

Effect of Jacobson's Relaxation Technique versus Warm Compresses on Pain Intensity, Fatigue and Quality of Life among Nursing Students with Primary Dysmenorrhea

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Abstract

Background: The quality of life for females who experience primary dysmenorrhea, which causes spasmodic cramping in the lower abdomen, back, or inner thighs, may be negatively impacted. Therefore, non-pharmacological methods such as Jacobson's relaxation technique and warm compresses can be safe and effective treatment for primary dysmenorrhea, as they reduce women's menstrual pain and improve their quality of life. **Aim of the study:** to investigate the effect of Jacobson's relaxation technique versus warm compresses on pain intensity, fatigue and quality of life among nursing students with primary dysmenorrhea. **Design:** A quasi-experimental, comparative research design. **Sample:** A convenient sample of 100 female students with primary dysmenorrhea. **Setting:** This study was carried out at the Faculty of Nursing, Damanshour University in El-Beheira Governorate, Egypt, from the beginning of March 2022 till the end of June 2022. **Data Collection Tools:** four tools were utilized, tool one: basic data structured interview schedule, which included socio-demographic and clinical data as well as menstrual history and dietary habits; tool two: Visual Analog Scale (VAS); tool three: Fatigue Severity Scale (FSS) and tool four: 36-Item Short Form Survey (SF-36). **Results:** after intervention, severe pain was declined (2%) among the Jacobson's relaxation technique group, but it remained the same among the warm compresses group. in contrast, fatigue was diminished (78%) among the latter group, while it was dropped (52%) among the former group. In addition; the warm compresses group obtained significantly better total score of quality of life than the Jacobson's relaxation technique group in terms of general health ($P=0.000$), energy/fatigue ($P=0.043$) and emotional well-being ($P=0.046$). **Conclusion:** it was concluded from this study that although Jacobson's relaxation technique was a little bit more effective in relieving menstrual pain than warm compresses, the latter was more effective in relieving fatigue and improving quality of life than the former. **Recommendations:** Health teaching classes for adolescent should be conducted to teach them about the benefits of Jacobson's relaxation technique and warm compresses in decreasing menstrual pain

Keywords: Jacobson's Relaxation Technique, Warm Compresses, Pain Intensity, Fatigue, Quality of Life, Nursing Students, Primary Dysmenorrhea

Introduction:

Menstrual cycle is a series of events that normally last between 21 and 35 days, with an average length of 28 days and continue throughout the woman's reproductive age (15-49 years). It consists of a sequence of natural changes of hormonal concentration in the blood as well as the structures of the uterus and ovaries (Warulkar et al., 2020; Wikipedia, the free encyclopedia, 2022).

However, menstrual disturbances, particularly dysmenorrhea, may be developed and have negative effects on the girls' quality

of life. Dysmenorrhea is usually, defined as painful menstruation and is classified to primary and secondary. Primary dysmenorrhea commonly starts within 3 years of menarche (the first menstrual period). It occurs due to overproduction of uterine prostaglandins and has no underlying macroscopic pelvic pathology. Primary dysmenorrhea is defined as spasmodic cramping in the lower abdomen, back or inner thighs. It occurs just before or during menstruation and lasts for 1-3 days (Arafa et al., 2018; Armour et al., 2019; Bernardi et al., 2017; Sharghi et al., 2019).

The release of fatty acids and disruption of progesterone secretion caused by chemical intermediates from arachidonic acid metabolism is one idea for the origins of primary dysmenorrhea. Arachidonic and fatty acid-derived prostaglandins (PTGs) and leukotrienes (LTs) play a role in both healthy homeostasis and inflammatory disorders. Uterine ischemia and cramps are brought on by the inflammatory reaction brought on by these acids. Backaches, anxiety, headaches, disturbed sleep, exhaustion, sleepiness, weight gain, bloating, nausea, and vomiting, as well as diarrhoea and breast tenderness, can all be symptoms of primary dysmenorrhea. It also has a negative impact on social and recreational activities, relationships, academic achievement, and attendance. (Barati et al., 2021; Bezuidenhout et al., 2018; Guimaraes & Póvoa, 2020; Hanfy et al 2020; Shehata et al., 2018).

A critical review found that 28% of women reported that their sleep was disturbed by menstrual cramps or pain during the first few days of menstruation (The National Sleep Foundation's Women and Sleep Poll, 2018). A study achieved in Portugal also revealed that 8.1% of girls reported missing school or work due to menstrual pain and 65.7% of them reported that this pain had impact on their daily activities; however, only 27.9% sought medical help (Guimaraes & Póvoa, 2020).

Globally, the prevalence of primary dysmenorrhea is very high, where it affects more than 50% of women in late adolescence and the early 20s, while in Egypt, it was 62% in 2018 (Abdel-Sattar et al., 2018; Azagew et al 2020). Management of primary dysmenorrhea can be carried out by using pharmacological or non-pharmacological methods. Pharmacological methods involves non-hormonal (such as non-steroidal anti-inflammatory medicines) and hormonal therapy (such as combined oral contraceptive and progestin regimens), which can result in a wide range of harmful side effects. In contrast, non-pharmacological treatments can be both secure and efficient. They include self-care techniques including exercise, rest, dietary changes, and cold and heat therapy. Other effective complementary alternative therapies for

primary dysmenorrhea include acupuncture and aromatherapy. These techniques enhance the quality of life of women by decreasing their demand for analgesics and the discomfort of their periods. (Aboualsoltani et al., 2020; Unnisa et al., 2022)

To relieve menstrual pain of primary dysmenorrhea, superficial heat has been traditionally used in different forms (e.g., hot water bags, towels, or bottles). Temperature ranging between 40–45 °C for a depth of about 1 cm was used on the affected site to reduce muscle tension and relax abdominal muscles. This increases pelvic blood circulation, leading to elimination of local blood and body fluid retention, thereby diminishing congestion and swelling as well as enabling reduction of pain caused by nerve compression. It was found that heat is a common method for coping with primary dysmenorrhea, where it constitutes 36.5–50% (Jo & Lee, 2018).

Jacobson's or progressive relaxation technique is also a type of therapy for primary dysmenorrhea that focuses on tightening and relaxing specific muscle groups in sequence. There are several possible mechanisms by which this method might be effective in the management of primary dysmenorrhea. One of these mechanisms is releasing endorphins from the brain and spinal cord, which act as a natural sedative, that cause a sense of comfort. However, progressive relaxation technique is simple, easy to adopt, self-administered, and has no side effects. Therefore, it has beneficial effect on reduction of dysmenorrhea and associated symptoms, which in turn, improves quality of life and self-esteem (Hanfy et al., 2020; Manalu et al., 2020; Warulkar et al., 2020).

