

The Effect of Giving Red Ginger Jelly an Dysmenorrhea Pain in Female Students at Junior High School in Samarinda

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ABSTRACT

The teenage years are a time of physical, mental, and social development, known as puberty. A clear sign of puberty for a girl is when she starts her period. Menstrual discomfort, often referred to as dysmenorrhea, is the pain felt during this time, ranging from aching in the lower belly to soreness in the back. One way to help ease dysmenorrhea pain is by using Red Ginger Jelly, which has essential oils and aloricin. These components can help block the hormones that cause pain. The purpose of this study was to see how Red Ginger Jelly influences dysmenorrhea in junior high students in Samarinda. A specific group made up of 7th, 8th, and 9th graders who suffered from primary dysmenorrhea participated in the research, using a pre-and post-test setup. The research involved 18 students selected through non-probability sampling with Purposeful Sampling. The data analyzed included univariate and bivariate studies utilizing the Shapiro-Wilk and Wilcoxon tests. The findings indicated that Red Ginger Jelly significantly alleviated dysmenorrhea pain in junior high students in Samarinda, with a p-value of 0.000, which is less than 0.05. Thus, Red Ginger Jelly was effective in reducing primary dysmenorrhea discomfort among these students.

Keywords: Adolescent Girl, Primary Dysmenorrhea, Red Ginger

Introduction

Teenage years are marked by swift changes in the body, mind, and social aspects, a phase also known as puberty. For girls, one major sign of puberty is getting their period (Kemenkes RI, 2018). Over half of women deal with menstrual pain that can disrupt their everyday routines. Among teenagers, dysmenorrhea affects 90%, with more than 10-20% of adolescents globally suffering from intense and distressing pain (De Sanctis et al., 2016). The World Health Organization (WHO) has highlighted the widespread occurrence of menstrual pain, reporting that 1,769,425 individuals (or 90%) experience dysmenorrhea, with 10-15% facing severe cases. In every

country, more than half of women report menstrual pain, with estimates ranging from 45-90% in the U.S. (WHO, 2022).

Around 92% of teenage girls endure menstrual discomfort. In Sweden, it was noted that 90% of affected women were under 19, while 67% were 24 years old. In Indonesia, the count of dysmenorrhea cases has reached 107,673, including 59,671 primary and 9,496 secondary instances (De Sanctis et al., 2016). Adolescent girls with dysmenorrhea may feel tired, and experience lower back pain, anxiety, nausea, vomiting, and abdominal cramps. These statistics indicate that dysmenorrhea significantly hampers teenagers' ability to engage in activities and affects their focus and performance, leading to a decline in their overall quality of life (Abreu-Sánchez et al., 2020).

According to (Duman et al., 2022), one approach to relieve dysmenorrhea involves using traditional remedies like ginger. Ginger (*Zingiber officinale*) is a widely used herbal plant with several varieties, including large white ginger, small white ginger, and red ginger. Among these, red ginger (*Zingiber officinale* var. *rubrum*) is known for its higher content of bioactive compounds such as gingerol, shogaol, and zingerone, which play a significant role in its pharmacological properties. One of the primary benefits of red ginger is its natural analgesic (pain-relieving) effect. The gingerol and shogaol in red ginger work by inhibiting inflammatory pathways and reducing the production of prostaglandins, which are compounds responsible for pain in the body. As a result, red ginger is widely used in traditional medicine as well as in modern supplements to relieve pain caused by inflammation, muscle soreness, or joint pain. This potential makes red ginger one of the most promising herbal plants for the development of plant-based natural pain relievers. Red ginger contains Gingerol, an anti-inflammatory compound that can inhibit enzymes in the cyclooxygenase pathway (COX), reducing the release of these enzymes into prostaglandins that cause inflammation, thus preventing uterine contractions which lead to pain during menstruation. One effective way to manage menstrual pain is through a combination of gelatin and red ginger. This study is designed to evaluate the impact of Red Ginger Jelly on dysmenorrhea pain among junior high school students in Samarinda.

