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The Effectiveness of Therapeutic Exercise in Improving Pain and Quality of Life Young Women with Primary Dysmenorrhea: A Systematic Review

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ABSTRACT
Dysmenorrhea or menstrual pain is one of the health problems of many young women of all ages and races that cause them to be absent from their job. Globally more than 50% of young women report dysmenorrhea, with 10-20% experiencing severity. Although dysmenorrhea has a negative impact on a woman's life, many women do not seek hospital treatment associated with dysmenorrhea. Treatment of dysmenorrhea varies mainly. The treatment approach of dysmenorrhea is divided into three: pharmacological, non-pharmacological, and surgical. Exercise therapy has a positive influence on the human body, because exercise therapy not only activates the limbs, but also the organs in it. The study aims to review the effectiveness of therapeutic exercise in improving pain and quality of life in young women with primary dysmenorrhea. A systematic review using PRISMA guidelines for quality appraisal, four electronic databases were accessed that recorded studies on exercise intervention in young women with primary dysmenorrhea (PubMed, Springer, Science Direct, and Pedro). The quality of methodologies was check by PEDro scale. Fifteen studies were included in this research. Exercise seems effective in reducing pain and increasing the quality of life among young women with primary dysmenorrhea.
***Keywords**: therapeutic exercise, dysmenorrhea, young women, quality of life*

1. INTRODUCTION

Dysmenorrhea or menstrual pain is one of the health problems of many young women of all ages and races that cause them to be absent from their job. (Proctor & Farquhar, 2006; Osayande et al., 2014; Arafa et al., 2018). Dysmenorrhea is defined as cramping pain that occurs during menstruation and can cause problems in the pelvic organs. (Jang et al., 2013; Teimoori et al., 2016). Globally more than 50% of young women report dysmenorrhea, with 10-20% experiencing severity. Primary dysmenorrhea occurs in women younger than 20 years after menarche. (Ju et al., 2014). A study conducted by Sanctis et al. (2016) reported that the prevalence of dysmenorrhea varies worldwide, with the lowest prevalence in Egypt (34%) and highest in Oman (94%).

Dysmenorrhea is classified into three parts according to the pain level, namely mild, moderate, and severe pain. Likewise, the VAS (Visual Analog Scale) scale divides pain intensity into no pain, mild, moderate, and severe pain. VAS recommends cut point pain with the following ranges: 0-4 mm painless, 5 - 44 mm mild pain, 45-74 mm moderate pain, and 75-100 mm severe pain. The normative value of pain is that there is no pain. [8].

Although dysmenorrhea has a negative impact on a woman's life, many women do not seek hospital treatment associated with dysmenorrhea. (Negriff et al., 2009). In the United States, up to 86% of women with dysmenorrhea do not seek health care from a health care professional. (Banikarim et al., 2000; Chen et al., 2019). There are several reasons for them not to seek treatment from a health care professional for dysmenorrhea. These reasons are: the assumption that the symptoms are normal, choosing to manage themselves, limited resources, the belief that health care providers will not offer appropriate help, do not understand the suitable treatment options, symptoms can be tolerated, feel afraid or embarrassed to seek treatment, and do not seek treatment generally for any condition. [11]

Treatment of dysmenorrhea varies mainly. The treatment approach of dysmenorrhea is divided into three: pharmacological, non-pharmacological, and surgical. (Smith et al., 2011). NSAIDs (Non-steroidal Anti-Imflamatoric Drugs) are

pharmacological first-line treatments for primary dysmenorrhea (Osayande et al. 2014; Western Australia Adolescent Community Health Mnul 2013; Marjoribanks et al. 2015). NSAIDs work to reduce the intensity of cramps by reducing prostaglandin production. Although, in general, pharmacological treatment works well to reduce dysmenorrhea, the proportion of women (18%) does not improve with drugs such as NSAIDs. (Oladosu et al., 2019).