Significance of the study:

Although menstruation is a physiological process, pain may render it a very unpleasant experience. University students are one of the high-risk categories for developing primary dysmenorrhea, with nursing students being particularly vulnerable; Nearly half of students with primary dysmenorrhea missed academic attendance at least once every cycle (Mammo et al., 2022; Azagew et al., 2020). Despite the significant impact of menstrual pain, most young women

do not seek medical treatment but prefer to use self-care because it is cost effective, easy to use and harmless. Therefore, progressive relaxation technique and warm compresses may be valuable approaches and the most popular methods that nurses can encourage young women to use for relieving menstrual pain. Thus, this study was undertaken to evaluate the effect of progressive relaxation technique and warm compresses on relieving pain and fatigue associated with primary dysmenorrhea as well as on improving the quality of life.

Aim of the study:

Investigate the effect of Jacobson's relaxation technique versus warm compresses on pain intensity, fatigue and quality of life among nursing students with primary dysmenorrhea

Research hypotheses:

H₁: Nursing students with primary dysmenorrhea who apply Jacobson's relaxation technique exhibit less pain intensity, less fatigue and better quality of life than those who apply warm compresses

H₂: Nursing students with primary dysmenorrhea who apply warm compresses exhibit less pain intensity, less fatigue and better quality of life than those who apply Jacobson's relaxation technique

Subjects and method:

Design:

A quasi-experimental, comparative research design was utilized.

Setting:

The study was carried out at the Faculty of Nursing, Damanhour University in El-Beheira Governorate, Egypt.

Subjects:

A convenient sample of 100 female students with primary dysmenorrhea was chosen from all grades of the previously mentioned setting, who meet the following inclusion criteria:

- Unaffected by any chronic disease

- Free from any pelvic disorder
- Willing to take part in the study

The study subjects were randomly assigned (by odd & even numbers) to two equal groups of 50; Jacobson's relaxation technique or warm compresses.

The sample size of female students was estimated by using the Epi-Info 7 program, where the following parameters were applied:

- Population size = 1942/ 2021-2022 academic year
- Expected frequency =50%
- Acceptable error = 5%
- Confidence coefficient = 95%.
- Minimum sample size = 88
- The final sample size was 100

Tools:

The researchers utilized four instruments as the following:

Tool one: Basic data structured interview schedule, which included three parts:

Part (I):Socio-demographic and clinical data such as age, college grade , occupation, marital status, current residence, type of family, family income and body mass index.

Part (II): Menstrual history such as age at menarche, duration and regularity of menstruation as well as previous use of pain relief method and family history of primary dysmenorrhea.

Part (III): dietary habits such as intake of coffee, cola, tea and chocolate.

Tool two: Visual Analog Scale (VAS)

It was originally developed by Woodforde & Merskey (1972) and adopted by the researchers to measure intensity of menstrual pain. This scale is a self-report device that consists of a horizontal line in centimeters from 0 to 10, representing 0 (no pain), 1-3 (mild pain), 4-6 (moderate pain), 7-9 (severe pain) and 10 (unbearable pain).

Tool three: Fatigue Severity Scale (FSS):

It was developed by Krupp et al (1989) and adopted by the researchers to assess study subjects' fatigue during the past month. It

consisted of nine items, rated on 7 point likert scale; from 1 (strongly disagree) to 7 (strongly agree). The total score ranged from 9 to 63 and categorized as following:

- No fatigue (9- 35)
- Presence of fatigue (36 - 63)

Tool four: 36-Item Short Form Survey (SF-36)

It was developed by Hays et al (1993), and adopted by the researchers to measure the health-related quality-of-life. The SF-36 is a set of generic, coherent, and easily administered self -reported questionnaire that covers eight health domains: physical functioning (10 items), bodily pain (2 items), role limitations due to physical health problems (4 items), role limitations due to personal or emotional problems (4 items), emotional well-being (5 items), social functioning (2 items), energy/fatigue (4 items), and general health perceptions (5 items). Scores for each domain of health-related quality-of-life range from 0 to 100, categorized as following:

- Good (80-100)
- Fair (60-79)
- Poor (0-59)

Field Work:

First phase (Initial preparatory phase):

- Approval was obtained from the dean of faculty of nursing after explaining the aim of the study
- The researchers created tool one based on a thorough analysis of recent and pertinent literature, whereas tools two, three and four were adopted.
- Content validity of the tools was checked by a jury of five experts in the related field.
- The reliability of tools two-four was checked using Cronbach's Alpha test and the results were reliable for tool two (0.82), tool three& four (0.70).
- The feasibility of the study, the clarity and application of the instruments, the identification of potential barriers and an estimation of the time needed for data collection were all tested in **a pilot study** on 10 female students who were not

included in the study subjects. The tools were changed and prepared for usage as a result.

Second phase (Implementation phase):

- Collection of data covered a period of four months, from March 2022 to June 2022, 2 days/week; 3-4 nursing students /day.
- Data were collected from nursing students during their breaks, in the lecture halls; laboratory or library through an interview schedule, which was conducted individually for 30-45 minutes.
- Data of the four tools were collected from nursing students, who fulfilled the inclusion criteria, during the first day of the prior menstrual cycle (one month before intervention) to collect basic data as well as to assess pain intensity, severity of fatigue and quality of life.
- At the same time, the researchers demonstrated for nursing students of Jacobson's relaxation technique and warm compresses groups how to perform the former and how to apply the latter respectively, using a video for illustration. Then, each nursing student of both groups was asked to re-demonstrate her technique.
- The researchers asked nursing students of Jacobson's relaxation technique and warm compresses groups to perform and apply them during the first and the second day of the next menstrual cycle. Meanwhile, they were instructed to abstain from using pharmacological pain relief methods during intervention.

Third phase (Evaluation phase):

- Thereafter, nursing students were followed up half an hour after intervention of the first and the second day of the menstrual cycle either in the faculty or through telephone calls to assess pain intensity, severity of fatigue and quality of life, using tools two- four.
- The effect of Jacobson's relaxation technique versus warm compresses on menstrual pain intensity, fatigue, and quality of life was compared between the

two groups once data collection was completed.

