JPPIPA 11(3) (2025)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Jamu as a Therapy for Primary Dysmenorrhea in Adolescents in Lahat, Banyuasin and Muara Enim District, South Sumatera Province in 2024

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Received: January 26, 2025
Revised: February 28, 2025
Accepted: March 25, 2025
Published: March 31, 2025

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DOI: 10.29303/jppipa.v11i3.10507

Abstract: Primary dysmenorrhea is a common complaint among adolescent girls, affecting daily activities. Herbal medicine has been widely used as an alternative treatment. This study aims to compare the effectiveness of herbal medicine and mefenamic acid in reducing primary dysmenorrhea pain among 460 high school students in South Sumatra. Pain levels were measured using the Numeric Rating Scale (NRS) at specific time intervals. Results indicate that herbal medicine has comparable effectiveness to mefenamic acid in reducing pain at the 60th minute. While the mefenamic acid group was given 500 mg of mefenamic acid. The degree of pain was measured using the Numeric Rating Scale (NRS) before treatment, at 14, 30, 45, and 60 minutes after treatment. Results: The significance value of the pain level of both groups at 60 minutes (0.244) > α 0.05 (error level 5%). This shows that there is no significant difference between the differences in the mean pain level given herbal medicine and mefenamic acid at 60 minutes. So it is concluded that herbal medicine is able to reduce the level of pain the same as mefenamic acid at 60 minutes. This also means that herbal medicine can be used as a therapy for primary dysmenorrhea as well as the use of mefenamic acid at 60 minutes. Herbal medicine can be used as a therapy for primary dysmenorrhea in adolescents. This study provides initial evidence that herbs and chemical drugs actually have the same efficacy if given in the appropriate amount.

Keywords: Adolescents; Herbal medicine; Mefenamic acid; NRS; Primary dysmenorrhea

Introduction

The percentage of adolescents in Indonesia in 2023 is 23.18 percent or almost a quarter of the Indonesian population and female adolescents have a higher morbidity rate than male adolescents (6.76% compared to 5.73%) (Central Statistics Agency, 2023). One of the causes of the high morbidity rate in female adolescents is menstruation. Menstruation is experienced by every woman from menarche to menopause throughout her life (Sarwono, 2011). Women experience various physical complaints and disrupt activities when menstruation occurs, one of which is dysmenorrhea (Acheampong et al., 2019). Dysmenorrhea has an impact on women's lives. Dysmenorrhea results in restrictions on daily activities, lower academic ability in adolescents, poor sleep quality, and has a negative effect on mood causing anxiety and depression (Assefa et al., 2016).

The prevalence of dysmenorrhea is estimated to be quite high, ranging from 45% to 93% in women of reproductive age in several countries (Patel et al., 2006). The highest prevalence of dysmenorrhea occurs in

How to Cite:
Putri, D. P., Haryati, D., Malena, Y., Aulia, Y., Diana, Puspitasari, I., … Kartanti, M. (2025). Jamu as a Therapy for Primary Dysmenorrhea in Adolescents in Lahat, Banyuasin and Muara Enim District, South Sumatera Province in 2024. *Jurnal Penelitian Pendidikan IPA*, *11*(3), 787-749. https://doi.org/10.29303/jppipa.v11i3.10507

adolescents (Lindh et al., 2012). Meanwhile, the incidence of dysmenorrhea in Indonesia is 107,673 people, consisting of 59,671 people experiencing primary dysmenorrhea (54.89%) and 9,496 people experiencing secondary dysmenorrhea (9.36%) (Orimadegun et al., 2019). Jamu is a traditional Indonesian medicine made from ingredients or concoctions of ingredients from plants, animals, minerals, galenic preparations, or mixtures of these ingredients that have been used for generations for treatment (Regulation of the Minister of Health of the Republic of Indonesia No. 3 of 2010).