Non-pharmacological medicine consists of complementary therapies, physiotherapy, dietary supplements, and lifestyle modifications. Dysmenorrhea can also be treated with physiotherapy modalities, including Transcutaneous Electrical Nerve Stimulation, warm baths, exercise, and acupressure.[15]; Jyoti Kapoor, Navpreet Kaur 2017). A recent study reported that physical activity could reduce prostaglandin levels, pain, dan stress. On the other hand, exercise has a positive effect on improving mental health and quality of life. [17]. Surgical treatment will be done if any pathological condition on the reproductive organ, especially endometriosis, is found. The condition is secondary dysmenorrhea. The kind of surgery is endometrial ablation, hysterectomy, and presacral neurectomy (Chen et al. 2018; Roberts et al. 2012). The study aim of this review was to study the effectiveness of exercise therapy on pain and the quality of life of primary dysmenorrhea among young women.

Non-pharmacological treatment becomes important, so that the side effects of the drug can be avoided. One important treatment is physiotherapy that uses physical modalities to reduce dysmenorrhea complaints. One such modality is exercise therapy. Exercise therapy has a positive influence on the human body, because exercise therapy not only activates the limbs, but also the organs in it. This study aims to find out the effectiveness of exercise therapy to improve pain and quality of life of women with dysmenorrhea.

2. METHODS

The research design used in this study is a systematic review. The research articles used in this review must meet several criteria. The criteria are 1) research articles with randomized experiments, 2) articles published in English, 3) data collected through online strategy searches. The study follows the rules of Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA). The criteria of respondents from the study are: young women under the age of 25 years, no history of pathology in the reproductive organs, have all the characteristics of primary dysmenorrhea, treatment is exercise therapy in one of the intervention groups, the outcome measured is pain and or quality of life, pain complaints affecting daily activities, a baseline score higher than three on the visual analog scale (VAS) or another equivalent device; primary dysmenorrhea in most (>50%) of the menstrual cycle, and primary dysmenorrhea for at least one menstrual day. The exclusion criteria are irregular or infrequent cycles, oral contraceptives, or the womb.

Data is searched from search engines related to health, health sciences, and medical databases, including Physiotherapy Evidence Database (Pedro), Pubmed, Science Direct, google scholar, and Springer. Keywords are used to perform searches. The words are exercise, therapeutic exercise, physiotherapy, physical activity, physical therapy, quality of life, and intervention of physical. The search is done with the help of Google and a manual to identify the reference list of existing articles. The literature search covers the range between January 2015 and April 2021. Published studies focus on the effectiveness or effect of different exercises on pain and or the quality of life of women with primary dysmenorrhea.

Each writer has their role. The first author performs the main author and directing task. The second author performs the task of reviewing, extracting, and managing data. The third author is tasked with conducting a review to extract data from the paper. The authors also clarified all data items and the quality of the assessment tools. Standardized procedures are needed to maintain consistency in extracting data. Discussions between writers are necessary to reach a mutual agreement. The third author makes further discussions to reach a consensus. The extraction method used is double data extraction which has been shown to have a lower error rate than simple data extraction. For each trial, data were extracted regarding participants (age range, eligibility criteria), nature of the intervention, and data relating to the specified results.

3. RESULT

The initial online search of 5 databases was 2633 potential studies. Finally, 15 articles met the inclusion and exclusion criteria of the study. All papers are RCT studies with time frames 2015 - 2020, investigating women aged 18-25 years old and pain's primary outcomes measure. Secondary outcomes are quality of life, sleep quality, functional limitations, and menstrual pressure. The research flow chart can be seen in figure 1, and the details of the study can be seen in table 1. According to predefined criteria, figure 1 shows the flow of potential papers for review to eligible papers for review.

