pain. Rifiana et al. (2021) found that menstrual pain decreased by an average of 2.26 after consuming coconut water. Meanwhile, Nugroho et al. (2021) study found a difference in pain scale reduction between the 1st and 2nd days, with an average reduction of 1.5. The conclusion from these studies is that consuming young coconut water effectively relieves menstrual pain in adolescent girls. In this study, the researcher wants to see the effectiveness of consuming young coconut water in reducing dysmenorrhea pain. The administration of young coconut water in this study was given at 300 cc once a day for 3 days to achieve a more significant pain scale reduction.

An initial survey conducted at SMPN 2 Belat, Karimun Regency, through interviews with 10 female students, found that 2 felt mild pain during menstruation with a pain scale of 1-3, managed by resting; 5 experienced moderate pain with a scale of 4-6, managed with warm compresses and rest; while 3 others experienced severe pain during menstruation with a scale of 7-10, managed by taking pain relievers. Among the 10 respondents experiencing dysmenorrhea pain, none were aware that young coconut water could reduce menstrual pain and had never consumed it during menstrual pain (Baritugo et al., 2023; Fernandes et al., n.d.). Therefore, the researcher is interested in conducting research on the "effectiveness of consuming young green coconut water on dysmenorrhea pain in adolescent girls."

Literature Review

Pain is an unpleasant emotional and sensory experience resulting from tissue damage, which is subjective. Although pain is causal (primary), it is essentially a complex sensation characterized by pain, pressure, and hot/cold sensations. Pain must be understood as a complex emotion, a comprehension that represents a combination of all causal emotional elements (sensitivity to pain and temperature stimuli with little or no differentiation) (Swandari, 2022).

Dysmenorrhea usually occurs in the lower abdomen but can also spread to the lower back, pelvis, calves, and thighs. The pain can be accompanied by more severe abdominal cramps. The cramps result from

strong uterine muscle contractions as menstrual blood exits the uterus. The intensity of these muscle contractions causes the muscles to tense, leading to spasms, pain, and discomfort. The tension in these muscles is not only in the abdominal area but also in the supporting muscles of the lower back, pelvis, calves, and thighs (Sinaga, 2017).

One therapy to reduce menstrual pain is consuming young coconut water. According to Huzaimah (2015), young coconut water contains electrolytes, folic acid, minerals, and vitamins. Blood loss during menstruation can be replaced by folic acid, which supports red blood cell formation. Menstrual cramps are caused by excessive uterine contractions and an imbalance of progesterone and prostaglandin hormones (Asakitogum et al., 2023; Dehzad et al., 2023). The minerals and vitamins in coconut water can stimulate the production of progesterone and prostaglandins. If hormone levels are sufficient, the endometrium's release process will be stimulated and accelerated, and the resulting pain will quickly subside. When the blood flows heavily or continuously, the pain subsides.

According to Widowati et al. (2021), the reduction of dysmenorrhea pain after drinking young coconut water is believed to be due to several factors: Young coconut water offers several benefits that can help alleviate menstrual discomfort. The calcium, minerals, and magnesium present in young coconut water can relax the uterine muscles and prevent abdominal cramps. Additionally, its anti-inflammatory properties may reduce the production of prostaglandin hormones, which helps to lessen pain and inflammation. The vitamin C in young coconut water acts as an antioxidant, aiding in the repair of damaged uterine wall tissues caused by the shedding of the endometrium. Furthermore, the slightly sweet and refreshing taste of young coconut water can help relieve bloating, nausea, and abdominal discomfort (Beal et al., 2023; Rivera-Garcia et al., 2023). It also serves to replenish fluids lost through sweating due to dysmenorrhea, making it a soothing and beneficial beverage during menstrual periods.

Method

The research design used is a quasi-experimental design with a pretest-posttest control group design, which is a semi-experimental study that includes a comparison group (control group) (Notoatmodjo, 2018). This design can be illustrated as follows table 1.

Table 1. Design Research

Pre-test	Treatment	Post-test
O1	X1	O2
O1	X2	O2

Explanation:
O1 = Menstrual pain before the intervention
X1 = Intervention through the consumption of young green coconut water
X2 = Intervention without the consumption of young green coconut water
O2 = Menstrual pain after the intervention

This study was conducted in 5 junior high schools (SLTP) in various regions. The population consists of all female students experiencing dysmenorrhea, totaling 126 students. The sample size was calculated using the Slovin formula (Sujarweni, 2014), which is:

$$\mathbf{n = N / (1 + N.(e)^2)} \quad (1)$$

Explanation:
n = Sample Size
N = Total Population
e = Margin of Error

$$n = \frac{126}{1+126\ (0.1)^2}$$

$$n = \frac{126}{2.26}$$

The sample size was calculated to be 55.8, rounded up to 56 people. The sampling was done using purposive sampling and divided into 2 groups: 28 people in the experimental group and 28 people in the control group.

