

Which one is more effective? Abdominal stretching exercise or knee to chest exercise reduce dysmenorrhea in adolescent girls

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ABSTRACT

Background: Dysmenorrhea is menstrual pain that most commonly experienced in adolescent can cause a risk of health problem in the future can result in a decrease in physical, psychological, and academic well-being.

Objectives: The objective of this study was to determine the effectiveness of abdominal stretching exercise and knee-to-chest exercise on lowering dysmenorrhea

Methods: This type of research is a quasi-experiment pre-post-test with a control group. Samples are adolescents who had dysmenorrhea in last two month. The sampling technique used was systematic random; the sample number was divided into two group each group is 26 students. The intervention of ASE with duration 15 minutes and the group was KTCE for 30 times with duration 20 second for 5 consecutive days. Dysmenorrhea was measured by numeric rating scale.

Results: The results showed that dysmenorrhea before giving the ASE 5.54 and after intervention 3.69 (*p*-value of 0.001). Whereas the pain scale before giving the knee-to-chest exercise 5.58, after there was a decrease in pain of 4.85 (*p*-value 0.001) by using Wilcoxon test. The difference in the average in pain between groups after the intervention was 1.16 on the pain scale. The results of the Mann Whitney test with a *p*-value of 0.001 (*p*-value $0.000 \leq \alpha 0.005$). Abdominal stretching exercise intervention is more effective in reducing the dysmenorrhea by 37% compared to KTCE 14%.

Conclusions: Abdominal stretching exercise is more effective in reducing dysmenorrhea than knee to chest exercise. ASE is one of nursing therapies of choice for treating dysmenorrhea.

KEYWORD: abdominal stretching; adolescent; dysmenorrhea; exercise; menstruation

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INTRODUCTION

Dysmenorrhea is the most common gynecological problem and needs to be addressed in women of reproductive age (1). It has a significant impact on life course potential. It has a widespread impact on a female's mental and physical well-being, with longstanding impairments on quality of life, personal relationships, and education and career attainment (2). Dysmenorrhea, or menstrual pain, is a prevalent gynecological complaint among adolescent females, with significant implications for daily functioning, school attendance, and overall quality of life (3). Dysmenorrhea refers to the painful cramps experienced during menstrual cycles typically observed in younger females of the reproductive age, often felt as a pain in the lower abdomen and that pain possibly radiating to the lower back and legs (4).

The prevalence of dysmenorrhea in women of reproductive age worldwide ranges from 16% to 92% and of those who suffer severe pain, 2% to 29% (5). A literature review and meta-analysis study involving more than 20,000 women from 38 different countries found that the prevalence of dysmenorrhea reached 71.1% (2). An estimated prevalence of 43% to 93% of all women of reproductive age worldwide, dysmenorrhea is the most common gynecological condition. In Indonesia, where exact prevalence data were not available, such different estimates also exist. However, according to a Central Java

research, about half of Indonesian women suffer from dysmenorrhea (6). In academic settings, primary dysmenorrhea is particularly prevalent among female undergraduate students. According to estimates, about 50% of women worldwide who 90% of female teenagers experience menstruation, and 10% to 20% say that their discomfort is severe, acute, or upsetting (7). Primary or secondary dysmenorrhea are both types of dysmenorrhea. Menstrual pain without an organic disorder is termed as primary dysmenorrhea, whereas menstrual pain associated with organic pelvic pathology is characterized as secondary dysmenorrhea (8).

The impact of primary dysmenorrhea in adolescents included headache (2.2%), flatulence (3.0%), fatigue (0.4%), nausea, and vomiting (2.5%)(9). Inability to attend school (10%), loss of concentration in class (71%), decreased exam writing skills (85%), and inability to complete assignments on time (63%), poor mood, anxiety (62%) and poor sleep quality (36.4%)(10) These conditions can significantly reduce well-being physically, psychosocially and academically (1,11,12). The present study showed that while a majority of adolescent girls experienced dysmenorrhea, a substantial proportion lacked sufficient knowledge regarding menstrual problem management, highlighting the need for improved education on dysmenorrhea care (13). Female dysmenorrheics frequently

employ non-pharmacological treatments. According to a recent meta-analysis of 12,526 female dysmenorrheics, 51.8% of them used various non-pharmacological coping mechanisms to manage their menstrual discomfort.