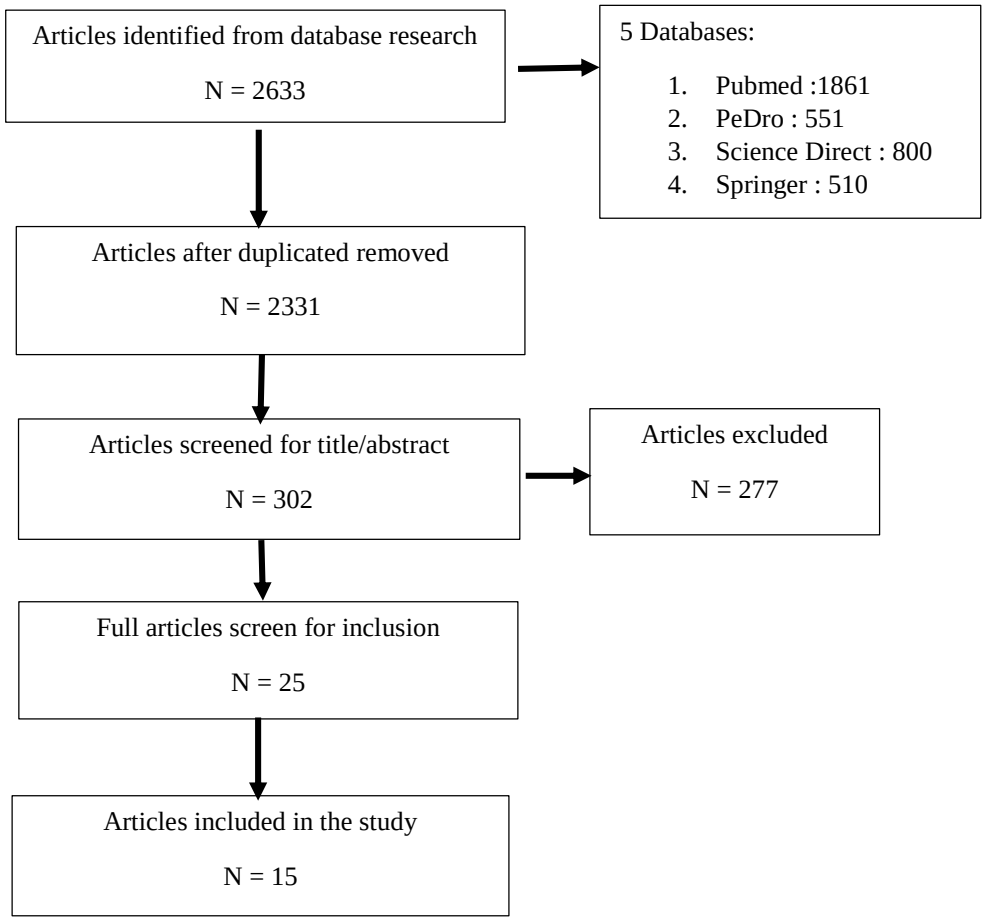

Figure 1 Flow chart of the review

Evaluation of the methodological quality of the articles reviewed using PRISMA and Pedro. Table 1 describes the evaluation of methodological quality using PRISMA.

Table 1 The PRISMA scale of studies on exercise compare with control

Author	Design of study	Respondents	Intervention/ Exposure	Comparison	Outcome measure
S. Azima et al (2015)	RCT	68 students with PD	Isometric exercise	No intervention	VAS, pain duration, Spielberger questionnaire
Kirmizigil et al (2020)	RCT	28 sedentary individual. (22-23 y.o)	Exercise protocol	No intervention	VAS, MSQ, PSQI
Yang et al (2016)	RCT	40 students PD (20 y.o)	yoga.	No intervention	VAS , MDQ
Dehnavi et al (2018)	Clinical trial study	70 students PD	aerobic exercise,	No intervention	VAS
Heidarimoghadam et al (2019)	Clinical trial	86 students	FITT based exercise	No intervention	MPQ
Samy et al (2019)	RCT	98 PD	Zumba exercise	No intervention	VAS
Ortiz et al (2015)	RCT	Female 18-22 years	General and specific Stretching exercise, Kegels, jogging, and relaxation	No intervention	VAS,
Yonglitthipagon et al (2019)	RCT	34	yoga	No intervention	VAS and SF-36,Back and

Author	Design of study	Respondents	Intervention/ Exposure	Comparison	Outcome measure
					Leg Dynamometer

Table 2 The PRISMA scale of studies on exercise compare with other intervention

Author	Study design	Respondents	Intervention/ Exposure	Comparison	Outcome measure
Motahari-Tabari et al (2017)	RCT	122 female PD	belly and pelvic stretching exercises	mefenamic acid 250 mg	VAS
Fallah and M. Mirfeizi (2018)	RCT	70 students (15-18 y.o) PD	Stretching exercise	massage	PRI, VAS, PPI, MPQ
Vaziri et al (2015)	RCT	105 students PD	Aerobic	stretching	MSQ
Azima et al (2015)	RCT	102 student with PD	massage,	isometric exercises,	VAS, hours, Spielberger's questionnaire (anxiety level)
Shirvani et al (2017)	RCT	61 students PD	Stretching exercise	ginger	VAS,
Saleh and Mowafy (2016)	RCT	150 PD	Stretching exercise	Strengthening exercise	VAS
Kannan et al (2019)	RCT	70 women	aerobic training	Usual care	VAS, SF-12, daily functioning, sleep

