Jordan Journal of Nursing Research, Volume **3**, No. **2**, **2024**
DOI: https://doi.org/10.14525/JJNR.v3i2.08

Jordan Journal of Nursing Research

www.jjnr.just.edu.jo

Effectiveness of Giving Ginger and Citronella Oil for Dysmenorrhea among Adolescent Girls

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ARTICLE INFO

Article History:
Received: January 18, 2024
Accepted: April 16, 2024

ABSTRACT

Background: Dysmenorrhea often occurs in adolescent girls and disrupts their daily activities. Dysmenorrhea occurs 1-2 years after menarche, with an average age of 12.8 years. One way to reduce dysmenorrhea is to use plants, such as ginger and citronella oil. ***Purpose:*** This study aimed to determine the effectiveness of ginger and citronella oil on dysmenorrhea in adolescent girls. ***Methods:*** This research was quasi-experimental with a one-group *pretest-posttest* design approach. The sample consisted of 68 adolescent girls from SMPN 14 Tasikmalaya city who were experiencing dysmenorrhea with moderate pain intensity. *Purposive* sampling was used. The results of this study were obtained using the Numeric Rating Scale (NRS) and then analyzed using the Wilcoxon signed-rank test. ***Results:*** The research results showed that the average dysmenorrhea score before being administered ginger and citronella oil to adolescent girls was 4.6, and after the intervention, it was 3.69 out of ten. The statistical-test results showed that ginger and citronella oil were effective for dysmenorrhea in adolescent girls ($p = 0.000$). ***Conclusion:*** This study concluded that there is a difference in the average dysmenorrhea score before and after administering ginger and citronella oil to adolescent girls. Therefore, adolescent girls can use ginger and citronella oil to reduce dysmenorrhea. ***Implications for Nursing:*** Integrating complementary ginger and citronella oil therapy into nursing or midwifery services is necessary to reduce dysmenorrhea. This innovation can be a reference source to provide care and minimize chemical-drug use.

Keywords: Dysmenorrhea, Ginger and citronella oil, Adolescent girls.

What does this paper add?

1. Primary dysmenorrhea has been experienced by many adolescent girls, especially in the last few decades, one of the reasons for which is that the age of menarche in adolescent girls is earlier (less than 12 years).
2. Ginger and citronella oil are used to reduce dysmenorrhea by applying a mixture of ginger and citronella essential oils to painful areas.

Introduction

Menarche is the first menstruation in women and is a sign that the reproductive system is starting to function. The average age at menarche is 12.8 years, but this figure has decreased in the last few decades (Putra et al., 2016). Early age at menarche (<12 years) is a risk factor for dysmenorrhea (Lail, 2019). Dysmenorrhea is a condition of menstrual disorders experienced by women in the form of cramps or pain centered in the lower abdomen and reaching the lower back, causing nausea, vomiting, headaches or diarrhea (Puspita et al., 2022).

Dysmenorrhea occurs 1-2 years after menarche; so, if the average age at menarche is 12.8 years, dysmenorrhea often occurs in junior high school-aged

girls (Ani et al., 2022).

Based on data from the World Health Organization (WHO) in 2020, the number of cases of dysmenorrhea was 1,769,425 (90%), with 10-16% suffering from severe dysmenorrhea. The average prevalence of dysmenorrhea in the world is more than 50%, while the prevalence of dysmenorrhea in Indonesia is 64.25%, consisting of 54.89% primary dysmenorrhea and 9.36% secondary dysmenorrhea (Yuliyani & Susilowati, 2022). Primary dysmenorrhea in Indonesia occurs in adolescent girls aged 14-19 years, around 54.89% (Kusnaningsih, 2020).

The prevalence of dysmenorrhea in West Java is relatively high, where 54.9% of women experience dysmenorrhea, with 24.5% experiencing mild dysmenorrhea, 21.28% experiencing moderate dysmenorrhea, and 9.36% experiencing severe dysmenorrhea (Haqiqi, 2019). Based on data from the Tasikmalaya City Health Service, in 2022, the number of junior high-school girls will be 36,322, and high-school girls will be 30,240; so, the most significant number of teenagers will be at the junior high-school level. Based on the results of a preliminary study at one of the junior high schools in Tasikmalaya city; namely, Public Junior High School 14 Tasikmalaya city, of 181 female students, 90.6% of young women experienced dysmenorrhea with a distribution of 35.98% mild pain, 53.04% moderate pain, and 10 .98% severe pain.