Based on research (Karout et al., 2021), The majority of females with dysmenorrhea (340, or 76.4%) reported using medicine to control their pain. Of these, 126 (37.1%) were prescribed by medical professionals, while 214 (62.9%) self-medicated. The most frequent prescribers (n=92,73%) were pharmacists, who were followed by doctors (n=29,23%) and nurses (n=5,4%)(14) Whereas, if the use of these drugs is not in accordance with the dosage and used for a long period of time, it can cause adverse effects on health such as gastric ulcer, indigestion, intestinal bleeding and others (15).

The results of the researchers' preliminary study at several junior high school in Bengkulu City, we found that the problem encountered was that teenagers did not make efforts to reduce menstrual pain with other methods, only relying on medication to relieve the dysmenorrhea pain. Teenagers are lazy to do exercise when they are menstruating. Currently, more students said her mother do not teach various ways to lower pain when they menstruate. A preliminary study conducted through a random survey using an online questionnaire obtained data including: 82.9% of 30 adolescents experienced

dysmenorrhea, mild pain (14.3%), moderate pain (54.3%), and severe pain (14.3%), with 80% experiencing pain on days 1-2 of menstruation. Results of interviews with 5 female students at SMP 12, Bengkulu City, on August 4, 2024, revealed that 1 (20%) experienced mild pain, 3 (60%) moderate pain, and 1 (20%) severe pain. The actions taken during menstruation included: 2 (40%) taking analgesics, namely Panadol and Paracetamol, 1 (20%) applying eucalyptus oil to the abdomen, 1 (20%) drinking a carbonated drink (soda), and 1 (20%) taking no action.

Due to the various adverse effects of pharmacological therapy, non-pharmacological therapy is an alternative to reduce the intensity of dysmenorrhea pain (16). As a result, an increasing amount of study has focused on alternative therapies, such physical activity. Exercise enhances mental health and quality of life in addition to being affordable, low-risk, and without side effects. It has been established that exercises like yoga and aerobics can successfully lessen the discomfort and severity of dysmenorrhea pain (17).

Accordingly, the non-pharmacological therapy is an alternative to lower the intensity of dysmenorrhea pain. One of the therapies that can be completed is physical exercise such as abdominal stretching exercise (ASE) and *knee-to-chest exercise (KTCE)*(16). ASE is one of the stretching exercises that focus on the abdominal muscles that can lower dysmenorrhea pain.

ASE can enhance blood circulation, reduce muscle tension, boost muscle strength, and cause muscles flexible(18).Other than ASE therapy, one of effective intervention for reducing menstrual pain, KTCE. *It* is a stretch with a supine position and pulling both knees towards the chest that can increase pelvic blood flow, reduce muscle tension and strengthen the abdominal muscles and gluteus maximus muscles (16) and improve lower back flexibility (19).

Based on the problems, related to the management of dysmenorrhea pain in adolescents, we need to conduct a study to determine the effectiveness of therapy of ASE and KTCE on relieve dysmenorrhea pain in adolescent girls.

MATERIALS AND METHODS

The type of research used is a quasi-experimental design using a pre-and post-test with a control group design. This research was carried out from October 17, 2024, to December 27, 2024, at junior high school: SMP Negeri 12 and SMP Negeri 4 Bengkulu City. The samples in this study were grade VII students, aged 12-14 years who had a history of dysmenorrhea for 2 consecutive months.

The total of students has suffered dysmenorrhea was 52 in SMP negeri 12 and 73 adolescent in SMP negeri 4. The number of samples in this study was 52 people who were divided into two groups, each group consists of 26. The sampling

technique is systematic random sampling. The small sample size was due limited time and resources to conduct this study. In the intervention group, the ASE consisted of six types of stretching the abdominal muscles movements, with a duration of 15 minutes for five consecutive days one week before menstruation. Researcher makes a procedure operational standard and a procedure guideline to do exercise themselves. The researcher first taught ASE until they were able to do it independently, the researcher observed ASE for consecutive times for 15 minutes. The learning method have done by making a procedure guideline.

The control group was given KTCE in a supine position, then holding it for 20 seconds is repeated 30 times for 5 consecutive days 1 week. The researcher first taught knee-to-chest exercises until they were able to do it, the researcher observed for 5 consecutive times for 10 minutes. The baseline dysmenorrhea pain measurement based on menstruation of the previous month, and remeasurement after the intervention was carried out in the first 24 hours of menstruation using the Numerical Rating Scale (NRS). A study by Hawker (2011) showed that the validity test of the Numeric Rating Scale (NRS) pain scale showed $r = > 0.86$ and the reliability test using a test-retest yielded $r = > 0.96$ ($r > 0.70$). The research procedure flow can be seen in the following **Figure 1**.