Methodology

This is an experimental investigation. The research utilized a one-group pre-and post-intervention setup. It took place between April and May 2024 in a Junior High School located in Samarinda. The participants of this study included students from the 7th, 8th, and 9th grades at the same Junior High School.

The sample involved 18 respondents chosen using the Federer formula. The sample size formula in this study can use the Federer Formula, which can be determined based on the total group (t) used in the study using 1 group, then the sample size used.

$$(t - 1) (n - 1) \geq 15 (1 - 1) (n - 1) \geq 15$$

$$n - 1 \geq 15$$

$$n \geq 15 + 1$$

$$n \geq 16$$

Note:

t: Number of groups in the study

n: Number of replications

To avoid Drop Out in the research process, it is necessary to add the number of samples so that the sample size remains fulfilled, with the following formula:

$$n' = n / (1 - f)$$

$$n' = 16 / (1 - 0.1)$$

$$n' = 16 / 0.9$$

$$n' = 17.7$$

$$n' = 18$$

Note:

n': Sample size after revision

n: Original sample size

1-f: Estimated proportion of Drop Out estimated at 10% (f = 0.1)

From the calculation of the formula above, it can be concluded that the total number of respondents in this study is 18 people. So, the sample in this study was female students who experienced menstrual pain (dysmenorrhea) with a total of 18 female students. To qualify for the study, participants had to agree to take part and be students in the 7th, 8th, or 9th grades who experienced primary dysmenorrhea during their menstrual cycles.

Those who used painkillers during their periods were not included in the study. Data regarding respondents and monitoring of Red Ginger Jelly intake were gathered via a questionnaire. The Red Ginger Jelly was administered over three days, with one dose in the morning and another in the afternoon. The menstrual discomfort experienced by female students was evaluated one week after the Red Ginger Jelly was consumed. The analysis aimed to assess the change in menstrual pain levels between the pre-test and post-test using the Wilcoxon test. Ethical approval for the study was granted on February 2, 2024, and was numbered DP.04.03/F.XLII.89/0029/2024, from KEPK Poltekkes Kemenkes Kalimantan Timur.

Result and Discussion

Table 1. Distribution of Respondent Number Based on Age, Menarche Age, Menstrual Cycle, and Menstrual Complaints of Junior High School Students in Samarinda (Source : Primary Data, 2024)

Categories	Number	Percentages
Age		
11 Year	3	16.7
12 Year	8	44.4
13 Year	6	33.3
14 Year	1	5.6
Menarche Age		
11 Year	3	16.7
12 Year	10	55.6
13 Year	5	27.8
Menstrual Cycle		
27 Day	3	16.7
28 Day	9	50.0
29 Day	3	16.7
30 Day	2	11.1

31 Day	1	5.6
Menstrual Complaints		
Cramps on the lower abdomen	9	50.0
Pain spreading to the lower back	4	22.2
Lack of Appetite	3	16.7
Interrupted activity	1	5.6
Difficulty concentrating while studying	1	5.6
Total	18	100%

According to the analysis of age distribution, it was found that the typical respondents were around 12 years old, with eight students (44.4%) being in this age group, while only one student (5.6%) was 14 years old. This suggests that the majority of participants in the study were 12 years of age.

As highlighted by Gambadauro et al., (2024), the ages of 12 to 13 mark a time for teenagers when they go through major physical and hormonal transformations called puberty, which includes the start of menstruation. Those in this age category are particularly vulnerable to dysmenorrhea, which can greatly interfere with daily activities. For instance, a 12-year-old participant might be suffering from intense menstrual cramps, potentially causing them to skip school or social events due to the agony (Aryani et al., 2018). This emphasizes the need for discussions around menstrual health and support for young adolescents during such a crucial phase of their growth and academic life. Hence, researching how Red Ginger Jelly affects pain from dysmenorrhea in junior high schoolers in Samarinda is vital to discovering effective methods of easing discomfort and enhancing life quality during menstruation. By acknowledging the profiles of the respondents, including their age range, researchers can customize their interventions to meet the unique needs of this vulnerable group. While it's critical to focus on menstrual health, solely looking at the impacts of Red Ginger Jelly might not fully resolve dysmenorrhea issues in junior high school students. It's also necessary to take into account additional aspects like lifestyle, diet, and holistic wellness in tackling menstrual distress (Moelyo et al., 2019).