Dysmenorrhea is experienced by many adolescent girls, resulting in disruption of daily activities. When experiencing dysmenorrhea, adolescent girls find it difficult to concentrate, because they feel uncomfortable (Swandari, 2023). Management of dysmenorrhea is with pain relievers, drinking water, warm compresses on the painful area, light exercise, and consuming vegetables and fruit (Dewi et al., 2021). Apart from that, the concept of "Back to Nature" is becoming a trend among Indonesians. This concept can be applied to reduce dysmenorrhea using plants. Of these plants, most of the main ingredients that play a role in alleviating dysmenorrhea are essential oils (Fauziyah et al., 2020).

Ginger is a plant that contains essential oils of around 2.58%-3.9% of dry weight. The gingerol chemical content in ginger can block prostaglandins to reduce pain and nausea during menstruation (Intiyaswati, 2022). Ginger water can reduce pain, especially primary dysmenorrhea, in women of childbearing age (Ramdania & Legiati, 2022). Red ginger oil on changes in the Numeric Rating Scale (NRS) for dysmenorrhea showed significant changes in the NRS scale for dysmenorrhea in adolescents (Prianti, 2022).

Citronella contains phytonutrients which can improve blood circulation and help reduce spasms, muscle cramps, sprains, and back pain (Savitri et al., 2016). Citronella contains antioxidants found in the compounds citronellal and geraniol, which play a role in reducing dysmenorrhea (Nuari et al., 2023). Ginger and citronella compresses can reduce dysmenorrhea (Nurhalimah et al., 2020).

Currently, there are various techniques for using plants to reduce dysmenorrhea. Researchers will apply essential oils to the skin, because the effect works directly on the desired part of the body. This study will determine the effectiveness of ginger and citronella oil on dysmenorrhea in adolescent girls.

Method

Study Design

This research type is quasi-experimental with a one-group pretest-posttest design. This research aimed to test and evaluate the effect of applying ginger and citronella oil on dysmenorrhea in adolescent girls; so, the research just used one group of adolescent girls who experienced dysmenorrhea.

The instrument used to measure dysmenorrhea scores was the Standardized Numeric Rating Scale (NRS) questionnaire. The NRS validity and reliability tests were not carried out in this research. However, validity and reliability have been tested in several research studies. The Research study of De Arruda et al. (2022) showed that the NRS can be considered a valid and reliable patient-reported outcome measure for assessing dysmenorrhea-related pain intensity (r= 0,9,02 and alpha 0.90). The questionnaire components contain the respondent's name, day/date, current age, menarche, day of menstruation, durration of menstruation, as well as Numeric Rating Scale scores before and after the intervention. This is the Numeric Rating Scale:

Score 0 : No pain.
Scores 1-3: Mild pain (It was starting to hurt, but it was bearable).
Scores 4-6: Moderate pain (There is pain; it feels annoying, with a strong effort to hold it in).
Scores 7-10: Severe pain (There is pain; it is very annoying; I can't stand it).

The NRS questionnaire was filled out before ginger and citronella oil and 20 minutes after ginger and citronella oil. This research used ginger and citronella oil, which consisted of a mixture of 0.7 ml of ginger essential oil and 0.7 ml of citronella essential oil diluted with 7 ml of Virgin Coconut Oil (VCO) to obtain an oil mixture of 8.4 ml. The dose given is 2 ml. This oil is rubbed into the lower abdomen in 1 ml (20 drops) and the lower back up to the pelvis as much as 1 ml (20 drops).

Mixing essential oils (ginger and citronella oil) with carrier oil (VCO) is 1:5 (Verigin, 2021). Meanwhile, the dose used was adjusted to the results of previous research calculations in the form of oil produced from 20 grams of ginger (Suwanto & Islamiyah, 2018) until 100 grams of ginger and citronella oil (Nurhalimah et al., 2020). This research has received ethical clearance from Bakti Tunas Husada University, Indonesia.

Sample

The population is 164 adolescent girls at Junior High School 14 Tasikmalaya City who experienced dysmenorrhea. The sample size, based on the Slovin formula with an error rate of e=0,1 (10%), is 63 particpants. Anticipating dropout, the number of respondents was increased by 10% to become 70 respondents. However, the number of research respondents who met the criteria was 68 people (Kamaruddin et al., 2022). The sampling method used the purposive sampling technique by the inclusion and exclusion criteria.