Statistical analysis:

- The collected data were categorized, coded, computerized, tabulated and analyzed using Statistical Package for Social Sciences (SPSS) version 23 program.
- Statistical measures were used such as cross tabulation to describe and summarize categorical variables of the two groups.
- A descriptive and analytical statistics were used such as percentages; mean & SD, where Chi-square-test, Fisher Exact-test and t-test were used to find out the difference in the results at ≤ 0.05 (5%) level of significance.

Ethical considerations:

An approval from Ethical Research Committee, Faculty of Nursing, Damanshour University was obtained. The subjects' written informed consent was obtained; their rights to privacy and to withdraw at any time, as well as the confidentiality of their data, were guaranteed.

Results:

As shown in Table (1), the mean age was 20.94 ± 1.018 & 21.14 ± 1.178 years for the Jacobson's relaxation technique and the warm compresses groups respectively. College's grade was represented by 46% of the second year Jacobson's relaxation technique group, compared to 24% of the same year warm compresses group. In contrast, it was represented by 56% of the fourth year latter group compared to 38% of the same year former group. Occupation also manifested that the majority of the Jacobson's relaxation technique and the warm compresses groups (82% & 78%) respectively were not working. In addition, marital status illustrated that the vast majority of the former and the latter groups (94% & 84%) respectively were single. Moreover, current residence displayed that a sizeable proportion of the Jacobson's relaxation technique and the warm compresses groups (68% & 76%) respectively were rural residents. Furthermore, type of family was extended among 64% of the Jacobson's

relaxation technique group, compared to 42% of the warm compresses group. On the contrary, it was nuclear among 58% of the latter group, compared to 36% of the former group. Likewise, family income/month was just and not enough among most of the Jacobson's relaxation technique group (58% & 38%) respectively and the warm compresses group (64% & 32%) respectively. The two groups were homogenous, where no statistically significant differences were found between their socio-demographic data, except for type of family ($P = 0.028$).

Figure (1) exhibits the distribution of nursing students according to their BMI. Normal weight was found among 42% of the warm compresses group, compared to 26% of the Jacobson's relaxation technique group. On the other hand, overweight was observed among 72% of the latter group, compared to 56% of the former group. However, the relationship between the two groups' BMI was not statistically significant.

Table (II) demonstrates nursing students' menstrual history. The mean age at menarche was 12.32 ± 1.039 & 12.84 ± 1.315 years for the Jacobson's relaxation technique the warm compresses groups respectively. The mean duration of menstruation was also 5.06 ± 0.712 & 5.00 ± 0.808 days for the two groups respectively. In addition, menstruation was irregular among almost three-fifths (58%) of the Jacobson's relaxation technique and the warm compresses groups. Moreover, pain relief methods were previously used by all and most of the Jacobson's relaxation technique and the warm compresses groups (100% & 92%) respectively. However, pharmacological pain relief method was previously used by the vast majority of the two groups (90% & 89.1%) respectively. This method was previously used without doctor's order by a sizeable proportion of the Jacobson's relaxation technique and the warm compresses groups (84.4% & 75.6%) respectively. Finally, family history of primary dysmenorrhea was not reported by more than half (56% & 52%) of the two groups respectively. However, no statistically significant differences were found between the two groups' menstrual history, except for age at menarche ($P = 0.031$) and previous use of pain relief method ($P = 0.041$).

Table (III) manifests nursing students' dietary habits. A large proportion of the Jacobson's relaxation technique and the warm compresses groups reported intake of *cola* (72% & 76 %) respectively, *coffee* (68% & 78%) respectively, *tea* (80 % & 88 %) respectively and *chocolate* (80% & 90%) respectively. However, the relationship between the two groups' dietary habits was not statistically significant.

Table (IV) displays nursing students' dysmenorrheal pain intensity, using VAS. Although, no statistically significant differences were observed between the two groups before and after intervention, severe pain was declined sharply from 36% to 4% (32%) among the Jacobson's relaxation technique group and from 40% to 8% (32%) among the warm compresses group after the first intervention. Severe pain was further decreased from 4% to 2% (2%) among the former group, but it remained the same 8% (0%) among the latter group after the second intervention.

Table (V) clarifies nursing students' total score of fatigue, using FSS. Although, the relationship between the two groups was highly statistically significant before intervention ($P = 0.000$), it was not statistically significant after intervention. However, fatigue was diminished sharply from 92 % to 14% (78%) among the warm compresses group, while it was dropped from 58% to 6% (52%) among the Jacobson's relaxation technique group.

Table (VI) reveals nursing students total score of quality of life, using SF-36. *Good total score* was elevated among the Jacobson's relaxation technique and the warm compresses groups in terms of *emotional role limitations* from 22% to 84% (62%) & from 4% to 80% (76%) respectively; *physical role limitations* from 8% to 62% (54%) & from 2% to 78% (76%) respectively; *physical functioning* from 18% to 36% (18%) & from 12% to 46% (34%) respectively; *social functioning* from 0% to 20% & from 0% to 16% respectively; *energy/fatigue* from 2% to 12% (10%) & from 0% to 14% respectively; *emotional well-being* from 2% to 6% (4%) & from 0% to 4% respectively; *general health* from 2% to 8% (6%) & from 0% to 28% respectively and *pain*

from 6% to 12% (6%) & from 0% to 22% respectively; However, good total score for *health change* remained the same among 6% of the former group, while it was increased from 6% to 10% (4%) of the latter group.

On the other hand, *poor total score* was reduced among the Jacobson's relaxation technique and the warm compresses groups in respect of *emotional role limitations* from 70% to 12% (58%) & from 92% to 16% (76%) respectively; *physical role limitations* from 84% to 20% (64%) & from 94% to 18% (76%) respectively; *social functioning* from 70% to 26% (44%) & from 88% to 16% (72%) respectively; *pain* from 72% to 12% (60%) & from 88% to 16% (72%) respectively; *general health* from 90% to 70% (20%) & from 86% to 30% (56%) respectively; *energy/fatigue* from 82% to 64% (18%) & from 84% to 40% (44%) respectively; and *physical functioning* from 72% to 42% (30%) & from 56% to 32% (24%) respectively. On the contrary, poor total score for *emotional well-being* was increased slightly from 76% to 78% (2%) among the Jacobson's relaxation technique group, while it was decreased from 90% to 58% (32%) among the warm compresses group. Poor total score for *health change* was also elevated from 74% to 80% (6%) among the former group and from 68% to 74% (6%) among the latter group.