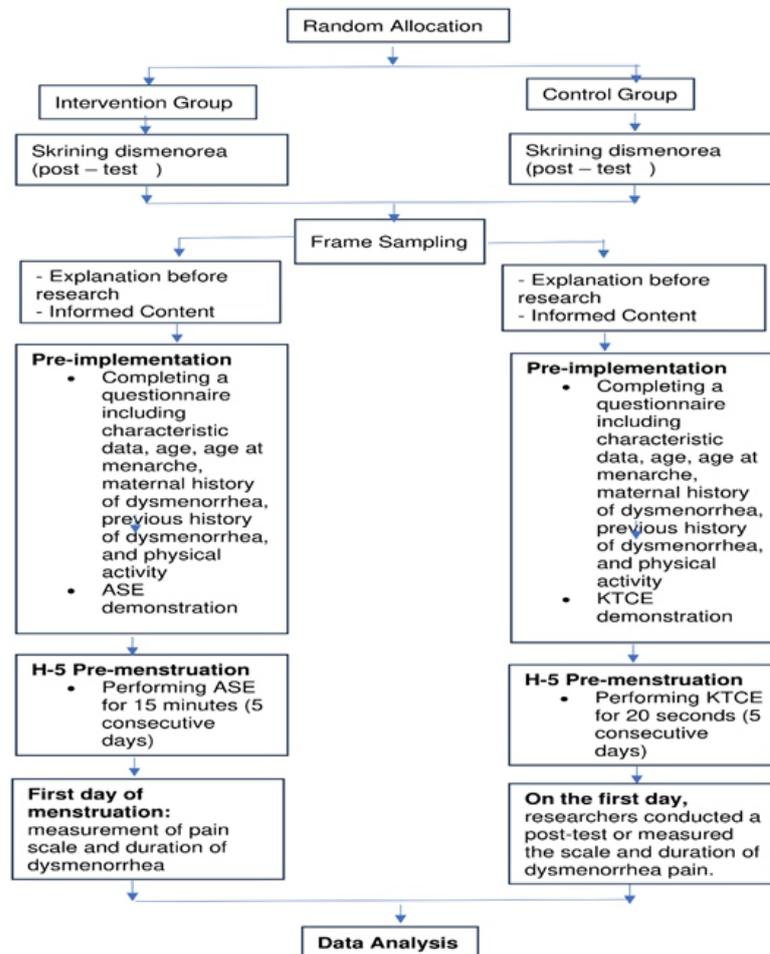


Figure 1. Research flow

The results of the data normality test were tested using Shapiro Wilk and showed that the data distribution was not normal. Statistical analysis using the Mann Whitney U-test and Wilcoxon test. The ethical clearance from the Ethics Commission of the Bengkulu Ministry of Health with certificate number KEPK.BKL/643/10/2.

RESULTS AND DISCUSSION

Based on this research, both groups were comparable in terms of their characteristic profile which can be seen in more detail on **Table 1**.

Based on **Table 1**, the average age of respondents in the ASE group and the knee-to-chest exercise group was 12 years old; the average age of menarche in the ASE group was a normal 11 years old. Menstruation duration in both groups showed that more than half of the respondents were normal for 3-7 days. Menstrual cycles in both groups, most of them were regular. Based on body mass index in both groups, more than half of the respondents were underweight, but there were some who had overweight 10,3% in the control group. In the ASE group, more