Data collection was conducted directly using an observation sheet to assess the respondents' pain levels. The pain level was measured using the Numeric Rating Scale (NRS), a simple and easily understood scale, making it more effective for assessments before and after the intervention. The validity and reliability of this pain scale were tested in Flaherty's (2012) study, with validity values ranging from 0.56 to 0.90. The reliability test using Cronbach's Alpha resulted in values between 0.75 and 0.89, indicating that the questionnaire is reliable.

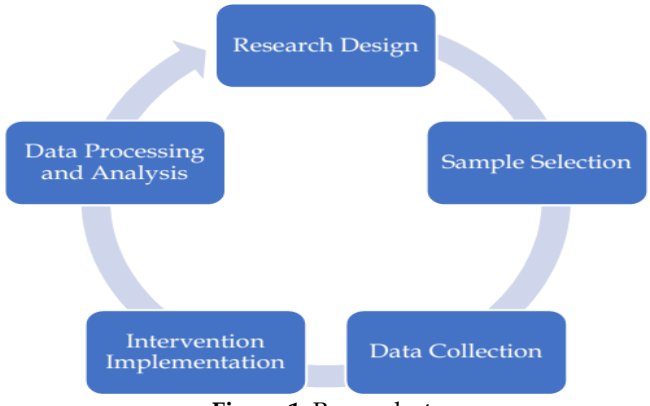

Figure 1. Research stages

The intervention involved providing young green coconut water without any additional ingredients, in an amount of 250 cc, administered over 3 consecutive days. Pain scale measurements were taken before and after the intervention. Data processing and analysis were computerized, using the Wilcoxon test to determine the difference in pain scale before and after the intervention, and the Mann-Whitney test to assess the effectiveness of the young green coconut water, see figure 1.

Result and Discussion

Result

Based on the analyzed data, the following results were obtained, offering valuable insights into the effectiveness of the intervention. The data reveal significant changes in menstrual pain levels among the participants, highlighting the impact of consuming young green coconut water compared to a control group (Chassagne et al., 2022; Kasiske et al., 2004). These findings not only demonstrate the efficacy of the intervention but also provide a clearer understanding of how dietary changes can influence dysmenorrhea. The detailed results underscore the importance of the intervention and its potential benefits for managing menstrual discomfort in adolescent girls.

Table 2. Univariate Analysis Average Pain Scale before Intervention in Adolescent Girls (3-9) Experiencing Dysmenorrhea

Menstrual Pain	N	Mean	Standard Deviation	Min-Max
Experiment group	28	5.18	1.94	3 – 9
Control group	28	4.68	2.16	3 - 9

Based on the table, it is known that the average menstrual pain of the respondents before the intervention in the experimental group is 5.18 (moderate pain) with a standard deviation of 1.94. The average pain in the control group is 4.68 (moderate pain) with a standard deviation of 2.16.

Table 3. Univariate Analysis Average Pain Scale Before Intervention in Adolescent Girls (0-2, 0-7) Experiencing Dysmenorrhea

Menstrual Pain	N	Mean	Standard Deviation	Min-Max
Experiment group	28	1.00	0.61	0 – 2
Control group	28	3.43	2.44	0 - 7

Based on the table, it is known that the average menstrual pain of the respondents after the intervention in the experimental group is 1.00 (mild pain) with a standard deviation of 0.61. The average pain in the control group is 3.43 (mild pain) with a standard deviation of 2.44.

Bivariate Analysis

Based on the table 4, it is known that the difference in pain scale before and after the intervention in the experimental group is 4.18 (5.18 – 1.00). The statistical test results showed a p-value of 0.000 (< 0.05), meaning there is a difference in pain scale before and after the intervention in the experimental group of adolescent girls experiencing dysmenorrhea. The difference in pain scale before and after the intervention in the control group is 1.25 (4.68 – 3.43). The statistical test results showed a p-value of 0.000 (< 0.05), meaning there is a difference in pain scale before and after the intervention in the control group of adolescent girls experiencing dysmenorrhea.

Table 4. Difference in Pain Scale Before and After Intervention in Adolescent Girls Experiencing Dysmenorrhea

Treatment Group	Pain Scale			n	p_{value}
	Mean	SD	Min - Max		
Experiment group					
- Pre-test	5.18	1.94	3 – 9	28	0.000
- Post-test	1.00	0609	0 – 2		
Control group					
- Pre-test	4.68	2.16	3 – 9	28	0.000
- Post-test	3.43	2.44	0 – 7		

Based on the table 5, it is known that the reduction in pain scale in the experimental group is 4.18 and in the control group is 1.25. There is a noticeable difference in the reduction of pain scale between the experimental group and the control group, which is 2.93. The statistical test results showed a p-value of 0.000 (< 0.05), meaning that the consumption of young green coconut water is effective in reducing dysmenorrhea pain in adolescent girls.