The data was extracted in the form of descriptive characteristics, which are presented in tables 1 and 2. Furthermore, the data were also assessed according to the PEDro scale (tables 3 and 4). The PEDro scale is a systematic rating scale for evaluating an article. The PEDro scale consists of 11 question items. The first item is a question related to external validity, and the other ten items are related to internal validity. Each point of the criteria met, except for the first item, is given a Yes answer, and if it does not meet the requirements, a response is given NO. The maximum score on the PEDro scale is 10; the higher the score, the better the study and vice versa. The PEDro score point scale is as follows: 1) 9-10 perfect, 2) 6-8 good, 3) 4-5 quite, 4) <4 less. One score is obtained from a YES answer, which is an answer that meets the criteria set by Pedro. YES, answers are added up to get the total score. Authors use two signs to provide quality assessments with a PEDro scale, namely the ✗ sign for an answer NO or an answer that does not meet the criteria and a ✓ mark for a YES answer or that meets the criteria.

Tabel 3 Pedro quality appraisal of studies on exercise compared with control.

Author	Criteria											Total
	Eligibility criteria	Random allocation	Concealed allocation	Baseline comparability	Blind subjects	Blind therapists	Blind assessors	Adequate follow-up	Intention-to-treat analysis	Between-group comparisons	Point estimates and variability	
Azima, Bakhshayesh, Abbasnia, et al. (2015)	✓	✓	✗	✓	✗	✗	✗	✗	✗	✓	✓	4/10
Kirmizigil & Demiralp (2020)	✓	✓	✗	✓	✗	✗	✗	✗	✗	✓	✓	4/10
Yang & Kim (2016)	✓	✓	✗	✓	✗	✗	✗	✓	✗	✓	✓	
Dehnavi et al. (2018)	✓	✓	✗	✓	✗	✗	✗	✓	✗	✓	✓	5/10
Heidarimoghadam et al. (2019)	✓	✓	✗	✓	✗	✗	✗	✓	✗	✓	✓	5/10
Samy et al. (2019)	✓	✓	✓	✓	✗	✗	✗	✓	✗	✓	✓	6/10
Ortiz et al. (2015)	✓	✓	✗	✓	✗	✗	✗	✗	✓	✓	✓	6/10
Yonglitthipagon et al. (2017)	✗	✓	✓	✓	✗	✗	✗	✗	✗	✓	✓	5/10
P. Kannan, et al (2019	✓	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓	6/10

Tabel 4 Pedro quality appraisal of studies on exercise compared with other interventions

Author	Criteria											Total
	Eligibility criteria	Random allocation	Concealed allocation	Baseline comparability	Blind subjects	Blind therapists	Blind assessors	Adequate follow-up	Intention-to-treat analysis	Between-group comparisons	Point estimates and variability	
Motahari-Tabari et al. (2017)	✓	✓	✗	✓	✗	✗	✗	✓	✓	✓	✓	6/10
Fallah & Mirfeizi (2018)	✓	✓	✓	✓	✗	✗	✓	✓	✗	✓	✓	7/10
Vaziri et al. (2015)	✓	✓	✗	✗	✗	✗	✗	✓	✗	✓	✓	4/10
Azima, Bakhshayesh, Kaviani, et al. (2015)	✓	✓	✗	✓	✗	✗	✗	✗	✗	✓	✓	4/10
Shirvani et al. (2017)	✓	✓	✗	✓	✓	✗	✗	✓	✓	✓	✓	6/10
S Saleh & E Mowafy (2016)	✓	✓	✗	✗	✗	✗	✗	✓	✓	✓	✓	5/10