Table 1. The characteristic description and homogeneity test

Variable	Intervention (n=30)	Control (n=29)	P-value
Age			
Mean	12.4	12.3	
Min	12	12	
Max	13	13	0.333*
SD	0.5	0.47	
CI 95%	12.25; 12.62	12.13; 12.49	
Menarche age			
Mean	11	10.7	
Min	10	9	
Max	12	12	0.119*
SD	0.71	0.70	
CI 95%	10.77;11.30	10.46;10.99	
Menstruation Duration			
Abnormal (<3 day or >7 day)	11 (36.7%)	13(44.8%)	0.524**
Normal (3-7 day)	19 (63.3%)	16 (55.2%)	
Cyclic of menstruation			
Regular	22 (73.3%)	21 (72.4%)	0.937**
Not Regular	8 (26.7%)	8 (27.6%)	
BMI			
<i>Underweight</i>	17 (56.7%)	15 (51.7%)	0.194**
Normal	13 (43.3%)	11 (37.9%)	
<i>Overweight</i>	-	3 (10.3%)	
Family History			
Yes	20 (66.7%)	14 (48.3%)	0.153**
No	10 (33.3%)	15 (51.7%)	
Physical Activity			
Mild	24 (80.0%)	23 (79.3%)	0.948**
Moderate	6 (20.0%)	6 (20.7%)	

than half of the respondents had a family history of dysmenorrhea, while in the knee-to-chest exercise group, almost half of the respondents had a family history of dysmenorrhea. Physical activity in the both groups of most respondents was mild physical activity. Based on the independent T-test and chi-square test results showed a p-value of variables are greater than 0.05,

indicating that all characteristic variables in both are homogeneous. The baseline of intensity of dysmenorrhea pain is not different among group that can see in **Table 2**.

Based on **Table 2**, the average dysmenorrhea pain scale before ASE intervention was moderate pain 5.54 SD (0.647) while in the group given *knee-to-*

Table 2. Description of baseline of dysmenorrhea dan homogeneity

Variable	Group		P-value
	Intervention (n=26)	Control (n=26)	
Dysmenorrhea			
Mean	5.54	5.58	0.711*
Min	5	5	
Max	7	7	
SD	0.65	0.58	
CI 95%	5.28-5.80	5.34-5.81	

SD, Standard of Deviation, sig p value $\leq \alpha 0,05$, *Mann Whitney U test

chest exercise it was moderate pain 5.58 (0.578). The results of the homogeneity test showed a p value > 0.05 , which means that the pain variable before the intervention between groups was homogeneous.

Both groups were comparable in terms of their severity of dysmenorrhea pain before and after intervention, which can be seen in more detail below:

Table 3. Difference of dysmenorrhea after intervention

Variable	N	Before		After		Mean diff	P-value
		Min-max	Mean (SD)	Min-max	Mean (SD)		
Dysmenorrhea							
Intervention	26	7-May	5.54 (0.647)	5-Mar	3.69 (0.679)	1.85	0.001*
Control	26	7-May	5.58 (0.578)	6-Apr	4.85 (0.613)	0.73	0.001*

SD, Standard of Deviation, p value sig ≤ 0.05 α 95%, *Wilcoxon

Based on **Table 3**, the average dysmenorrhea pain scale before ASE intervention was 5.54 (0.647) while in the group given *knee-to-chest exercise* it was 5.58 (0.578). After ASE intervention, an average reduction in dysmenorrhea pain was 3.69 (a decrease of 1.85 on the dysmenorrhea pain scale), while the average dysmenorrhea pain after *knee-to-chest exercise* intervention was 4.85 (an average decrease of 0.73 on the dysmenorrhea pain scale). The results of the statistical test using the *Wilcoxon* test

showed that the p-value at ASE 0.001 (p -value $\leq \alpha 0.05$) in the group given *knee-to-chest exercise* was obtained with a p-value of 0.001 (p -value $\leq \alpha 0.05$). This shows that there was a difference in the average dysmenorrhea pain scale in the group given ASE and the group given *knee-to-chest exercise* before and after the intervention. After the effect of the intervention on reducing pain has tested, the effectiveness of the intervention between groups was also tested, which can be seen in the following **Table 4**.

Table 4. Effectivity of intervention between group

Variable	N	Mean (SD)	Mean Diff	P-value	Effectivity (%)
Dysmenorrhea					
Intervention group	26	1.85 (0.613)	1.12	0.001*	37%
Control Group	26	0.73 (0.452)			14%

*Standard of Deviasi, p value sig ≤ 0.05 α 95%, *Mann U Whitney*

The average difference in pain after ASE is 1.85 with a standard deviation of 0.613 while the average decrease in pain after knee-to-chest exercise is 0.73 with a standard deviation of 0.452. Based on the **Table 4** statistical tests using the Mann Whitney test, *p*-value of $0.001 < \alpha 0.05$ was obtained. This shows a significant difference in the scale of dysmenorrhea pain in the intervention group and the control group. It can be concluded that ASE is more effective in reducing the average dysmenorrhea pain scale in adolescent girls than knee-to-chest exercise. Effectiveness of the intervention in lowering the pain scale of dysmenorrhea. ASE is effective in reducing dysmenorrhea pain compared to knee-to-chest exercise. The effectiveness of ASE therapy was 37% in reducing the pain scale while knee-to-chest exercise was 14%.