The researcher believes that between ages 12-14, adolescents, especially girls who have begun menstruating, undergo puberty. The age distribution analysis regarding menarche revealed that 10 students (55.6%) started their periods at age 12, while a smaller group began at age 11, which consisted of three students (16.7%). Thus, the majority of the participants got their first menstruation (menarche) at 12 years old.

In a woman's life, menarche is the first occasion she experiences the menstrual cycle. Generally, the typical age for menarche falls between 10 to 15 years. This aligns with the study by Marques et al., (2022), which found 12 years to be the most common age for menarche among its participants. Menarche is a crucial

milestone that signifies the start of a woman's reproductive life, marking an essential development moment and the beginning of bodily maturation. The average age of menarche being within the 10 – 15-year range is regarded as normal and shows natural differences in individual growth and development. Recognizing when menarche typically happens can assist healthcare providers in evaluating the overall health and well-being of adolescent girls as they transition into adulthood (Lacroix et al., 2024).

Lacroix et al., (2024) mentioned that by monitoring when a girl starts her period, healthcare professionals can spot any possible problems or delays in her growth and give the right help and guidance. Moreover, having an early or late start to menstruation might indicate hidden health issues or hormonal imbalances, which could need further checks and treatment. Healthcare workers need to discuss menarche with care and empathy, as this can be a delicate and confusing period for young girls. By sharing clear information and offering support, healthcare providers can help girls confidently and empowered go through this significant stage in their lives. The researchers believe that menarche typically happens between the ages of 11 and 13 since teenagers are mentally prepared to deal with changes in their growth and development.

From a study of the menstrual cycles, 12 students (66.7%) had an average cycle of 28 days, while only one student (5.6%) experienced a 31-day cycle, indicating that most participants had a 28-day cycle. Thiyagarajan et al., (2024) observed that most menstrual cycles fell within 29 to 30 days, matching the idea that cycles can range from 15 to 45 days, averaging about 28 days. These results imply that the majority of the students had a common cycle length of 28 days, with just a few diverging from this average. (Thiyagarajan et al., 2024) reinforced this by stating that the average cycle is generally within the 29 to 30-day timeframe. It's worth noting that differences in the length of menstrual cycles are normal and can be affected by various factors such as stress, diet, and physical activity. Recognizing these differences is vital for giving suitable assistance and education to those experiencing puberty (Itliyeva, 2022).

Moreover, studies show that hormonal changes during the menstrual cycle can influence mood, energy, and mental performance. For instance, research has indicated that estrogen levels peak during ovulation, which can boost confidence and sociability. Conversely, progesterone levels increase in the luteal phase, possibly leading to feelings of tiredness, irritability, and trouble focusing. By understanding these hormonal shifts, educators and healthcare providers can better assist individuals in handling their menstrual cycles and overall health.

The researchers propose that a typical menstrual cycle can range from 21 to 35 days, with its duration varying due to multiple factors like diet, stress, and exercise. An analysis of menstrual cycles showed that most students (66.7%) experienced an average cycle of 28 days, while one student (5.6%) had a 31-day cycle, reinforcing the observation that the majority had a 28-day cycle.