The inclusion criteria were:

1. Adolescent girls who experience dysmenorrhea with an NRS score of 4-6 (moderate pain).
2. Adolescent girls who have never been married.
3. Respondents can be actively invited to communicate.
4. Respondents do not have allergies to ginger and citronella oil.
5. Participants agreed to participate and signed informed consents.
6. Participants have a cellphone and WhatsApp application.

The excluded girls were those who are experiencing dysmenorrhea and take pain medications, during the research. The sample size used from October to November 2023 based on inclusion and exclusion criteria was 68 girls. The respondents were very enthusiastic about participating in this research.

Data Collection

Each respondent received 1 bottle of oil containing 8,4 ml, and the NRS questionnaire. Respondents who experienced dysmenorrhea contacted the researchers via WhatsApp. If it occurs at school, the researcher observes directly at the school. Meanwhile, if the respondent experienced dysmenorrhea at night or the respondent is not at School, observations are carried out *via* WhatsApp. The oil was applied by respondents who had been taught how to apply it.

Respondents filled out the NRS questionnaire before and after applying ginger and citronella oil. The respondents selected were respondents who were experiencing dysmenorrhea with a score of 4-6 according to filling in the NRS before administering ginger and citronella oil. Then, ginger and citronella oil are applied, and after 20 minutes, the NRS is filled in again. The respondent confirmed it to the researcher after the intervention was completed. Then, the researcher records and collects research data.

Analysis

Analysis was carried out using statistical applications. The data that has been collected is tested for normality using the Kolmogorov-Smirnov test. It can be seen that the data is not normally distributed; so, bivariate analysis was used utilizing the Wilcoxon Signed Rank test.

Ethical Considerations

This research has received Ethical Clearance from the Health Research Ethics Commission (KEPK) of Bakti Tunas Husada University, Tasikmalaya city in Indonesia, with ethical number No.235/E.01/KEPK BTH/IX/2023.

Results

Univariate Analysis

Table 1 shows the average age of respondents as 13.96 years. Most of the respondents' menarche age was <12 years as many as 37 participants (54.4%). Most respondents experienced dysmenorrhea on day 1 (n=52; 76.5%) and 59 (86.8%) had a menstrual period of ≥7 days.

Table 1. Frequency distribution and percentage of respondent characteristics (n=68)

No.	Respondent Characteristics	Frequency	Percentage (%)
1.	Respondent's current age		
	12 years	4	5.9
	13 years	17	25
	14 years	25	36.8
	15 years	22	32.4
	The average age of respondents is 13.96 years		
2.	Respondent's menarche age		
	< 12 years	37	54.4
	≥ 12 years	31	45.6
3.	Time of occurrence of dysmenorrhea		
	Day 1	52	76.5
	Day 2	13	19.1
	Day 3	3	4.4
4.	Duration of menstruation		
	< 7 days	9	13.2
	≥ 7 days	59	86.8

Based on Table 1, it can be seen that the average age of respondents is 13.96 years. Most of the respondents' menarche age was <12 years as many as 37 people (54.4%). Most respondents experienced dysmenorrhea on day 1, 52 people (76.5%) and 59 people (86.8%) had a menstrual period of ≥7 days.

Table 2 shows that before the intervention, the majority had a score of 4 (n=35; 51.5%), while after the intervention, the majority had a score of 3 (n=24; 35.3%).

Table 2. Distribution of dysmenorrhea scores before and after administration of ginger and citronella oil to adolescent girls (n=68)

No.	Dysmenorrhea Score	Frequency (f)	Percentage (%)
1.	Before Intervention		
	NRS Score: 4		
	NRS Score: 5	35	51.5
	NRS Score: 6	20	29.4
		13	19.1
2.	After Intervention		
	NRS Score: 2		
	NRS Score: 3	8	11.8
	NRS Score: 4	24	35.3
	NRS Score: 5	22	32.4
	NRS Score: 6	10	14.7
	NRS Score: 7	3	4.4
		1	1.5

Table 3 shows that the average dysmenorrhea score before giving ginger and citronella oil was 4.68, while the average dysmenorrhea score after giving ginger and citronella oil was 3.69. It can be concluded that there is a decrease in the average dysmenorrhea score.

