The effect of Hatha Yoga on pain intensity in severe primary dysmenorrhea among students: A randomized controlled trials

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ABSTRACT

Background: Yoga has been known as an alternative therapeutic modality for reducing pain. The benefits of yoga for reducing pain have been proven. Women often suffer pain due to dysmenorrhea. The effect of Yoga on dysmenorrhea pain has not been widely studied.

Objectives: This study aimed to investigate the effect of hatha yoga on pain in primary dysmenorrhea (PD).

Methods: This was a randomized controlled study (RCT) involving 50 female students, 25

KATA KUNCI: latihan otot panggul; relaksasi otot; pose yoga; pereda nyeri; dismenore primer

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INTRODUCTION

Dysmenorrhea is highly prevalent with a wide range of prevalence. It is estimated that the prevalence varies from 45% to 95% (1). The prevalence of dysmenorrhea among schoolgirls was about 43%-91%, as reported by previous studies (2). A study in Indonesia reported that about 87.5% of women in Jakarta had dysmenorrhea (3). This wide range might be due to different definitions of the dysmenorrhea condition (1).

A typical symptom of dysmenorrhea is abdominal pain before and during menstruation (4). However, the symptoms of dysmenorrhea vary across time and between individuals due to various influencing factors (5). Dysmenorrhea symptoms often harm women’s daily activities. Primary dysmenorrhea often causes physical activity restriction and increases absenteeism from work and school (5). In more severe symptoms, anxiety, and depression, could arise (6).

Nevertheless, despite this considerable impact on quality of life and general well-being, only a few women seek primary dysmenorrhea (PD) treatment as they are less confident in the usual treatment. While the treatment of PD may not get appropriate attention as PD may not be seen as a legitimate health issue by women and healthcare providers (5). Pharmacokinetic treatment is the most common option for dysmenorrhea. Pharmacokinetics drugs aim to relieve pain or symptoms by altering the physiologic mechanisms causing pain and symptoms (7). Drugs such as NSAIDs reduce pain by inhibiting prostaglandin production by decreasing the activity of cyclo-oxygenase.
pathways (7), whereas oral contraceptive reduces pain by inhibiting ovulation (8). However, some women may be unresponsive to NSAIDs, and pharmacokinetic drugs can have some adverse effects (9).

Alternative treatments for dysmenorrhea have been studied. Yoga is an increasingly popular alternative medicine. A previous study reported that specially designed poses of yoga effectively improved pain and quality of life in non-athlete women aged 18-22 with PD (10). Hatha yoga, with some poses such as bhujangasana, shavasana, and vajrasana, was also claimed to improve pain due to dysmenorrhea (11). Yoga movements may reduce pain through relaxation of the pelvic muscles and natural sedatives by increasing the release of the endorphins hormone (10).

The COVID-19 pandemic forced the government to issue strict policies to reduce the spread of infection. Large-scale social restrictions make people engage in limited social activities and physical distancing. Most social activities turn into online activities, including physical exercise, sports, and school classes. Therefore, this study aimed to investigate the effect of hatha yoga online training on the reduction of primary dysmenorrhea pain in female college students.

MATERIALS AND METHODS

This study aimed to investigate the effect of Yoga exercise on pain scale reduction in students with dysmenorrhea. Pain scale was an independent variable. Pain and dysmenorrhea were evaluated using established questionnaire tools. The results were examined using appropriate statistical test.

This study involved fifty healthy females, students of the School of Medicine and Health Sciences, Atma Jaya Catholic University of Indonesia. Participants were divided into two groups using a block randomization method to ensure a balance sample size in each group, the yoga group (n=25) and the control group (n=25). This study was held during the COVID-19 social activity restriction period (May to August 2021). All participants gave their informed consent by signing a consent form. The study protocol was approved by the Ethics Committee of Atma Jaya Catholic University (Approval number: 65/04/KEP-FKUAJ/2021).

The participants who were healthy and had no sexual hormones disturbances were included. Participants with spinal deformities, musculoskeletal and cardiopulmonary disorders, and balance, coordination, and vestibular disturbances were excluded. Participants who exercised regularly for at least three months before the study were also excluded. Participants were asked to refrain from taking analgesics at least three days prior to pain evaluation. Also, participants had to discontinue hormonal medication and hormonal status-affecting drugs at least a month before and during the study.