Herbal medicine has been used for centuries by Indonesian people to maintain health and treat diseases (Elfahmi et al., 2014). Various types of plants that have analgesic properties in herbal medicine include Zingiber officinale (ginger), Alpinia galanga (galangal), Foeniculum vulgare (fennel), Parkia speciosa (petai), Curcuma longa (turmeric), Coriandrum sativum (coriander), Cinnamomum verum (cinnamon), Syzygium polyanthum (bay leaf), Andrographis paniculata (sambiloto), Tamarindus indica (tamarind), Citrus aurantifolia (lime), Curcuma xanthorrhiza (Temulawak) and Piper betle (betel) (Andanalusia et al., 2023).

Herbal medicine is believed to reduce the intensity of menstrual pain. Research by Jamila et al. (2018), that there is a significant difference before and after giving turmeric and tamarind herbal medicine to reduce the level of menstrual pain in adolescent girls (p-value <0.05). Based on the description above, it is important to study herbal medicine as a therapy for primary dysmenorrhea in adolescents in Lahat, Banyuasin, and Muara Enim Regencies, South Sumatra Province.

Method

Study Design

This study used a quantitative approach with the aim of determining the extent to which herbal medicine can be used as a therapy for primary dysmenorrhea in adolescents based on inferential statistics.

Data analysis

Data were analyzed using the Paired Sample T-Test to compare pain levels before and after intervention in each group. Additionally, the Levene's test was used to assess data homogeneity, and an independent t-test was applied to compare the effectiveness of herbal medicine and mefenamic acid in pain reduction

Participants

460 female students in grades X, XI, and XII from six Senior High Schools in Lahat, Banyuasin, and Muara Enim Regencies, South Sumatra Province who experienced primary dysmenorrhea when data collection was carried out and were selected using a purposive sampling technique. Respondents were divided into two groups, namely 234 female students were given herbal medicine and 234 female students were given mefenamic acid as a therapy for primary dysmenorrhea.

Instrument

The degree of primary dysmenorrhea pain was measured using the Numeric Rating Scale (NRS). The NRS is a single numeric scale containing 11 values, namely 0 to 10. A value of 0 describes the condition of the respondent who does not feel any pain at all, while a value of 10 describes the condition of the respondent who feels the greatest pain imaginable. The NRS value was conveyed verbally by the respondent. The degree of primary dysmenorrhea pain was measured five times, namely before being given herbal medicine or mefenamic acid and at 15, 30, 45, and 60 minutes after being given herbal medicine or mefenamic acid. The internal consistency of the measuring instrument is very high (Cronbach alpha = 0.900) (Arruda et al., 2022).

Result and Discussion

A total of 468 respondents in both groups, the majority of respondents have an age range of 16-19 years (late adulthood), age of menarche in the range of 11-14 years (normal), and menstrual cycles occur for 24-35 days (normal) with a menstrual duration of 3-7 days (normal). The time of onset of dysmenorrhea in the majority of respondents occurred on the 1st or 2nd day of menstruation with a duration of dysmenorrhea <2 days. The results of the homogeneity test using the Levene test showed that all variables had a p value> 0.05 which showed that the variance of respondent age, age of menarche, menstrual cycle, duration of menstruation, time of onset of dysmenorrhea, and duration of dysmenorrhea from both groups were the same or homogeneous.

The table below shows that the majority of the degree of pain felt by respondents before being given herbal medicine fell into the moderate pain category, which was 162 people (69.2%) and respondents who fell into the severe pain category were 54 people (23.1%).

At 15, 30, and 45 minutes after being given herbal medicine, there was a decrease in the number of respondents who fell into the moderate pain category and the severe pain category. Meanwhile, at 60 minutes after being given herbal medicine, no more respondents were

found to fall into the severe pain category. Based on these results, it can be concluded that after being given herbal medicine, there was a decrease in the number of respondents who fell into the moderate pain and severe pain categories.