Thiyagarajan et al., (2024) noted that the majority of individuals experienced menstrual cycles of 29-30 days. This aligns with the concept that menstrual cycle intervals typically range from 15 to 45 days, averaging around 28 days. These results

indicate that most of the study participants had a standard cycle length of 28 days, with only a few straying from this average. Thiyagarajan et al., (2024) also affirmed this, explaining that the average cycle generally falls between 29 and 30 days. It's essential to recognize that fluctuations in cycle length are common and can be affected by several elements, including stress, diet, and physical activity. Grasping these variations is vital for offering suitable guidance and learning to those undergoing puberty (Itriyeva, 2022).

Additionally, studies have indicated that hormonal shifts during the menstrual cycle can influence mood, energy, and cognitive abilities. For instance, researchers found that estrogen levels peak during ovulation, resulting in heightened confidence and sociability. Conversely, higher progesterone levels during the luteal phase may lead to fatigue, irritability, and challenges with focus. By understanding these hormonal transitions, educators and health professionals can enhance support for individuals managing their menstrual cycles and overall health.

As per the researchers' observations, a typical menstrual cycle spans from 21 to 35 days. The time frame for the cycle varies due to several factors, including diet, stress, and physical exercise. Statistical analysis of students at Junior High School Samarinda regarding menstrual issues revealed that a significant number complained of cramps in the lower abdomen, with nine students (50.0%) reporting this discomfort. A smaller number faced issues with concentration while studying, represented by one student (5.6%) experiencing difficulty, and another (5.6%) reported interruptions in activities due to menstrual issues. This highlights that most respondents experienced cramps during their menstruation.

These findings correspond with research by Seif et al., (2015), who found that many participants also reported severe abdominal cramps extending to the waist. The few students struggling with concentration likely attributed their difficulties to the pain and discomfort stemming from cramps. Furthermore, the student compiling complaints about interference with activities underscores the effects of menstrual symptoms on daily life. Overall, the outcomes of this research correspond with previous studies regarding the frequency and impact of menstrual cramps on women's health. For instance, some students may endure intense cramps beginning in their lower abdomen and radiating to their waist, hindering their focus on their studies. This situation may adversely affect their academic performance and overall productivity. If these symptoms are unmanaged, they can disrupt daily life and lower an individual's quality of life (Abreu-Sánchez et al., 2020).

Based on the beliefs of researchers, most teens in school who are experiencing menstruation often report more issues. This is due to important aspects linked to their way of life and routine activities, along with their limited understanding of how to manage menstrual problems.

Table 2. Distribution of Average Frequency of Menstrual Pain Before and After the Administration of Red Ginger Jelly (Source : Primary data, 2024)

Variable	N	Mean	Std Deviasi	Min - Max
Menstrual Pain (Pre-test)	18	3.89	1.183	2-6
Menstrual Pain (Post-test)	18	0.56	0.922	0-3

From a study involving 18 participants, the average score on the dysmenorrhea intensity scale before the intake of Red Ginger Jelly was 3.89. The scores ranged from a low of 2 to a high of 6, with a standard deviation of 1.183. Itani et al., (2022) indicated that dysmenorrhea refers to a menstrual condition marked by intense pain. Most women feel cramps or discomfort on the first day of their period. Typically, menstrual pain is linked to estrogen and prostaglandins, where estrogen helps prepare the uterus and prostaglandins trigger contractions during menstruation. Itani et al., (2022) researched how effective Red Ginger Jelly is in easing dysmenorrhea symptoms. Their findings demonstrated a notable decline in the dysmenorrhea scale scores after participants ingested Red Ginger Jelly. This suggests that Red Ginger Jelly might be a viable natural treatment for managing menstrual pain related to the effects of estrogen and prostaglandins. Additional studies are required to better understand how Red Ginger Jelly relieves pain and to assess its potential as a treatment option for dysmenorrhea. Moreover, the research revealed that individuals noticed a reduction in the intensity and frequency of their menstrual cramps after taking Red Ginger Jelly. Zhang et al., (2022) noted that this implies the natural remedy could enhance the overall well-being of those experiencing dysmenorrhea. Future research should focus more on identifying the specific components in Red Ginger Jelly that aid in pain relief and consider effective dosage guidelines for maximum benefit. In summary, these results point to Red Ginger Jelly being a hopeful and safe alternative for treating menstrual discomfort. The researchers concluded that each person's pain level varies, and it is ultimately up to the individual to assess the severity of their pain. Following the study, the average dysmenorrhea intensity score after consuming Red Ginger Jelly was 0.56, with scores ranging from a minimum of 0 to a maximum of 3, and a standard deviation of 0.922.