However, before intervention, statistically significant differences were observed between the two groups in relation to *emotional role limitations* ($P = 0.015$) and *social functioning* ($P = 0.027$). After intervention, the relationship between them was highly statistically significant in respect of *general health* ($P=0.000$) as well as statistically significant regarding *energy/fatigue* ($P = 0.043$) and *emotional well-being* ($P = 0.046$).

Table (I): Distribution of nursing students according to their socio- demographic data

Socio - demographic data	Jacobson's Relaxation technique group (n=50)		Warm compresses group (n=50)		t-test (P) F / χ^2 (P)
	No	%	No	%	
Age (years): Min-Max Mean & SD	19-23 20.94 ± 1.018		19-23 21.14 ± 1.178		0.908 (0.366)
College's grade: - First - Second - Third - Fourth	2 23 6 19	04.0 46.0 12.0 38.0	4 12 6 28	08.0 24.0 12.0 56.0	5.847 (0.119)
Occupation: - Working - Not working	9 41	18.0 82.0	11 39	22.0 78.0	0.25 (0.617)
Marital status: - Married - Single	3 47	06.0 94.0	8 42	16.0 84.0	2.554 (0.110)
Current residence: - Rural - Urban	34 16	68.0 32.0	38 12	76.0 24.0	0.794 (0.373)
Type of family: - Nuclear - Extended	18 32	36.0 64.0	29 21	58.0 42.0	4.857 (0.028)*
Family income/month: - Enough and save - Enough for basic needs only - Not enough	2 29 19	04.0 58.0 38.0	2 32 16	04.0 64.0 32.0	0.405 (0.817)

χ^2 (P): Chi-Square Test & P for χ^2 Test
*: Significant at P ≤ 0.05

F (P): Fisher Exact test & P for F Test

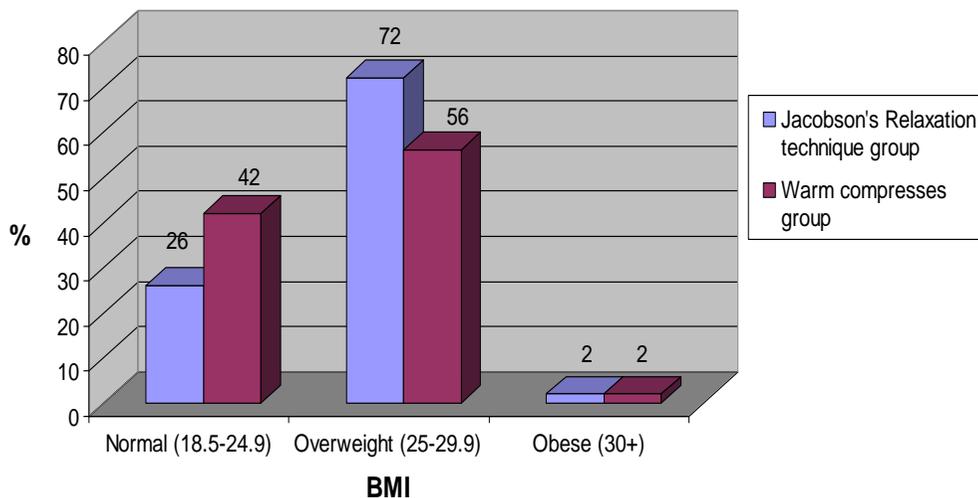


Figure (1): Distribution of nursing students according to their BMI

Table (II): Distribution of nursing students according to their menstrual history

Menstrual history	Jacobson's Relaxation technique group (n=50)		Warm compresses group (n=50)		t-test (P) F / χ^2 (P)	
	No	%	No	%		
Age at menarche (years): Min-Max Mean & SD	10-15 12.32 ± 1.039		8-15 12.84 ± 1.315		2.194 (0.031)*	
Duration (days): Min-Max Mean & SD	2-7 5.06 ± 0.712		3-7 5.00 ± 0.808		0.394 (0.695)	
Regularity: - Regular - Irregular	21 29	42.0 58.0	21 29	42.0 58.0	0.000 (1.000)	
Previous use of pain relief method: - Yes - No	50 0	100.0 00.0	46 4	92.0 08.0	4.167 (0.041)*	
Type of used pain relief method: - Pharmacological - Non-Pharmacological	45 5	90.0 10.0	(n=46) 41 5		89.1 10.9	0.019 (0.890)
Way of using pharmacological method: - As doctor's order - On her own	(n=45) 7 38		(n=41) 10 31		24.4 75.6	1.056 (0.304)
Family history of primary dysmenorrhea: - Yes - No	22 28	44.0 56.0	24 26	48.0 52.0	0.161 (0.688)	

χ^2 (P): Chi-Square Test &P for χ^2 Test

F (P): Fisher Exact test &P for F Test

*: Significant at $P \leq 0.05$

Table (III): Distribution of nursing students according to their dietary habits

Dietary habits	Jacobson's Relaxation technique group (n=50)		Warm compresses group (n=50)		F / χ^2 (P)
	No	%	No	%	
Intake of cola: - Yes - No	36 14	72.0 28.0	38 12	76.0 24.0	0.208 (0.648)
Intake of coffee: - Yes - No	34 16	68.0 32.0	39 11	78.0 22.0	1.268 (0.260)
Intake of tea: - Yes - No	40 10	80.0 20.0	44 6	88.0 12.0	1.19 (0.275)
Intake of chocolate: - Yes - No	40 10	80.0 20.0	45 5	90.0 10.0	1.961 (0.161)

χ^2 (P): Chi-Square Test &P for χ^2 Test

F (P): Fisher Exact test &P for F Test

*: Significant at $P \leq 0.05$

Table (IV): Distribution of nursing students according to their dysmenorrheal pain intensity, using VAS

Dysmenorrheal pain intensity	Jacobson's Relaxation technique group (n=50)		Warm compresses group (n=50)		F / χ^2 (P)
	No	%	No	%	
Before intervention (1 st menstrual day):					
- Mild (1-3)	0	00.0	5	10.0	7.494 (0.058)
- Moderate (4-6)	9	18.0	11	22.0	
- Severe (7-9)	18	36.0	20	40.0	
- Unbearable (10)	23	46.0	14	28.0	
1/2 hr. after intervention (1 st menstrual day):					
- Mild (1-3)	13	26.0	17	34.0	1.762 (0.414)
- Moderate (4-6)	35	70.0	29	58.0	
- Severe (7-9)	2	04.0	4	08.0	
1/2 hr. after intervention (2 nd menstrual day):					
- Mild (1-3)	21	42.0	20	40.0	1.898 (0.387)
- Moderate (4-6)	28	56.0	26	52.0	
- Severe (7-9)	1	02.0	4	08.0	

χ^2 (P): Chi-Square Test & P for χ^2 Test
*: Significant at P \leq 0.05

F (P): Fisher Exact test & P for F Test
**: Highly Significant at P \leq 0.05

Table (V): Distribution of nursing students according to their total score of fatigue, using FSS.