Dysmenorrhea is the most common gynecological problem and needs to be addressed in women of reproductive age and can occur during menstrual periods, with the characteristics of mild to severe pain that can radiate to the lower back and thigh(9,20). Current evidence indicates that the pathophysiology of dysmenorrhea is caused by increased secretion of

prostaglandin F2α (PGF2α) and prostaglandin E2 (PGE2) in the endometrium, which are involved in increasing myometrial contractions leading to uterine ischemia and sensitization of pain fibers (21). The pathophysiology of PD is still unknown; however, it may be explained by the increase in the synthesis and release of prostaglandins during menstruation, which leads to hypercontractility of the myometrium, uterine muscle ischemia, hypoxia and decreased pain threshold (12).

In this study found the initial average of dysmenorrhea pain in both groups 5.54 (moderate pain level), after ASE intervention the average dysmenorrhea pain was 3.69 (mild pain). This research is in-line with the research conducted Mahundingan & Andriani (2023) in adolescent girls in Kenjeran, Surabaya, showed an average dysmenorrhea pain before ASE of 5.20 then after being given ASE intervention to 3.40, this shows that there is a decrease in the average dysmenorrhea pain scale of 1.80. ASE done for 4 consecutive days before menstruation for 10-15 minutes can reduce the scale of mild to moderate pain and even no one experiences severe pain. Based on the results of the study, after being given ASE intervention, there was a decrease of

1.85 on the pain scale of dysmenorrhea. It caused the ASE is a stretching and relaxation movement that focuses on the muscles of the abdomen, pelvis and lower back. The effect of stretching exercises can smooth blood supply to the abdominal and pelvic area. A smooth blood supply will bring oxygen to the mitochondria, and the process of the citric acid cycle (Krebs cycle) runs optimally, resulting in increased energy production or ATP and reduced lactic acid formation which can reduce the tension of the pelvic muscles of the abdomen and pelvis (22). Smooth supply of blood and oxygen to the body, uterine muscles, psoas and iliacus muscles removes metabolite residues and relaxes contracted uterine muscles (23). Research by Fatimah & Sholihah (2025) also demonstrated that ASE is effective in reducing dysmenorrhea pain in adolescent girls. Prior to the study, 33.3% of adolescent girls experienced mild dysmenorrhea and 66.3% moderate pain. After ASE, the number of women experiencing mild pain increased to 75%, and the number of women experiencing moderate pain decreased to 25% (24).

ASE can increase the levels of endorphins in the blood by up to 4-5 times. When a person performs physical activity, B-endorphins are released and received by receptors present in the hypothalamus and limbic system that function as natural sedatives, thus providing a sense of comfort. This increase in endorphins can reduce pain, including during contractions

(18,25). This is in line with research conducted by Nur et al., (2020), ASE performed during ASE, which is carried out for 4 consecutive days before the first day of menstruation, can increase endorphin levels by 115 pg/ml. In addition, ASE can also lower the level of prostaglandins in the blood. Prostaglandin levels after being given ASE 345 pg/ml were lower than in the group not given the 360 pg/dl intervention (26).

Average dysmenorrhea pain outcomes in the control group before KTCE was 5.58, after the intervention, the average dysmenorrhea pain became 4.85 (lowering 0.73). This research is different from the research conducted by Patel et al, (2019) by doing KTCE with supine lying position during eight weeks (3 times per-week) with 10 times respiration showed average of dysmenorrhea pain before it was performed, KTCE of 6.26, and after doing KTCE, the average pain of dysmenorrhea became 3.26. This shows that there is an average decrease of 3 pain scales (27). This difference in the average decrease in dysmenorrhea pain can occur because there is a difference in duration and the intensity of the time of intervention administration KTCE. What is different is that the time of measuring dysmenorrhea pain carried out by Patel's research was carried out on the third day of menstruation, so the results of the reduction in the dysmenorrhea pain scale obtained will be much different from this study, which

measured pain in the first 24 hours of the first day of menstruation. Dysmenorrhea pain and other menstruation-related symptoms appear immediately before or at the same time as menstrual flow and disappear within the first 48 hours to the third day. However, the most severe dysmenorrhea pain will be felt in the first 24 hours and will subside on the second day of menstruation (28).