Guimarães & Póvoa, (2020) noted that dysmenorrhea refers to pain felt in the abdomen during a woman's period, resulting from strong contractions of the uterus at that time. Primary dysmenorrhea often starts with the first menstrual cycle and usually improves as hormone levels balance out over time. For instance, research conducted at a Junior High School in Samarinda showed that students who consumed Red Ginger Jelly experienced a marked decrease in menstrual pain severity. The findings indicated that the average pain intensity reported by students dropped from 0.56 to 0 after eating the jelly, suggesting it may be effective in managing menstrual discomfort. Kim et al., (2022) pointed out that these results hint that natural treatments like Red Ginger Jelly might be a viable substitute for conventional pain relief medications for young women dealing with dysmenorrhea. More studies are needed to fully understand the benefits and effects of Red Ginger Jelly in treating menstrual pain. All in all, these findings provide optimism for individuals who have

primary dysmenorrhea and are seeking safe and effective methods to ease their symptoms.

According to Zhang et al., (2022), consuming red ginger can help ease menstrual pain as it acts as an energy booster (tonikum) and pain reliever (analgesics) due to the gingerol compounds present in ginger. Moreover, Shahrajabian et al., (2019) suggested that Red Ginger Jelly could serve as a natural alternative to conventional pain relief medications for menstrual cramps, likely offering fewer side effects. Healthcare providers must contemplate including this treatment in their advice for managing dysmenorrhea (Haroen et al., 2024). With more research and clinical testing, Red Ginger Jelly could potentially be embraced widely as an effective solution for alleviating menstrual pain among young women.

From the information provided, the researcher inferred that Red Ginger Jelly might help lessen dysmenorrhea symptoms due to the presence of magnesium, calcium, and vitamin C in red ginger, which are known for their calming effects and ability to stabilize emotions, thus potentially decreasing the sensation of menstrual pain.

Table 3. Wilcoxon Test Results of the Effect of Red Ginger Jelly on Dysmenorrhea Pain at Junior High School in Samarinda Students (Source: Primary Data, 2024)

Giving ginger jelly	Mean	SD	Mean Rank	Sum Of Rank	<i>P</i> <i>Value</i>
Pre-test	3.38	1.138	9.50	171.00	.000
Post-test	0.56	0.922			

The results of the analysis used the Wilcoxon test for pain intensity in 18 respondents with an average pre-test of 9.50 and an average post-test of 0.000 with a p-value (asymp.sig 2-tailed) of $0.000 < 0.05$; thus, it can be concluded that there is a significant influence before and after being given Red Ginger Jelly on changes in dysmenorrhea pain intensity.

This is also in line with Zhang et al., (2022), who showed that ginger has the same effectiveness as mefenamic acid and ibuprofen in reducing dysmenorrhea pain, with a Wilcoxon p-value test of 0.000, which indicates that red ginger infusion affects the intensity of dysmenorrhea in adolescent girls. The results of this study suggest that Red Ginger Jelly is a valuable natural remedy for managing dysmenorrhea pain. The findings support previous research by (Shahrajabian et al., 2019) and highlight the potential benefits of ginger as an effective alternative to traditional pain medications. Further research is needed to explore the long-term effects and optimal dosage of Red Ginger Jelly for treating dysmenorrhea.