Total score of fatigue	Jacobson's Relaxation technique group (n=50)		Warm compresses group (n=50)		F / χ^2 (P)
	No	%	No	%	
4 weeks before intervention:					
- No fatigue (9-35)	21	42.0	4	08.0	15.413 (0.000)**
- Presence of fatigue (36-63)	29	58.0	46	92.0	
4 weeks after intervention:					
- No fatigue (9-35)	47	94.0	43	86.0	1.778 (0.182)
- Presence of fatigue (36-63)	3	06.0	7	14.0	

χ^2 (P): Chi-Square Test & P for χ^2 Test

F (P): Fisher Exact test & P for F Test

*: Significant at $P \leq 0.05$ **: Highly Significant at $P \leq 0.05$ **Table (VI):** Distribution of nursing students according to their total score of quality of life, using SF-36

Total score of quality of life	Jacobson's Relaxation technique group (n=50)						Warm compresses group (n=50)						F / χ^2 (P)
	Good (80-100)		Fair (60-79)		Poor (0-59)		Good (80-100)		Fair (60-79)		Poor (0-59)		
	No	%	No	%	No	%	No	%	No	%	No	%	
4 weeks before intervention:													
- Physical functioning	9	18.0	5	10.0	36	72.0	6	12.0	6	12.0	38	56.0	0.745 (0.689)
- Role limitations (physical)	4	08.0	4	08.0	42	84.0	1	02.0	2	04.0	47	94.0	2.748 (0.253)
- Role limitations (emotional)	11	22.0	4	08.0	35	70.0	2	04.0	2	04.0	46	92.0	8.391 (0.015)*
- Energy/fatigue	1	02.0	8	16.0	41	82.0	0	00.0	8	16.0	42	84.0	1.012 (0.603)
- Emotional well-being	1	02.0	11	22.0	38	76.0	0	00.0	5	10.0	45	90.0	3.84 (0.147)
- Social functioning	0	00.0	15	30.0	35	70.0	0	00.0	6	12.0	44	88.0	4.882 (0.027)*
- Pain	3	06.0	11	22.0	36	72.0	0	00.0	6	12.0	44	88.0	5.271 (0.072)
- General health	1	02.0	4	08.0	45	90.0	1	02.0	6	12.0	43	86.0	0.445 (0.801)
- Health change	3	06.0	10	20.0	37	74.0	3	06.0	13	26.0	34	68.0	0.518 (0.772)
4 weeks after intervention:													
- Physical functioning	18	36.0	11	22.0	21	42.0	23	46.0	11	22.0	16	32.0	1.285 (0.526)
- Role limitations (physical)	31	62.0	9	18.0	10	20.0	39	78.0	2	04.0	9	18.0	5.421 (0.067)
- Role limitations (emotional)	42	84.0	2	04.0	6	12.0	40	80.0	2	04.0	8	16.0	0.334 (0.846)
- Energy/fatigue	6	12.0	12	24.0	32	64.0	7	14.0	23	46.0	20	40.0	6.303 (0.043)*
- Emotional well-being	3	06.0	8	16.0	39	78.0	2	04.0	19	38.0	29	58.0	6.152 (0.046)*
- Social functioning	10	20.0	27	54.0	13	26.0	8	16.0	34	68.0	8	16.0	2.216 (0.330)
- Pain	6	12.0	38	76.0	6	12.0	11	22.0	31	62.0	8	16.0	2.466 (0.291)
- General health	4	08.0	11	22.0	35	70.0	14	28.0	21	42.0	15	30.0	16.681 (0.000)**
- Health change	3	06.0	7	14.0	40	80.0	5	10.0	8	16.0	37	74.0	0.684 (0.710)

 χ^2 (P): Chi-Square Test & P for χ^2 Test

F (P): Fisher Exact test & P for F Test

*: Significant at $P \leq 0.05$ **: Highly Significant at $P \leq 0.05$

Discussion:

Primary dysmenorrhea is an important health issue of adolescent girls as it badly affects their activities of daily living and quality of life (Gebeyehu et al., 2017). It can be treated by pharmacological and/or non-pharmacological techniques. However, pharmacological methods can cause a great variety of adverse side effects.

On the contrary, non-pharmacological approaches are one of the autonomous nursing interventions for menstrual pain management, which are viewed as more practical, safe and effective (Brewer et al., 2019; Puntillo et al., 2020).

Progressive muscle relaxation is one of the non-pharmacological methods that combine deep breathing exercises and a series of specific muscle

contractions and relaxations. It is performed for 15 to 30 minutes, paying attention to the sequence of muscles being relaxed. On the other hand, warm compresses are also one of the non-pharmacological methods that are considered very effective in reducing menstrual pain or muscle spasms. It can act by removing inflammatory products (e.g., bradykinin, histamine and prostaglandins) that cause pain. Warm compresses are applied with a temperature of 40 °C for 15-20 minutes on the lower abdomen (**Agustin et al., 2022**).

University students, including nursing students are one of the high risk groups for developing primary dysmenorrhea, which has a high prevalence among them (**Azagew et al 2020**). Unfortunately, backaches, fatigue, and poor quality of life are some of the devastating effects of primary dysmenorrhea. Therefore, progressive relaxation technique and warm compresses may be valuable approaches that can be used to relieve menstrual pain. Thus, this study was done to investigate the effect of Jacobson's relaxation technique versus warm compresses on pain intensity, fatigue and quality of life among nursing students with primary dysmenorrhea.

The present findings revealed that both Jacobson's relaxation technique and warm compresses groups were identical in their socio-demographic data, menstrual history and dietary habits (Tables I-III). This was entirely predicted since the residents of El-Beheira governorate are almost from the same socio-demographic class. This homogenous profile was useful in limiting extraneous variables, which could impede the effect of the intended interventions on the participants. It was also helpful in understanding and securing the relevance and reliability of the forthcoming results of this study. In addition, these consistent characteristics may offer rationale to the potential impact produced by the interventions.