Table 5. The Effectiveness of Consuming Young Green Coconut Water on Dysmenorrhea Pain in Adolescent Girls

Reduction in Pain Scale	Pain Scale			p_{value}
	Mean	SD	Difference	
Experiment group	4.18	2.24	2.93	0.000
Control group	1.25	1.17		

Discussion

Pain Scale Before Intervention

Based on the table, it is known that the average menstrual pain of the respondents before the intervention in the experimental group is 5.18 (moderate pain) with a standard deviation of 1.945. The average pain in the control group is 4.68 (moderate pain) with a standard deviation of 2.16.

Menstrual pain primarily occurs in the lower abdomen but can also spread to the lower back, pelvis,

thighs, and calves (Abhijeet-Shirkande et al., 2024; Ayaz et al., 2024). The pain can be accompanied by severe abdominal cramps caused by strong uterine muscle contractions as menstrual blood exits the uterus. These intense muscle contractions cause the muscles to tense, leading to spasms and pain. The tension in these muscles occurs not only in the abdominal area but also in the supporting muscles of the lower back, pelvis, thighs, and calves (Sinaga et al., 2017).

Dysmenorrhea decreases with age and disappears on its own (Proverawati, 2017). However, there are concerns that dysmenorrhea can affect the activities of adolescents who are in the learning process at school. Therefore, dysmenorrhea can make adolescent girls feel unwell and difficult to concentrate. Adolescents experiencing dysmenorrhea require treatment to prevent it from worsening. Dysmenorrhea also has psychological impacts, including emotional conflicts, tension, and anxiety. This can create feelings of discomfort and alienation. Even slight discomfort accompanied by anger can quickly escalate into a significant problem (Swandari, 2022). Risk factors for dysmenorrhea include psychological factors, body mass index (BMI), family history, exercise, age at menarche, menstrual cycle, alcohol intake, and the influence of prostaglandin hormones, as evidenced by malondialdehyde levels in the body (Irianti, 2018)(.

This study's findings are consistent with Abdullah's (2021) research on the effectiveness of green coconut water (Cocos nucifera L) for managing dysmenorrhea. According to this research, the pain range experienced by respondents varied from mild to very severe pain. According to the researcher's assumption, the dysmenorrhea experienced by respondents is primary dysmenorrhea, caused by myometrial contractions resulting in ischemia due to prostaglandins produced by the secretory phase endometrium. The pain scale experienced by respondents in both the experimental and control groups was almost the same, with the average respondent experiencing moderate pain (4–5) or very intense pain. The pain felt was so severe and intense that it affected the senses of some respondents, making it difficult for them to concentrate and communicate. The pain fully occupied their senses, making them unable to communicate well or take care of themselves. Respondents preferred to remain still or sleep while holding their aching abdomen.

The pain scale experienced by respondents varied from one another, with the lowest pain scale being 3 (very noticeable pain) and the highest being 9 (unbearable and excruciating pain). Generally, the symptoms experienced by respondents included abdominal cramps, anxiety, and discomfort, typically occurring one or two days before menstruation, dizziness, nausea and vomiting, and headaches (Abed et al., 2024; Francque et al., 2021). The difference in pain scales experienced by respondents could be influenced by their diet and daily activities. Respondents who consumed high-sugar foods, canned foods, meat, and fried foods experienced higher pain scales because the sugar, fat, and sodium content in these foods could worsen their condition during menstruation. Conversely, respondents with regular physical activity experienced less pain because good physical activity increased blood and oxygen circulation, reducing pain severity.

Pain Scale After Intervention

Based on the table, it is known that the average menstrual pain of the respondents after the intervention in the experimental group is 1.00 (mild pain) with a standard deviation of 0.609. The average pain in the control group is 3.43 (mild pain) with a standard deviation of 2.441. Dysmenorrhea treatment can be done pharmacologically with pain relievers, hormonal therapy, prostaglandin steroid drugs, and non-pharmacologically with acupuncture, green coconut water, massage or Mozart massage therapy, and relaxation (Wiknjosastro et al., 2017). One non-drug treatment is green coconut water. Green coconut water contains 14.11mg/100ml calcium, 9.11mg/100ml magnesium, and 8.59mg/100ml vitamin C. The calcium and magnesium in green coconut water reduce muscle tension, and vitamin C is a natural anti-inflammatory. This helps relieve pain caused by menstrual cramps by inhibiting the cyclooxygenase enzyme, which plays a role in the formation of prostaglandin cyclooxygenase enzymes (Abdullah, 2021).