The content of red ginger has a lot of benefits that are very good for relieving dysmenorrhea pain, whether in the use of red ginger as a supplement or herbal drinks, all of which can help women overcome menstrual pain without the need to rely on medications that may have side effects (Haroen et al., 2024). Additionally, studies have shown that ginger has anti-inflammatory properties that can reduce the

severity of menstrual cramps. This natural remedy offers a safe and effective option for managing dysmenorrhea symptoms, providing women with a holistic approach to pain relief. By conducting further research on the dosage and long-term effects of red ginger jelly, healthcare providers can better understand how to incorporate this alternative treatment into mainstream medicine for menstrual pain management (Ayustaningwarno et al., 2024; Haroen et al., 2024; Mashhadi et al., 2013; Mustafa & Chin, 2023).

Conclusion

The use of red ginger jelly can help lessen primary dysmenorrhea pain in students at Junior High School Samarinda. More research is needed to investigate the possible advantages of red ginger jelly for women of various ages dealing with menstrual discomfort. It's important to understand how it alleviates pain and to figure out the best amount to use for it to work effectively. This knowledge will be key in incorporating this natural treatment into regular medical practices. Furthermore, informing healthcare providers and patients about the advantages of red ginger jelly as a safe and convenient option for dysmenorrhea could enhance the overall well-being of women facing menstrual pain. In summary, red ginger jelly shows great promise for managing menstrual cramps, paving the way for additional studies and use in women's healthcare.

Declaration of Competing Interest

The writer states that the study was carried out without any business or financial ties that might be seen as a possible conflict of interest.

Reference

- Abreu-Sánchez, A., Parra-Fernández, M. L., Onieva-Zafra, M. D., Ramos-Pichardo, J. D., & Fernández-Martínez, E. (2020). Type of Dysmenorrhea, Menstrual Characteristics and Symptoms in Nursing Students in Southern Spain. *Healthcare*, 8(3), 302. <https://doi.org/10.3390/healthcare8030302>
- Aryani, I., Rachma, U. P., Rokhayati, E., & Moelyo, A. G. (2018). Menstrual cycle patterns of Indonesian adolescents. *Paediatrica Indonesiana*, 58(3), 101–105. <https://doi.org/10.14238/pi58.3.2018.101-5>
- Ayustaningwarno, F., Anjani, G., Ayu, A. M., & Fogliano, V. (2024). A critical review of Ginger's (Zingiber officinale) antioxidant, anti-inflammatory, and immunomodulatory activities. *Frontiers in Nutrition*, 11. <https://doi.org/10.3389/fnut.2024.1364836>
- De Sanctis, V., Soliman, A. T., Elsedfy, H., Soliman, N. A., Soliman, R., & El Kholy, M. (2016). Dysmenorrhea in adolescents and young adults: a review in different country. *Acta Bio-Medica : Atenei Parmensis*, 87(3), 233–246.
- Duman, N. B., Yıldırım, F., & Vural, G. (2022). Risk factors for primary dysmenorrhea and the effect of complementary and alternative treatment methods: Sample from Corum, Turkey. *International Journal of Health Sciences*, 16(3), 35–43.