Of the 234 respondents, the majority of the degree of pain felt before being given mefenamic acid was in the moderate pain category, which was 144 people (61.5%) and respondents who were in the severe pain category were 66 people (28.2%). At 15, 30, and 45 minutes after being given mefenamic acid, there was a decrease in the number of respondents who were in the moderate pain category and the severe pain category. Meanwhile, at 60 minutes after being given herbal medicine, there were no more respondents who were in the moderate pain and severe pain categories. Based on these results, it can be concluded that after being given mefenamic acid, there was a decrease in the number of respondents who were in the moderate pain and severe pain categories.

Table 1. Characteristics of Participants

Variable	Jamu (Herbal Medicine)		Mefenamic Acid		P
	Total	%	Total	%	
Participant's Age					
13-15 years (middle adolescence)	47	20.1	42	17.9	0.219
16-19 years (late adulthood)	187	79.9	192	82.1	
Age of Menarche					
<11 years (early menarche)	12	5.1	9	3.9	0.403
11-14 years (normal)	222	94.9	225	96.2	
>14 years (late menarche)	0	0	0	0	
Menarche Cycle					
<24 days (polymenorrhea)	5	2.1	2	0.9	0.107
24-35 years (normal)	166	70.9	181	77.3	
>35 days (oligomenorrhea)	63	27	51	21.8	
Menstrual Period					
<3 days (hypomenorrhea)	0	0	0	0	0.093
3-7 days (normal)	218	93.2	224	95.7	
>7 days (menorrhagia)	16	6.8	10	4.3	
When Dysmenorrhea Occurs					
Before Menstruation	11	4.7	15	6.4	0.374
Day 1 or 2 of Menstruation	223	9.3	219	93.6	
After Day 2 of Menstruation	0	0	0	0	
Dysmenorrhea Duration					
<2 days	128	54.7	120	51.3	0.328
2-3 days	106	45.3	114	48.7	
>3 days	0	0	0	0	

The results of the Paired Sample T-test showed that there was a significant difference between the mean pretest and posttest scores at the 60th minute with a p value = 0.000 at the 60th minute (p <0.05). It can be concluded that herbal medicine has an effect in reducing the degree of pain at the 60th minute.

The results of the Paired Sample T-test showed that there was a significant difference between the mean pretest and posttest values at the 30th minute, 45th minute, and 60th minute with a p value = 0.028 at the 30th minute, p value = 0.000 at the 45th minute, and p value = 0.000 at the 60th minute (p <0.05). It can be concluded that mefenamic acid has an effect on reducing the degree of pain at the 30th minute.

Table 2. Distribution of Respondents Based on Pain Degree in the Herbal Medicine Group

Score	Herbal Medicine (Jamu)									
	Pre-test		Post-test							
	n	%	15′		30′		45′		60′	
			n	%	n	%	n	%	n	%
0 (no pain)	0	0	30	12.8	60	25.6	108	46.2	151	64.5
1-3 (mild pain)	18	7.7	48	20.5	84	35.9	102	43.6	72	30.8
4-6 (moderate pain)	162	69.2	114	48.7	66	28.2	24	10.3	11	4.7
7-10 (severe pain)	54	23.1	42	17.9	24	10.3	0	0	0	0
Total	234	100	234	100	234	100	234	100	234	100

Table 3. Distribution of Respondents Based on Pain Degree in the Mefenamic Acid Group

Score	Pre-test		Treatment Post-test							
	n	%	15′		30′		45′		60′	
			n	%	n	%	n	%	n	%
0 (no pain)	0	0	48	20.5	78	33.3	138	59	180	76.9
1-3 (mild pain)	24	10.3	120	51.3	108	46.2	78	33.3	54	23.1
4-6 (moderate pain)	144	61.5	54	23.1	42	17.9	18	7.7	0	0
7-10 (severe pain)	66	28.2	12	5.1	6	2.6	0	0	0	0
Total	39	100	39	100	39	100	39	100	39	100

Table 4. Distribution of Pre-test and Post-test Analysis in the Herbal Medicine Group