On investigating the effect of Jacobson's relaxation technique and warm compresses on menstrual pain intensity, using VAS, the results of the current study indicated that Jacobson's relaxation technique was slightly more effective in relieving pain severity than warm compresses after the second intervention, although no statistically significant differences were found (Table IV). This finding may be explained by the

fact that Jacobson's relaxation technique reduces muscle tension, stress and pain. It also has a calming effect and a comfortable sensation, which lessens and distracts the feeling of pain. In addition, Jacobson's relaxation technique increases blood flow and improves uterine metabolism, which can decrease the intensity and duration of dysmenorrheal pain. Moreover, it stimulates the body to release endorphins, which are natural painkillers that can raise pain tolerance and decrease pain perception. Furthermore, Jacobson's relaxation technique increases abdominal muscle strength and flexibility, as well as endurance. Likewise, it can relax breathing and improve lung ventilation, so that oxygen in the blood increases and can reduce pain (**Manalu et al., 2020; Moradpour, 2019**).

On the other hand, warm compress reduces muscle tension and promotes abdominal muscle relaxation. It stimulates the thermo receptors in the skin and deeper tissues, which can help reduce pain by closing the gating system in the spinal cord. Warm compress also reduces striated muscle spasm by minimizing muscle spindle excitability and reducing tension in muscle trigger points (**Jo & Lee, 2018**). In addition, it can accelerate blood circulation due to the effects of vasodilatation. Consequently, increased uterine blood circulation results in dilution of bradykinin, prostaglandins, and intravascular histamine. Prostaglandins can, in turn, increase oxytocin release without affecting synthesis. Warm compresses can also inhibit the activity of cyclooxygenase (COX), which reduces the formation of prostaglandins. Decreased prostaglandin production reduces oxytocin release, which in turn decreases uterine cramps and dysmenorrheal pain (**Arulkumaran et al., 2012; Berman et al., 2016; Yang et al., 2017**).

The present finding relatively corresponds with a study fulfilled in Bangsal Village, Kediri City, Indonesia, where it was found that progressive muscle relaxation therapy was significantly more effective than warm compresses in reducing joint pain scale in the elderly (**Richard & Sari, 2020**). It is also relatively congruent with a study conducted in Bali, Indonesia where it was concluded that active stretching exercise is more effective at reducing dysmenorrheal pain than warm compresses (**Tianing et al., 2021**).

Many studies investigated the effect of either progressive muscle relaxation technique or warm compresses on dysmenorrheal pain separately without comparing between them. As for example, a study executed in Samarinda, Indonesia concluded that progressive muscle relaxation technique was effective in reducing the intensity of dysmenorrheal pain (**Sulistyorini et al., 2019**). A study performed in Maharashtra, India also identified that Jacobson's relaxation technique remarkably reduces dysmenorrhea among adolescent girls (**Warulkar et al., 2020**). In addition, a study accomplished in Erzurum, Turkey demonstrated that progressive relaxation exercises are an effective method for reducing dysmenorrhea when they are performed on a regular basis (**Çelik & Apay, 2021**).

Moreover, a literature review of five articles also showed that deep breathing relaxation can help to decrease dysmenorrhea in adolescents (**Hidayatunnafiah et al 2022**). Furthermore, a study implemented in Port Said city, Egypt, concluded that progressive muscle relaxation technique had a positive effect on reducing pain intensity among female adolescents with primary dysmenorrhea (**Abdelhalim et al 2023**).

As for warm compresses technique, a study carried out in Yogyakarta, Indonesia illustrated that warm compresses are more effective in reducing primary dysmenorrheal pain (**Yuniangrum et al., 2018**). A survey fulfilled in Lamongan, Indonesia also manifested that there are differences in dysmenorrhea before and after warm compresses treatment between the study and the control groups (**Nurafifah et al., 2020**).

In addition, a study conducted in West Java, Indonesia proved that warm compress therapy was significantly useful for reducing the dysmenorrheal pain scale (**Widianti et al., 2021**). Moreover, a study finalized in Lampung, Indonesia explicated that giving warm water compresses was effective in reducing the dysmenorrheal pain scale in teenage girls (**Marlinda et al., 2022**).

On the contrary, the current study is not conformable with a study achieved in Bengkulu, Indonesia, where it was indicated that warm compress was significantly more effective in decreasing dysmenorrheal scale than deep breathing relaxation technique (**Kristiawan 2021**). The distinction between the finding of this

study and the present one may reflect different sample type and size as well as different assessment tool.

The present finding doesn't also correspond with two studies carried out in Jakarta and Tulungagung, Indonesia, where it was concluded that both progressive muscle relaxation technique and warm compress intervention have similar effect in decreasing dysmenorrhea pain intensity (**Agustin et al., 2022; Suphan&Eni, 2021**). The disparity between the finding of the first study and the present one may be due to using different research type (qualitative), design (Non-Equivalent Control Group), and method (using progressive muscle relaxation technique with warm compress intervention for the experimental group) as well as small sample size. Meanwhile, the discrepancy between the finding of the second study and the present one may reflect different research design and method (using progressive muscle relaxation technique with warm compresses intervention for one group as well as small sample size).

On evaluation the effect of Jacobson's relaxation technique and warm compresses on fatigue and quality of life, using FSS & SF-36 respectively, the results of the present study revealed that warm compresses were more effective in relieving fatigue and improving quality of life than Jacobson's relaxation technique after intervention, although no statistically significant differences were found (Tables V & VI). Using a warm compress elevates skin temperature and blood circulation, which improves nutrition and oxygen delivery and can help reduce weariness and its negative effects, such as a decline in quality of life. This may be brought on by improved nutrient status, cell waste, and enhanced blood flow to the muscles and metabolism of body tissues. Therefore, warm compresses can help relax the muscles contributing to cramping, so its application to the abdomen can help relieve annoying symptoms of dysmenorrhea, including fatigue (**Ameri et al., 2022**).

Some studies examined the effect of either progressive muscle relaxation technique or warm compresses on dysmenorrhea associated fatigue solely without exploring the correlation between them. As for example, a study executed in Shahroud, Iran, demonstrated that the use of

warm compression is an effective intervention in relieving fatigue associated with dysmenorrhea (Ameri et al., 2022). A study fulfilled in Port Said city, Egypt, also clarified that progressive muscle relaxation technique had a positive effect on reducing fatigue among female adolescents with primary dysmenorrhea (Abdelhalim et al 2023).