Based on the results of the study after being given an intervention KTCE, there was a decrease of 0.73 in the dysmenorrhea pain scale. Doing KTCE can flex the muscles in the pelvis and help with smooth blood circulation in the pelvis, thus stimulating endocrine production, which can reduce pain, reduce muscle tension, strengthen the abdominal muscles and gluteus maximus muscles, and improve lower back flexibility (27,29). Based on the results of the research that has been conducted, the average difference in the reduction of dysmenorrhea pain scale in both groups is 1.12 dysmenorrhea pain scale. This shows that ASE is more effective in reducing the dysmenorrhea pain scale by 37%, while KTCE is low effective in reducing the dysmenorrhea pain scale by 14%.

This difference in the decrease in the pain scale of dysmenorrhea can be caused by the exercise program. ASE has six types of exercises while in KTCE only do one movement so that it will have an impact on the muscles to be trained. ASE It can

increase muscle strength, endurance and flexibility of the rectus abdominis muscles, transversus abdominis muscles, external oblique and internus, especially the psoas and iliacus muscles located in the pelvic and lower abdomen area so that the tense uterine muscles relax and reduce pain (25). While KTCE focuses only on the pelvic muscles, abdominal muscles and gluteus maximus muscles (29). Exercises that involve more body muscles can cause vasodilation of blood vessels that can affect biochemical changes such as increasing blood and oxygen supply in areas experiencing ischemic and wider spasms so that it is more optimal in reducing pain(30). Furthermore, strengthening core and lower abdominal muscles can enhance stability and support for the pelvic region, which may lower muscle tension and cramping related to dysmenorrhea. Improved muscular endurance can also help mitigate fatigue during menstruation, contributing to better functionality and comfort (31).

Another factor that can cause differences in the pain scale of dysmenorrhea can be caused by the difference in the duration of different exercise times between the groups that ASE did for 15 minutes per session, while the groups that were done KTCE that is only done for 10 minutes each session. A shorter duration of exercise will cause not enough time to improve blood circulation in the body, so the process of removing metabolic waste such as lactic acid and

prostaglandins will decrease. Shorter exercise processes can lower the stimulation of the central nervous system, so it is less than optimal to stimulate the release of endorphins (32).

Decreased prostaglandin levels and increased endorphins in the blood after exercise can be influenced by several factors, such as the intensity of exercise, the duration of exercise, and the type of exercise performed (26). Furthermore, the effect depends on the different types of exercise, they also differ in intensity (number of sets, number of repetitions), frequency (number of sessions per week), program duration (number of weeks or months), exercise duration and the period chosen for the exercise (pre-menstrual period, during menstruation or post-menstruation)(31).

Research Limitations

The researcher acknowledges several limitations in this study, which are due to several limitations in its implementation, including: The sample size was small, making it impossible to generalize the research result to other adolescent girl populations and was selected from only two schools, thus not reflecting the characteristics of the external population. The researcher did not analyze other factors through multivariate testing that may influence dysmenorrheal pain. The exercises were only performed once a day during the researcher's presence, so the

pain reduction obtained was less than optimal. The researcher did not conduct menstrual cycle screening in determining the sample, thus increasing the risk of exclusion.

Based on this research, need future study to establish more consistent methodologies and explore comparative effectiveness to provide evidence-based practice for integrating exercise into routine care for female adolescents with dysmenorrhea. It can higher our understanding of how exercise can be effectively utilized, ensuring a more impactful approach to pain management.

CONCLUSION AND RECOMMENDATION

ASE is more effective in reducing the pain scale of dysmenorrhea than KTCE. However, ASE and KTCE can lower pain of dysmenorrhea. These two interventions can be two of the interventions that can be carried out by young women who have dysmenorrhea. This stretching exercise can be done independently and has no side effects compared to taking medications. It is necessary to conduct this with a larger sample size so that the research results can be generalized to a wider population.

Future researchers should use various regular ASE programs for adolescents and do exercise before and during menstruation especially 1-2 days of menstruation and higher exercise frequency to reduce dysmenorrhea pain optimally. Further research is needed on the

application of ASE with a larger sample of female adolescents and pain observation during dysmenorrhea after exercise periodically.

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