Table 3. Average dysmenorrhea score before and after giving ginger and citronella oil to adolescent girls (n=68)

	Before Application of Ginger and Citronella Oil	After Application of Ginger and Citronella Oil
Average	4.68	3.69
Respondents	68	68

Bivariate Analysis

Table 4 shows the results of the Wilcoxon Signed Rank Test, a p-value of 0.000 ($\alpha < 0.05$) was obtained, indicating that there was a difference in dysmenorrhea scores before and after giving ginger and citronella oil, where there was a decrease in dysmenorrhea scores in adolescent girls. This shows ginger and citronella oil effectively decrease dysmenorrhea in adolescent girls.

Table 4. Effectiveness of giving ginger and citronella oil against dysmenorrhea in adolescent girls (n=68)

	N	Mean	Std. Deviation	Minimum	Maximum	p-value
Before Intervention	68	4.68	0.781	4	6	0.000
After Intervention	68	3.69	1.096	2	7	

(Wilcoxon Signed Rank test)

Based on the results of the Wilcoxon Signed Rank test, a p-value of 0.000 ($\alpha < 0.05$) was obtained, indicating that there was a difference in dysmenorrhea scores before and after giving ginger and citronella oil, where there was a decrease in dysmenorrhea scores in adolescent girls. The p-value < 0.05 means that Ha is accepted or Ho is rejected. This shows that ginger and citronella oil are effective against dysmenorrhea in adolescent girls.

Discussion

Primary dysmenorrhea is a physiological menstrual pain caused by reproductive hormones without accompanying reproductive abnormalities. The pain appears 1-2 days before and on the first day of menstruation (Dewi et al., 2021). Research that has been conducted showed that dysmenorrhea felt by respondents most often appeared on the first day of menstruation, with as many as 52 girls (76.5%). At the beginning of menstruation, the prostaglandin content is extensive. On the second and subsequent days, the uterine wall lining will be shed, resulting in reduced prostaglandin content, so that dysmenorrhea begins to decrease (Ani et al., 2022).

The duration of menstruation experienced by respondents was ≥ 7 days for as many as 59 girls (86.8%). Suppose that the duration of menstruation is more than usual (7 days). In that case, it can cause more frequent uterine contractions, which cause more prostaglandin hormones to be produced and the blood supply to the uterus to stop, resulting in dysmenorrhea (Sagita, 2023). Based on research by Shelly Sagita et al. (2023), it can be seen that there is a relationship between the duration of menstruation and the incidence of dysmenorrhea. Respondents who have an abnormal duration have a 3.333 times greater tendency to experience dysmenorrhea compared to respondents who have regular menstrual duration (Sagita, 2023). This is in line with research by Nofrita (2021) regarding factors associated with the incidence of primary dysmenorrhea in adolescent girls. It can be seen that there is a relationship between the length of menstruation and the incidence of dysmenorrhea in adolescent girls (Horman et al., 2021).

The dysmenorrhea score experienced by 68 respondents before giving ginger and citronella oil was 4-6 (moderate pain). Most respondents scored 4, as many as 35 girls, or a percentage of 51.5%. The average dysmenorrhea score before giving ginger and citronella oil was 4.68. Primary dysmenorrhea is defined as pain during menstruation caused by increased production of prostaglandins resulting in uncoordinated uterine contractions. This pain occurs in the lower abdomen, but can spread to the back, waist, pelvis, upper thighs, and calves (Ani et al., 2022).

The leading cause of primary dysmenorrhea is the presence of prostaglandin F2a produced in the endometrium, which can stimulate uterine contractions during menstruation. Factors that influence dysmenorrhea are stress, obesity, age at menarche, and nutritional status.

During dysmenorrhea, uterine muscle contractions occur, causing vasospasm of the uterine arterioles and resulting in ischemia and cramps in the lower abdomen, which will stimulate pain (Trimayasari et al., 2014). Adolescent girls who experience dysmenorrhea cannot concentrate on studying, and their motivation to study decreases, because they feel pain (Kundaryanti et al., 2021). Untreated dysmenorrhea can result in pathological conditions and can trigger an increase in mortality rates and impact infertility (Horman et al., 2021).

Most of the dysmenorrhea scores after giving ginger and citronella oil had a score of 3, with as many as 24 girls or a percentage of (35.3%). The average dysmenorrhea score after giving ginger and citronella oil was 3.69. Efforts to reduce dysmenorrhea can include non-pharmacological therapy. This therapy is a complementary alternative treatment without the use of chemical drugs. The aim is to minimize the impact of the chemicals listed in the medicine (Ani et al., 2022). Non-pharmacological therapy with the "Back to Nature" concept is becoming a trend among Indonesians. This concept can be applied to reduce the symptoms of dysmenorrhea by using plants that have been proven to have this activity (Fauziyah et al., 2020). The plants used to reduce dysmenorrhea in this study were ginger and citronella.