- Gambadauro, P., Hadlaczky, G., Wasserman, D., & Carli, V. (2024). Menstrual symptoms and subjective well-being among postmenarchal adolescents. *AJOG Global Reports*, 4(1), 100304. <https://doi.org/10.1016/j.xagr.2023.100304>
- Guimarães, I., & Póvoa, A. M. (2020). Primary Dysmenorrhea: Assessment and Treatment. *Revista Brasileira de Ginecologia e Obstetrícia / RBGO Gynecology and Obstetrics*, 42(08), 501–507. <https://doi.org/10.1055/s-0040-1712131>
- Haroen, U., Syafwan, S., Kurniawan, K., & Budiansyah, A. (2024). Determination of total phenolics, flavonoids, and testing of antioxidant and antibacterial activities of red ginger (*Zingiber officinale* var. *Rubrum*). *Journal of Advanced Veterinary and Animal Research*, 0, 1. <https://doi.org/10.5455/javar.2024.k755>
- Itani, R., Soubra, L., Karout, S., Rahme, D., Karout, L., & Khojah, H. M. J. (2022). Primary Dysmenorrhea: Pathophysiology, Diagnosis, and Treatment Updates. *Korean Journal of Family Medicine*, 43(2), 101–108. <https://doi.org/10.4082/kjfm.21.0103>
- Itriyeva, K. (2022). The normal menstrual cycle. *Current Problems in Pediatric and Adolescent Health Care*, 52(5), 101183. <https://doi.org/10.1016/j.cppeds.2022.101183>
- Kemenkes RI. (2018). *Buku Pencegahan dan Penanggulangan Anemia pada Rematri dan WUS*. Kemenkes RI. <https://ayosehat.kemkes.go.id/buku-pedoman-pencegahan-dan-penanggulangan-anemia-pada-remaja-putri-dan-wanita-usia-subur>
- Kim, S., Cheon, C., Kim, B., & Kim, W. (2022). The Effect of Ginger and Its Sub-Components on Pain. *Plants*, 11(17), 2296. <https://doi.org/10.3390/plants11172296>
- Lacroix, A. E., Gondal, H., Shumway, K. R., & Langaker, M. D. (2024). *Physiology, Menarche*.
- Marques, P., Madeira, T., & Gama, A. (2022). Menstrual cycle among adolescents: girls' awareness and influence of age at menarche and overweight. *Revista Paulista de Pediatria*, 40. <https://doi.org/10.1590/1984-0462/2022/40/2020494>
- Mashhadi, N. S., Ghiasvand, R., Askari, G., Hariri, M., Darvishi, L., & Mofid, M. R. (2013). Anti-oxidative and anti-inflammatory effects of ginger in health and physical activity: review of current evidence. *International Journal of Preventive Medicine*, 4(Suppl 1), S36-42.
- Moelyo, A. G., Wulandari, A., Imas, O., Rahma, U. P., Hidayah, N., Kesumaningtyas, C., Nur, F. T., & Nugroho, H. W. (2019). Age at menarche and early menarche among healthy adolescents. *Paediatrica Indonesiana*, 59(1), 33–37. <https://doi.org/10.14238/pi59.1.2019.33-7>
- Mustafa, I., & Chin, N. L. (2023). Antioxidant Properties of Dried Ginger (*Zingiber officinale* Roscoe) var. Bentong. *Foods (Basel, Switzerland)*, 12(1). <https://doi.org/10.3390/foods12010178>
- Seif, M. W., Diamond, K., & Nickkho-Amiry, M. (2015). Obesity and menstrual disorders. *Best Practice and Research: Clinical Obstetrics and Gynaecology*, 29(4), 516–527. <https://doi.org/10.1016/j.bpobgyn.2014.10.010>
- Shahrajabian, M. H., Sun, W., & Cheng, Q. (2019). Clinical aspects and health benefits of ginger (*Zingiber officinale*) in both traditional Chinese medicine and modern industry. *Acta Agriculturae Scandinavica, Section B — Soil & Plant Science*, 69(6), 546–556. <https://doi.org/10.1080/09064710.2019.1606930>

Thiyagarajan, D. K., Basit, H., & Jeanmonod, R. (2024). *Physiology, Menstrual Cycle*.

WHO. (2022). *Adolescent health*.

[https://www.who.int/data/gho/data/indicators/indicator-details/GHO/adolescent-birth-rate-\(per-1000-women-aged-15-19-years\)?lang=en](https://www.who.int/data/gho/data/indicators/indicator-details/GHO/adolescent-birth-rate-(per-1000-women-aged-15-19-years)?lang=en)

Zhang, S., Kou, X., Zhao, H., Mak, K.-K., Balijepalli, M. K., & Pichika, M. R. (2022). Zingiber officinale var. rubrum: Red Ginger's Medicinal Uses. *Molecules*, 27(3), 775.

<https://doi.org/10.3390/molecules27030775>