Jamu (Herbal Medicine)	Mean	SD	Mean	SD	P
Minute 15					
Pre-test	5.31	1.472	0.62	0.990	0.084
Post-test	4.69	2.190			
Minute 30					
Pre-test	5.31	1.472	1.29	1.031	0.071
Post-test	4.02	1.984			
Minute 45					
Pre-test	5.31	1.472	2.46	0.975	0.059
Post-test	2.85	1.531			
Minute 60					
Pre-test	5.31	1.472	4.79	0.894	0.000
Post-test	0.51	0.942			

Table 5. Distribution of Pre-test and Post-test Analysis in Mefenamic Acid Group

Mefenamic Acid	Mean	SD	Mean	SD	P
Minute 15					
Pre-test	5.44	1.518	2.25	1.081	0.069
Post-test	3.19	2.238			
Minute 30					
Pre-test	5.44	1.518	2.47	0.790	0.028
Post-test	2.97	1.849			
Minute 45					
Pre-test	5.44	1.518	3.49	0.823	0.000
Post-test	1.95	1.413			
Minute 60					
Pre-test	5.44	1.518	5.03	1.034	0.000
Post-test	0.41	0.850			

Table 6. Differences in the Effects of Herbal Medicine and Mefenamic Acid in Reducing Pain Levels

Measurement	Group	Mean (SD)	SD	Mean	SD	t	p
Minute 15	Jamu (Herbal Medicine)	4.69	2.190	1.43	0.487	1.475	0.043
	Mefenamic Acid	3.19	2.238				
Minute 30	Jamu (Herbal Medicine)	4.02	1.984	1.05	0.434	0.354	0.006
	Mefenamic Acid	2.97	1.849				
Minute 45	Jamu (Herbal Medicine)	2.85	1.531	0.87	0.334	0.615	0.015
	Mefenamic Acid	1.95	1.413				
Minute 60	Jamu (Herbal Medicine)	0.51	0.942	0.09	0.203	0.505	0.244
	Mefenamic Acid	0.41	0.850				

This shows that there is no significant difference between the difference in the average pain level given herbal medicine and mefenamic acid at the 60th minute. So it can be concluded that herbal medicine is able to reduce the degree of pain as well as mefenamic acid at the 60th minute. This also means that herbal medicine can be used as a primary dysmenorrhea therapy as well as the use of mefenamic acid at the 60th minute. The table above shows the significance value of the pain level of the two groups at the 15th minute ($p = 0.043$), 30th minute ($p = 0.006$), and 45th minute ($p = 0.015$) showing $p < \alpha$ 0.05 with the average pain level in the mefenamic

acid group being smaller than the herbal medicine group in all three measurements. This means that there is a significant difference between the difference in the average pain level given herbal medicine at the 15th minute, 30th minute, and 45th minute and mefenamic acid can reduce the average pain level better than herbal medicine at the 15th minute, 30th minute, and 45th minute. While the significance value of the pain level of the two groups at the 60th minute shows p>α 0.05 (p = 0.244).

Data Analysis Results

Jamu is a traditional Indonesian medicine made from ingredients or concoctions of ingredients in the form of plant materials, animal materials, mineral materials, galenic preparations, or mixtures of these ingredients that have been used for generations for treatment and can be applied according to the norms prevailing in society (Balitbangkes, 2017). The herbal medicine in this study was made from 200 ml of extract from 100 g of Curcuma domestica (turmeric), 100 g of Zingiber officinale (ginger), 500 mg of Cinnamomum verum extract (cinnamon), 10 g of Syzygium polyanthum (bay leaf), 50 g of Tamarindus indica (tamarind), 5 g of Cymbopogon citratus (lemongrass), 100 g of Kaempferia galanga (galangal), and a little honey. Herbal medicine has been used for centuries by Indonesian people to maintain health and treat diseases, one of which is to reduce menstrual pain (Elfahmi et al., 2014).