4. DISCUSSION

Study with this systematic review method allows us to identify and assess several exercise therapy interventions that improve statistically significant pain and other menstrual symptoms. Available data show that exercise therapy performed by researchers, aerobic exercise, stretching exercises, functional exercises, isometric exercises, Zumba, and yoga, has been shown to reduce symptoms of dysmenorrhea pain significantly. Some researchers compared exercise with control groups and other methods in exercise or pharmaceutical drugs and herbal medicines (ginger). Available data show that exercise therapy has fewer side effects and is preferred over pharmacological or herbal drugs to reduce pain. However, these results have limitations due to some methodological weaknesses. We must interpret carefully in making decisions. This is done because decision-making is influenced by the quality and breadth of evidence obtained, the type of intervention in which it is ingested, and the estimated effects.

The methodological quality according to the PEDro score of each article ranged from 4-7 out of 10. A total of 8 articles had adequate scores, and seven other articles had good scores. Each article has three assessment components: Random allocation, Between-group comparisons, and Point estimates and variability. All articles that did not meet the Pedro were Blind therapists from all methodological assessments.

Five people studied aerobic exercise to improve or reduce the pain due to dysmenorrhea. Vaziri et al. (2015) found that aerobic exercise and stretching can reduce the severity of dysmenorrhea. These treatments have a good effect on reducing dysmenorrhea, depending on the situation and interest in the two exercises. Treadmills were chosen as anaerobic exercises by Vaziri et al. (2015) and Kannan et al. (2019) to reduce pain in dysmenorrhea. Kannan et al. (2019) also measured daily functional activities and quality of life for women with dysmenorrhea. According to him, exercise significantly reduces pain, increasing daily functional activities and quality of life for women with dysmenorrhea. Dehnavi et al. (2018) also examined aerobic exercise performed for 30 minutes, three times a week for eight weeks, but he did not explain the type of aerobics performed. He only explained warm-up exercise, aerobic exercise and ended with a cool-down exercise. Another research is Zumba Exercises conducted by Samy et al. (2019). Zumba is done for 60 minutes, two times a week for eight weeks. Zumba also significantly reduces the severity and duration of dysmenorrhea and is recommended as a treatment for dysmenorrhea. Heidarimoghadam et al. (2019) also conducted a study on aerobic exercise adapted to the FITT protocol for eight weeks with three sessions. The target heart rate is set to reach 60-40% maximum heart rate with a time of 20 minutes and increase gradually to 47 minutes. He said that proper and organized FITT-based exercise could improve dysmenorrhea.

Another exercise that has been widely studied is stretching exercise with or without a comparison of other interventions. [25] examined stretching exercises combined with jogging, Kegels, and relaxation exercises in sedentary women aged 18-22 years. The study results, stretching exercises combined with jogging, Kegels, and relaxation effectively reduce dysmenorrhea symptoms.

Stretching exercises compared to strengthening were performed by Saleh & Mowafy (2016). Both exercises are very easy to do and become a non-pharmacological method to reduce dysmenorrhea complaints. Shirvani et al. (2017) compared stretching with the use of ginger. The result is that stretching is a safe and inexpensive exercise that has been proven to be more effective than ginger for reducing pain due to dysmenorrhea. [27]Shirvani et al. (2015) also compared stretching with mefenamic acid. This study indicates that stretching is as effective as mefenamic acid in reducing dysmenorrhea complaints. However, stretching exercises have a more prolonged effect in reducing dysmenorrhea complaints.

Fallah & Mirfeizi (2018) also examined stretching exercises compared with massage and control with the result that lifestyle modification with exercise can help reduce the quality and quantity of pain in primary dysmenorrhea related to the duration and intensity of pain.

Isometric exercise also showed significant results in reducing some dysmenorrhea symptoms. Azima et al. (2015) compare isometric exercise with a massage and control group. They divided 102 students into three groups. The first group was given isometric exercise, the second one was given massage, and the third was not given any treatment. Massage is done when pain occurs, while Isometric Exercises are carried out for eight weeks for five days a week, and two sessions a day. In a previous study, Azima et al. (2015) also said that isometric exercise is a non-pharmacological and easy method to reduce dysmenorrhea complaints.