Ginger is a plant that contains essential oils. The essential-oil content in ginger is around 2.58%-3.9% of the dry weight. The chemical content of gingerol in ginger can block prostaglandins, so that it can reduce pain and nausea during menstruation (Intiyaswati, 2022). Citronella contains phytonutrients that can improve blood circulation (Savitri & Aisyah, 2016). Oil from citronella extract can warmly relax muscles and relieve stomach cramps (Khotimah et al., 2021). In this study, the non-pharmacological therapy given was ginger and citronella essential oil. This oil contains ingredients to block prostaglandins and reduce pain. It is applied to the lower abdomen, back, and waist to absorb them into the bloodstream.

One of the benefits of using topical applications is that the effect works directly on the desired part of the body; so, when the ginger and citronella-oil content is successfully absorbed, it will result in smooth blood flow to the uterus and a reduction in pain due to a decrease in prostaglandins. This is in line with Prianti (2022) research on the effect of giving red ginger oil on changes in the NRS dysmenorrhea scale, showing that there were significant changes in the NRS dysmenorrhea scale in adolescents (Prianti, 2022). Topical application to the skin depends on age, selection of the appropriate topical agent, location and surface area of the affected body, stage of the disease, the concentration of active ingredients, method of application, determination of duration of drug use, penetration of topical drugs into the skin (Bakri et al., 2023).

Based on research by Nurhalimah et al in 2020, it can be seen that to wait for the effect of topical preparations, you have to wait 20 minutes. Ginger has the effect of a hot and spicy taste, where this hot feeling can relieve pain and muscle stiffness or cause vasodilation of blood vessels. Maximum benefits will be achieved within 20 minutes after heat application (Nurhalimah et al., 2020).

The average dysmenorrhea score before intervention to 68 respondents was 4.68. After the intervention, the average dysmenorrhea score was 3.69; so, there was a decrease in the average dysmenorrhea score before and after giving ginger and citronella oil by 0.99. Based on Table 4, there was a significant difference in dysmenorrhea score before after applying ginger and citronella oil; so, the intervention was effective. Ginger contains essential-oil components and non-volatile oils. Red ginger rhizome contains flavonoids, phenols, terpenoids, and essential oils (oleoresin). Oleoresin is a non-volatile oil component that gives ginger its taste sensation.

The warming effect of ginger can cause vasodilation of blood vessels, which will increase blood flow to the tissues. In this way, the distribution of acids and food to the cells is increased, and the elimination of these substances is improved, which can reduce primary dysmenorrhea caused by insufficient blood supply to the endometrium. Citronella can reduce pain, because it contains essential oils with a warm pharmacological effect to relieve aches and pain with analgesic properties and improve blood circulation (Nurhalimah et al., 2020).

Based on research by Ni Wayan Wirayanti in 2020 regarding the effect of using ginger oil in reducing the scale of primary dysmenorrhea, it can be seen that there was a decrease in the average scale of dysmenorrhea from 6.32 to 4.46 and from 6.87 to 3.48 (Putri, 2020). In this study, researchers combined ginger and citronella oil. The results proved that there was a decrease in the average dysmenorrhea score in adolescent girls after being given ginger and citronella oil from 4.68 to 3.69.

Implications for Nursing

This research can prove that giving ginger and citronella oil can reduce dysmenorrhea in adolescent girls. This innovation is a complementary therapy in providing protection or midwifery to minimize the use of chemical drugs. This research can help clients reduce dysmenorrhea using natural ingredients. Apart from that, this research can also help educational and professional institutions add references or insight regarding complementary therapy in applying ginger and citronella oil to reduce dysmenorrhea.

Limitations

Experimental designs without control groups and measurement of variables using self-reports or questionnaires may be susceptible to bias. Research time was limited; so, the number of respondents was small. In future research, it is hoped that the appropriate number of respondents can be met.

Conclusion

Based on the research results, it can be concluded that there is a difference in the average dysmenorrhea score before and after giving ginger and citronella oil to adolescent girls. So, ginger and citronella oil are effective for dysmenorrhea in adolescent girls. For future researchers, it is hoped that they can use more respondents and use different oil administration frequencies to find out the average score before and after giving ginger and citronella oil.

Funding or Sources of Financial Support

This research received no financial support from any source.

Conflict of Interests

There is no conflict of interests to be declared by the researchers.

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