This can be seen that there is a significant difference between the mean pretest and posttest values at the 60th minute with a p value = 0.000 at the 60th minute (p <0.05) after giving herbal medicine, so it can be concluded that herbal medicine has an effect in reducing the degree of pain at the 60th minute. The same thing was also obtained from a study conducted by Ulaa et al. (2022) on 72 female adolescents at SMA Negeri 10 Palembang showed that there was a difference in pretest and posttest pain in the group given turmeric tamarind drink with a significance value of 0.000 (α = 0.05). According to Sannigrahi (2015) in Patala et al. (2023), plants containing secondary metabolites such as saponins, flavonoids, triterpenoids, and steroids have anti-inflammatory and analgesic activities. Flavonoid metabolites are known to have analgesic effects by inhibiting the COX enzyme in prostaglandin synthesis. The steroid saponin and triterpenoid saponin groups isolated from plants have anti-inflammatory and analgesic activities through the mechanism of inhibiting increased blood vessel permeability caused by inflammatory mediators. Turmeric rhizomes contain curcumin, flavonoids, tannins, saponins, essential oils, resins, and other minerals (Rezki et al., 2015).

The anthocyanin content in tamarind can inhibit the action of the cyclooxy genase enzyme so that it can inhibit the release of prostaglandins so that it can reduce pain. Meanwhile, the content of tannins, saponins, sesquiterpenes, alkaloids, and phlobatamines in tamarind is very useful for calming the mind and reducing psychological stress (Kaushik et al., 2020). Research conducted by Rahayu et al. (2018) on 33 female students of the Sakinah Pasuruan Midwifery Academy who were given 250 mg of ginger extract on the third day before menstruation until the first day of menstruation showed a decrease in the average pain intensity value of 1.364 with a significance value of 0.000 (p <0.05). According to Sari et al. (2024), ginger rhizome contains phytochemical compounds, including alkaloids, flavonoids, phenolics, triterpenoids, and saponins. Ginger rhizome juice has effectiveness as an analgesic or pain reliever because the compound elements contained in ginger rhizomes are related to analgesic effects, such as gingerol, shogaol, zingerone, diarylheptanoid, and their derivatives, especially paradol which can reduce pain because it can inhibit the cyclooxygenase enzyme, thereby reducing the formation or biosynthesis of prostaglandins (Mantiri et al., 2013). 50 g of ginger rhizome extract has the effect of relieving pain in human musculoskeletal. Ginger rhizomes can inhibit the effects of COX-2 and COX-1 enzymes/enzymatic activity in thromboxane synthesis. Ginger rhizomes can also significantly inhibit the formation of prostaglandin E-2 (PGE-2) (Food and Drug Supervisory Agency, 2016).

Research conducted by Carolin et al. (2023) on 66 ninth grade female students divided into two groups with the control group given 500 mg cinnamon extract capsules for three days showed that cinnamon extract had an effect on the incidence of dysmenorrhea with a significance value of 0.000 (p <0.05). The content of cinnamaldehyde and eugenol in cinnamon can overcome dysmenorrhea. Cinnamaldehyde has antispasmodic activity which is known to relieve, prevent, or reduce the risk of muscle spasms and relax muscles so that it can relieve stomach cramps. While eugenol can suppress the release of prostaglandin hormones and reduce inflammation. Meanwhile, research by Hafid et al. (2023) found that the most effective cinnamon bark extract in treating pain was at a concentration of 3% (200 g) with an analgesic percentage of 38.32%.

Research by Sari et al. (2024) on 32 female students of SMP Negeri 1 Simpang Tiga, Pidie Regency showed that giving boiled bay leaves was proven effective in reducing dysmenorrhea pain with a significance value of 0.000 (p value <0.05). The Indonesian Ministry of Health (2015) explained that bay leaves contain essential

oils (±0.05%) containing citral, eugenol, saponins, steroids, tannins, and flavonoids. Meanwhile, the analysis using MPLC and LC-MS in the study of Saifudin et al. (2012), the methanol extract of bay leaves contains quercitrin, campesterol, campest-4-en-3-one and cycloartenone, while TLC shows gallic acid, myricetrin and alangionoside-O-aglicone. Quercetin can inhibit COX-2 and quercetin works by inhibiting prostaglandin biosynthesis by inhibiting COX-1 and COX-2. The selectivity of inhibition towards COX-2 will prevent the formation of prostaglandins which are important mediators in the process of pain.