In contrast, the present study is not congruent with a study done in Bengkulu, Indonesia, where it was revealed that warm compress and deep breathing relaxation technique were similarly effective in decreasing fatigue associated with dysmenorrhea (Kristiawan 2021). The dissimilarity between the finding of this study and the present one may return to different sample type and size as well as different assessment tool.

Conclusion:

Based on the findings of the present study, it can be concluded that although Jacobson's relaxation technique was a little bit more effective in relieving menstrual pain than warm compresses, the latter was more effective in relieving fatigue and improving quality of life than the former.

Recommendations:

- Nurses should recommend and encourage teenagers with primary dysmenorrhea to use Jacobson's relaxation technique and warm compresses at home to help reduce their menstrual pain and improve their quality of life.
- Young women can do progressive muscle relaxation, as a non-pharmacological strategy, twice a day before and during the menstrual period to reduce pain intensity
- Health teaching classes for adolescent should be conducted to teach them about the benefits of Jacobson's relaxation technique and warm compresses in decreasing menstrual pain.
- Relaxation technique and warm compresses should be considered in developing plans to reduce menstrual pain in a non-pharmacological manner.
- Nurses need further education on their role in Jacobson's relaxation technique and warm compresses usage. Therefore, these methods

should be added to nursing curricula and care protocols

- The link between the use of Jacobson's relaxation technique and warm compresses and nurses' knowledge, attitudes, and treatment beliefs should be understood to provide direction for future educational interventions.
- Further studies are needed to:
 - Focus on the adaptive techniques used by the university students to mitigate the negative impacts of primary dysmenorrhea.
 - Evaluate the factors that have an impact on the severity of primary dysmenorrhea with more objective and detailed methods.
 - Examine the efforts to reduce primary dysmenorrheal pain in other non-pharmacological ways.
 - Replicate the present study with a larger population with various age levels and in different settings.
 - Compare between relaxation technique and other non-pharmacological measures for the management of primary dysmenorrhea.

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Conflict of Interest Disclosure

Researchers declared that there is no conflict of interest in the research.

References:

- Abdelhalim, E., Sweelam, M., Mohamed, A., Amer, F., & El-Shabory, N. (2023). Effect of progressive muscle relaxation technique on pain intensity and fatigue associated with primary dysmenorrhea among female adolescents. *Egyptian Journal of Health Care*, 14(1), 486-500.
- Abdel-Sattar, Sh., Mansour, N., Mostafa, T., & Abel-Azim, S. (2018). Prevalence of primary dysmenorrhea among secondary

- school students and its treatment modalities in Fayed City. *The Egyptian Family Medicine Journal*, 2(2), 69-79.
- Aboualsoltani, F., Bastani, P., Khodaie, L., & Fazljou, S. (2020). Non-pharmacological treatments of primary dysmenorrhea. A systematic review. *Archives of Pharmacy Practice*, 11(1), 136-42.
- Agustin, Y., Afrina, R., & Rukiah, N. (2022). Giving warm compresses with progressive muscle relaxation techniques can reduce pain intensity in dysmenorrhea. *Journal of Complementary Nursing*, 1(3), 99-105.
- Ameri, M., Ebrahimi, H., Khosravi, A., Mirhosseini, S., & Khatibi, M. (2022). Effect of local warm compression on restless leg syndrome and fatigue among critical care nurses: A parallel randomized clinical trial. *Critical care research and practice*, 2022, 1-7.
- Arafa, A., Senosy, S., Helmy, H., & Mohamed, A. (2018). Prevalence and patterns of dysmenorrhea and premenstrual syndrome among Egyptian girls (12–25 years). *Middle East Fertility Society Journal*, 23 (4), 486-90.
- Armour, M., Smith, C., Steel, K., & MacMillan, F. (2019). The effectiveness of self-care and lifestyle interventions in primary dysmenorrhea: A systematic review and meta-analysis. *BMC Complementary and Alternative Medicine*, 19(1), 1-16.
- Arulkumaran, S., Kandola, M., Hoffman, B., Hanyaloglu, A., Johnson, M., & Bennett, P. (2012). The roles of prostaglandin EP 1 and 3 receptors in the control of human myometrial contractility. *Journal of Clinical Endocrinology and Metabolism*, 97(2), 489–98.
- Azage, A., Kassie, D., & Walle, T. (2020). Prevalence of primary dysmenorrhea, its intensity, impact and associated factors among female students' at Gondar town preparatory school, Northwest Ethiopia. *BMC Women's Health*, 20(1), 1-7.
- Barati, A., Farhadi, L., & Khalily, M. (2021). Comparison of the effect of stretching exercises and combination of massage - stretching exercises on primary dysmenorrhea of female students of Razi University of Kermanshah. *J Clin Res Paramed Sci*. 2021 June; 10(1): 1-8.
- Berman, A., Synder, Sh., & Fradsen, G. (2016). *Kozier and Erb's Fundamental of Nursing*. 10thed. New York: Pearson, 437-64.
- Bernardi, M., Lazzeri, L., Perelli, F., Reis, F., & Petraglia, F. (2017). Dysmenorrhea and related disorders. *F1000Research*, 6 (1), 1-7.
- Bezuidenhout, S., Mahlaba, K., Nxumalo, G., Meyer, J., & Chukwu, B. (2018). Dysmenorrhea: An overview. *South Africa Pharmaceutical Journal*, 85(4), 19-25.
- Brewer, N., Turrise, S., Kim-Godwin, Y., & Pond, R. (2019). Nurses' knowledge and treatment beliefs: Use of complementary and alternative medicine for pain management. *Journal of Holistic Nursing*, 37(3), 248–59.
- Çelik, A., & Apay, S. (2021). Effect of progressive relaxation exercises on primary dysmenorrhea in Turkish students: A randomized prospective controlled trial. *Complementary Therapies in Clinical Practice*, 42 (1), 101280.
- Gebeyehu, M., Mekuria, A., Tefera, Y., Andarge, D., Debay, Y., Bejiga, G., et al. (2017). Prevalence, impact, and management practice of dysmenorrhea among University of Gondar students, Northwestern Ethiopia: A cross-sectional study. *International Journal of Reproductive Medicine*, 2017, 1-8.
- Guimaraes, I., & Póvoa, A. (2020). Primary dysmenorrhea: Assessment and treatment. *Rev Bras Ginecol Obstet*. 42(8), 501–7.
- Hanfy, H., Kamel, H., Kamal, W., & Mahmoud, S. (2020). The effect of progressive relaxation training versus aromatherapy