Yoga is also an alternative to reduce dysmenorrhea [21]. Yoga, which is practiced for 60 minutes once a week for 12 weeks, combined with relaxation and meditation, significantly reduced

menstrual cramps and stress. Research on yoga was also conducted by Yonglitthipagon et al. (2017) with the results that yoga significantly improved menstrual pain, physical fitness, and quality of life.

Another exercise is a combination of various activities performed for eight weeks compared to no exercise and found to be effective in managing symptoms associated with dysmenorrhea.

Overall, exercise has a better effect on complaints caused by dysmenorrhea compared to other methods, both pharmacological and herbal.

Pain reduction occurs because there is the facilitation of prostaglandin release after exercise. On the other hand, physical exercise also has an effect on increasing blood flow and metabolism in the uterus. The other impact is a reduction in dysmenorrhea and the release of antidiuretic hormones during exercise, as well as vasoconstriction in the pelvic area causing the breakdown of prostaglandins [19], [36]. Various studies have found that exercise therapy and physical activity are associated with decreased dysmenorrhea. Exercise therapy has an impact on the increase in premenstrual pelvic blood flow. The accumulation of prostaglandins in this area delays the onset of pain. Exercise therapy during pain causes the transfer of waste and prostaglandins to occur faster (which is the leading cause of menstrual pain) than the uterus. Regular exercise also plays an essential role in controlling stress and helps improve blood circulation, and increases endorphins and nerve transducers. The mechanism of inhibition of stress is one of the causes of the relationship between exercise and menstruation [22], [36].

One study used NSAIDs to reduce dysmenorrhea complaints. NSAIDs serve to prevent the change of arachidonic acid to endoperoxide (COX) to inhibit the production and release of prostaglandins. And thus inhibit the production and release of prostaglandins [37], [38]. The following impact is a reduction in pain. However, the long-term consumption of NSAIDs will result in side effects such as headaches, dizziness, drowsiness, loss of appetite, nausea, vomiting, gastrointestinal bleeding, acute asthma, dysuria, and acne [37], [39]. On the other hand, a person who has digestive problems should take the drug under the supervision of a specialist. Daniels et al. (2009; Jayaram et al., (2016); Sharghi et al., (2019) concluded that celecoxib has analgesic effects, while cyclooxygenase-2 inhibition neutralizes menstrual pain. Meanwhile, cyclooxygenation-2 plays a role in neutralizing dysmenorrhea. Iacovides et al., (2014) advise that NSAIDs are effective for dysmenorrhea.

One study reviewed the effect of massage on dysmenorrhea in the third cycle [30], [43]. Massage with lavender essential oil affects the reduction of dysmenorrhea pain. Another study compared to massage with lavender and placebo with almond oil, the results of massage with lavender are better at reducing dysmenorrhea pain than placebo [44].

There are several limitations of the study, namely: 1) several factors such as water consumption which is one of the factors that influence dysmenorrhea, were not studied; 2) prostaglandins as a factor that strongly influences dysmenorrhea were not studied; 3) Individual factors were not considered in several studies such as diet, and habits; 4) investigators did not consider abdominal radiographs to examine uterine conditions related to uterine vasoconstriction and biochemical blood conditions; 5) some studies had small samples; 6) some studies did not measure bleeding rates and menstrual duration; 7) studies did not measure symptoms associated with dysmenorrhea, i.e., nausea, vomiting, fatigue, and headache; 8) exercise protocols were only intended for short periods; 9) some studies did not pay attention to the dose of exercise or herbs used; 10) several studies considered it necessary to measure related to the variable psychological and social stress.

5. CONCLUSION

Exercise therapy has a good impact on dysmenorrhea. Although many other modalities positively impact dysmenorrhea, exercise therapy is easier, cheaper, can be done anywhere and without side effects. Advice for researchers next is 1) need to pay attention to individual aspects of both diet and habits, including fluid intake, 2) Researchers need to pay attention to abdominal radiographs to ascertain conditions in the uterus, 3) researchers need to measure bleeding rate and duration of menstruation, as well as other symptoms related to dysmenorrhea, including psychological variables and social stress.

AUTHORS' CONTRIBUTIONS

Each writer has their role. The first author performs the main author and directing task. The second author performs the task of reviewing, extracting, and managing data. The third author is tasked with conducting a review to extract data from the paper.

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