Research by Royhanaty et al. (2018) on 32 D IV Midwifery Study Program Students of Karya Husada Health College Semarang who drank 200 ml of lemongrass drink (50mg lemongrass) 2 hours after giving the lemongrass drink showed a decrease in the intensity of dysmenorrhea (average intensity of dysmenorrhea from 5.69 to 4.88) and showed a significant difference before and after giving the lemongrass drink with a p-value of 0.000 ($\alpha = 0.05$).

Lemongrass is widely used to give a distinctive taste to a dish. In addition to being used as a cooking ingredient, lemongrass plants are also developed to be used as medicine, such as analgesics, antipyretics, digestive disorders and as antibodies (Februyani et al., 2023). Lemongrass contains natural antioxidants and anti-inflammatories, from citronellal and geraniol, which can prevent free radicals in the human body. Antioxidants can inhibit the release of arachidonic acid with their mechanism in inhibiting protein kinase C which can affect the activity of the phospholipase A2 enzyme. So that with the inhibition of arachidonic acid synthesis will reduce the production of prostaglandins where prostaglandins play a role in causing the sensation of pain, antioxidants have a role in reducing menstrual pain (Salisatullutfiah et al., 2020).

Based on research by Andriyono (2019), it shows that the results of the analgesic test of small ethanol extracts of kencur rhizomes in mice using the writhing method show that writhing decreases by increasing the dose of kencur administration at levels of 25 mg/ kg BW, 50 mg/ kg BW and 100 mg/ kg BW with the analgesic effect of acetosal of 71%, 104%, 138%. Kencur rhizomes contain saponins, flavonoids, polyphenols and essential oils (ethyl-trnas p-methoxy cinnamate, tatadekan, 1,8-cineol, g-karen, borneol), camphene, kaempferol, kaempferide, cinnamaldehyde, p-methoxycinnamic acid, and ethynamine cinnamate. Kencur rhizomes are efficacious for treating stones, bloating, nausea, swelling, ulcers, and abdominal pain (Widyastuti et al., 2023). Phospholipid complexes are known to act as carriers that can increase the analgesic activity of kencur. This effect is likely obtained due to inhibition of the cyclooxygenase enzyme and inhibition of prostaglandin synthesis (Vittalrao et al., 2011). Mefenamic acid is a type of NSAID drug. Nonsteroidal anti-inflammatory drugs/NSAIDs are a therapy that is often used for dysmenorrhea. NSAIDs have an analgesic effect that directly inhibits prostaglandin synthesis and suppresses the amount of menstrual blood that comes out (Sarwono, 2011). This can be seen from the significant difference between the average pretest and posttest values at the 30th minute, 45th minute, and 60th minute with a p value = 0.028 at the 30th minute, a p value = 0.000 at the 45th minute, and a p value = 0.000 at the 60th minute ($p < 0.05$) after administering mefenamic acid, so it can be concluded that mefenamic acid has an effect on the menu.

Conclusion

Herbal medicine can be used as a therapy for primary dysmenorrhea in adolescents. This study provides initial evidence that herbs and chemical drugs actually have the same efficacy if given in the appropriate amount. However, more research is needed to find out other medicinal plants that can be processed into herbal medicine to increase its effectiveness in reducing morbidity due to primary dysmenorrhea in adolescents in Indonesia.

Acknowledgments
Thank you to research location for funding and Sekolah Tinggi Ilmu Kesehatan Abdi Nusantara for research support.

Author Contributions
P.D.P., contributed in conceptualizing the research idea, developing the product,. H.D., contributed in analyzing data and writing the article. M.Y & A.Y., contributed in writing, reviewing, and editing the article. D., contributed in collecting data. P.I & A.R., review the result and approved the final version of the manuscript.

Funding
This research was funded by researchers.

Conflicts of Interest
All authors declare no conflict of interest.

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