This study's findings are consistent with Mundriyastutik's (2022) research on the use of green coconut water as a natural therapy for reducing primary dysmenorrhea in adolescent girls. According to this research, after the intervention with green coconut water therapy, 81.8% of respondents did not feel any pain. Meanwhile, in the control group, respondents still experienced moderate and severe pain. According to the researcher's assumption, after the intervention, the pain experienced by respondents decreased in both the experimental and control groups (Eapen et al., 2019; Georas et al., 2022). In the experimental group, the reduction was immediately noticeable after the first consumption of young green coconut water, with an average pain scale of 3.9. After the second consumption of young coconut water, on the third day, all respondents experienced mild pain, and after the third day's consumption, 5 respondents did not feel any pain at all. This reduction occurred because of the many beneficial components in young green coconut water, such as carbonic acid or Vitamin C, protein, fat, carbohydrates, calcium, and potassium. Calcium and

magnesium reduce muscle tension and act as natural anti-inflammatories.

In the control group, after 3 days of intervention, there was no significant reduction in pain, with the average pain scale on the third day being 3.4. Observations showed that only 7 respondents experienced a reduction in pain scale (1–3 points), 1 respondent did not experience any reduction, and 3 respondents experienced an increase in pain scale on the third day. These differences could be influenced by the respondents' pain response and perception. Respondents who experienced a reduction in pain scale were likely not stressed, could relax, and did not focus on their menstrual pain. In contrast, respondents who experienced less reduction in pain might not have been able to control their thoughts and did not engage in activities to distract from the pain.

Difference in Pain Scale Before and After Intervention

Based on the table, the difference in pain scale before and after the intervention in the experimental group is 4.18 (5.18 – 1.00). The statistical test results showed a p-value of 0.000 (< 0.05), meaning there is a significant difference in the pain scale before and after the intervention in the experimental group of adolescent girls experiencing dysmenorrhea. The difference in pain scale before and after the intervention in the control group is 1.25 (4.68 – 3.43). The statistical test results showed a p-value of 0.000 (< 0.05), meaning there is a significant difference in the pain scale before and after the intervention in the control group of adolescent girls experiencing dysmenorrhea.

Green coconut water is one of the healthiest drinks, rich in nutrients, vitamins, hormones, glucose, and minerals, and does not contain preservatives. Green coconut water is easily absorbed by the body because its fluid content is isotonic to the human body. Green coconut water can help relax muscles due to prostaglandin activity during menstruation, replacing the damaged endometrium with a new one, releasing molecules called prostaglandins. This relationship causes uterine muscle contractions. When the uterine muscles contract, there is vasoconstriction of the endometrium's blood supply, leading to menstrual pain. Other substances known as leukotrienes, chemicals involved in the inflammatory response, also increase during this time and are related to the development of menstrual pain (Abdullah, 2021).

This study's findings are consistent with Tarigan's (2021) research on the effect of young coconut water on reducing menstrual pain in staff at Hutabargot Health Center, Mandailing Natal Regency in 2021, which found a p-value of 0.000 (< 0.05), indicating that young coconut water has an effect on reducing menstrual pain in the staff at Hutabargot Health Center. Similarly, Nugroho's (2022) research found that green coconut water can reduce dysmenorrhea pain, with a difference in pain scale reduction on the 1st and 2nd days, with an average reduction of 1.5. According to the researcher's assumption, the significant difference in respondents' pain scale after consuming young green coconut water is due to the almost uniform reduction in pain scale, ranging from 1 to 9 points. This reduction can occur because of the nutritional content in young green coconut water that relaxes uterine muscles during contractions. This relaxation significantly reduces or eliminates the pain after 3 days of consuming young coconut water. Meanwhile, the control group's significant pain scale reduction can also be attributed to the natural physiological decrease in menstrual pain over time, even without any intervention, as respondents rested in comfortable positions.

Effectiveness of Consuming Young Green Coconut Water

Based on the table, it is known that the reduction in pain scale in the experimental group is 4.18 and in the control group is 1.25. There is a noticeable difference in the reduction of pain scale between the experimental group and the control group, which is 2.93. The statistical test results showed a p-value of 0.000 (< 0.05), meaning that the consumption of young green coconut water is effective in reducing dysmenorrhea pain in adolescent girls.

Conclusion

The average menstrual pain of the respondents before the intervention in the experimental group was 5.18 (moderate pain), while in the control group it was 4.68 (moderate pain). After the intervention, the average menstrual pain of the respondents in the experimental group was 1.00 (mild pain), whereas in the control group it was 3.43 (mild pain). There was a significant difference in the pain scale before and after the intervention in the experimental group compared to the control group of adolescent girls experiencing dysmenorrhea (p = 0.000). The consumption of young green coconut water was effective in reducing dysmenorrhea pain in adolescent girls (p = 0.000).

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The following statements should be used Conceptualization, W, FF, AL, A, A contributed to the data collection process, data processing, article writing.

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Conflicts of Interest
The authors declare no conflict of interest.

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