- on primary dysmenorrhea, *Egypt.Med J Cairo Univ*, 88(2), 577- 82.
- Hays, R., Sherbourne, C., & Mazel, R. (1993). The RAND36- item health survey 1.0. *Health Economic*, 2(3), 217-27.
- Hidayatunnafiah, F., Mualifah, L., Moebari, M., & Iswantiningsih, E. (2022). The effect of relaxation techniques in reducing dysmenorrhea in adolescents. *KnE Life Sciences*, 7 (2), 473-80.
- Jo, J., & Lee, S. (2018). Heat therapy for primary dysmenorrhea: A systematic review and meta-analysis of its effects on pain relief and quality of life. *Scientific reports*, 8(1), 1-8.
- Kristiawan, M. (2021). The Effects of Relaxation Technique and Warm Compress on Decreasing Dysmenorrhea Scale. In *International Conference on Educational Sciences and Teacher Profession (ICETeP 2020)* (pp. 255-260). Atlantis Press.
- Krupp, L., Larocca, N., Muir-Nash, J., & Steinberg, A. (1989). The fatigue severity scale: Application to patients with multiple sclerosis and systemic lupus erythematosus. *Archives of neurology*, 46(10), 1121–3.
- Mammo, M., Alemayehu, M., & Ambaw, G. (2022). Prevalence of primary dysmenorrhea, its intensity and associated factors among female students at high schools of Wolaita Zone, Southern Ethiopia: Cross-sectional study design. *International Journal of Women's Health*, 14 (1), 1569- 77.
- Manalu, A., Siagian, N., Ariescha, P., Yanti, M., Purba, T., & Munthe, N. (2020). *The effects of anti-dysmenorrhea gymnastics on reducing menstrual pain in adolescent girls*. International Conference on Health Informatics and Medical Application Technology (ICHIMAT), 13- 19.
- Marlinda, R., Romadona, D., Septiasari, Y., & Yanti, D. (2022). Warm compresses effectively reduce dysmenorrhea pain for teenage girls. *Proceedings of International Conference Social Technology Education and Health Science*, 1 (1), 282-90.
- Moradpour, R. (2019). Resistance training improves primary dysmenorrhea symptoms in young girls: A randomized controlled trial. *Journal of Physical Activity and Hormones*, 3(3), 35-48.
- Nurafifah, D., Mauliyah, I., & Impartina, A. (2020). Warm compresses to decrease dysmenorrhea among adolescents. *Journal of Health Technology Assessment in Midwifery*, 3 (2), 110-14.
- Puntillo, K., Gélinas, C., & Chanques, G. (2017). Next steps in ICU pain research. *Intensive care medicine*, 43(9), 1386-8.
- Richard, S. & Sari, D. (2020). The influence of warm compress and progressive muscle relaxation therapy in decreasing joint pain to elderly at Posyandu Lansia RW 04 Kelurahan Bangsal Kota Kediri. *Journal of Innovation and Applied Technology*, 6 (2), 1031-7.
- Sharghi, M., Mansurkhani Sh., Ashtary-Larky D., Kooti W., Niksefat M., Firoozbakht M., et al. (2019). An update and systematic review on the treatment of primary Dysmenorrhea. *JBRA Assisted Reproduction*, 23(1), 51-7.
- Shehata1, N., Arafa, A., Abd El Wahed, H., Fahim, A., & Hussein, G. (2018). Epidemiology of dysmenorrhea among university students in Egypt. *International Journal of Women's Health and Wellness*, 4(1), 1-6.
- Sulistiyorini, Ch., Mukaromah, S., & Pongsibidang, F. (2019). Effectiveness of progressive muscle relaxation on decreasing intensity dysmenorrhea pain in adolescent women. *Medical Journal of Health Scientific Work*, 4(1), 10-15.

- Suphan, N., & Eni, F. (2021).The effect of relaxation techniques and warm compresses on reducing dysmenorrheal pain in adolescents.The 3rd Joint International Conferences, 3 (1), 242-8.
- The National Sleep Foundation's Women and Sleep Poll (2018).*What we know about primary dysmenorrhea today: A critical review*. Available at: <https://www.sleepfoundation.org/articles/women-and-sleep>. Retrieved on: 11 March 2023.
- Tianing, N., Nugraha, M., Indrayani, A., &Widyadharma, E. (2021).The difference in the effectiveness of warm compress and active stretching exercise in reducing dysmenorrhea pain.*Bali Medical Journal*, 10 (3), 1041- 4.
- Unnisa, H., Annam, P., Gubba, N., Begum, A.,&Thatikonda, K. (2022).Assessment of quality of life and effect of non-pharmacological management in dysmenorrhea.*Annals of Medicine and Surgery*, 81(1), 1-5.
- Warulkar, Y., Salvi, R., &Naik, N. (2020).A study to assess the effect of Jacobson's relaxation technique on dysmenorrhea among adolescent girls in selected schools.*European Journal of Molecular & Clinical Medicine*, 7(11), 7445-60.
- Widianti, W., Nurazizah, Y., Nurkania, V., Fauzi, A., Hidayat, A., Herdiansyah, Y., et al. (2021).The effect of warm compress on lowering dysmenorrhea pain. *Genius Journal*, 2(2), 54-60.
- Wikipedia, the free encyclopedia (2022). *Menstrual cycle*. Available at URL: [https:// en. wikipedia. org/ wiki/ Menstrual_ cycle](https://en.wikipedia.org/wiki/Menstrual_cycle). Retrieved on: 17 November 2022.
- Woodforde, J.,&Merskey, H. (1972).Some relationships between subjective measures of pain.*Journal of Psychosomatic Research*, 16(3), 173-8.
- Yang, M., Chen, X., Bo, L., Lao, L., Chen, J., Yu, S., et al. (2017). Moxibustion for pain relief in patients with primary dysmenorrhea: A randomized controlled trial. *PLoS ONE*, 12(2), 1–17.
- Yunianingrum, E., Widyastuti, Y., & Margono, M. (2018).The effect of warm compress and aromatherapy lavender to decreasing pain on primary dysmenorrhea.*Journal of Maternal and Child Health*, 12(1), 40-9.