Dysmenorrhea was evaluated using a scale-type questionnaire consisting of four items: working ability, location, intensity (Wong-Baker scale), and days of the pain of dysmenorrhea (WaLIDD). The WaLIDD score is a valid, reliable new tool to diagnose PD (12). Each item provided a score ranging from 0-3; thus, the total score ranged from 0 to 12. The WaLIDD score was classified as no dysmenorrhea for a score of 0, mild dysmenorrhea for a score of 1 to 4, moderate dysmenorrhea for a score of 5 to 7, and severe
dysmenorrhea for a score of 8 to 12. The Wong-Baker scale is a four scale that describes the intensity of the pain (no hurt, little bit hurts, hurts even more, and hurts worst) (2,12). WaLIDD score was taken once during the first month's menstrual cycle. A score ≥8 was included in this study.

The pain was assessed using the Numerical Rating Scale (NRS). The NRS has a good validity and reliability (13). Participants were asked to choose the number between 0 to 10 that fits best describes their pain intensity. 'Zero' usually refers to 'no pain at all' whereas 'ten' refers to 'the worst pain ever possible' (13). The pain was evaluated three times, day 1 (basal) and day 3 of the first month's menstrual cycle (second), and day 3 of the third month's menstrual cycle (third).

Before the training program, the eligibility of the participants to participate in the yoga training was evaluated using a Physical Activity Readiness Question (PAR-Q) consisting of seven simples 'yes/no questions. Answered 'yes' to any question; the participant would not be allowed to participate in the training (14).

Figure 1. Flow diagram of the participants in the study

Assessed for eligibility (n=57) → Refusing to participate (n=5) → Randomization (n=52)

Control group (n=25)  Sedentary or no regular exercise

Hatha yoga training (n=27)  Intervention: Hatha yoga training 30 min/session, 3 days/week, 12 weeks

First & second pain assessment (n=27) on days 1 & 3 of the menstrual cycle

First month's menstrual cycle

Third pain assessment (n=25) on day 3 of the menstrual cycle

Third month's menstrual cycle

Analysis

Drop out (n=2) Muscle complaints
Training preparation for Hatha yoga was made for a week, a few weeks before the next menstrual cycle. In the preparation training, participants were taught to do yoga poses. Yoga preparation and training were delivered as online training using a personal device via the zoom application. The participants must turn on their gadgets and the camera during the practice. The training was conducted under the guidance of videos of yoga poses from a certified instructor recorded earlier. The certified instructor supervised poses and corrected every incorrect pose performed by the participants.

The Hatha yoga training was carried out for 12 weeks, three days a week, and 30 minutes for each session. Each yoga training session consists of warm-up asanas, the Hatha yoga (main training), pranayama (breathing exercise), closing asanas, and savasana. The warm-up asanas consisted of 5 asanas and were completed in 2.5 min. Hatha yoga consists of four poses, Vajrasana, Ustrasana (camel pose), Bhujangasana (cobra pose), and Supta Baddha Konasana. Each pose was performed for 3 minutes; thus, it took 12 minutes for all Hatha yoga poses. Pranayama exercise consisted of ujjayi and nadi shodhana, took 3 minutes. Closing asanas contained five asanas which lasted for 2.5 minutes. The yoga practice session ended with savasana, a deep relaxation, which took 10 minutes. The overall practice duration for each session was 30 minutes.

Data were presented in numeric scale. Characteristic differences and changes in NRS between groups and the magnitude of NRS change were analyzed using the unpaired student t-test. Changes in NRS within groups were examined by ANOVA and followed by the Tukey post hoc test. The correlation between pain and possible influencing factors was analyzed using the Pearson correlation. A significant difference was accepted if \( p < 0.05 \). Statistic tests were accomplished using SPSS version 17.

RESULTS AND DISCUSSION

RESULTS

The characteristics of the participants are described in Table 1. The average BMI was within the normal value, with four participants (8%) classified as overweight and obese. There was no significant difference in the characteristics between the control and yoga groups (all \( p > 0.05 \)). The basal NRS score between the control and yoga group was not significant (7.48 ± 1.9 vs. 7.52 ± 1.8, \( p=0.681 \))

<table>
<thead>
<tr>
<th>Variables</th>
<th>Overall</th>
<th>Control (n=25)</th>
<th>Yoga group (n=25)</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>19.4 ± 1.0</td>
<td>19.3 ± 1.1</td>
<td>19.6 ± 0.9</td>
<td>0.408</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>56.1 ± 10.6</td>
<td>59.1 ± 12.2</td>
<td>52.9 ± 7.6</td>
<td>0.035</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>161.2 ± 6.4</td>
<td>163.5 ± 6.5</td>
<td>158.7 ± 5.4</td>
<td>0.006</td>
</tr>
<tr>
<td>BMI (kg/m2)</td>
<td>21.3 ± 3.2</td>
<td>22.0 ± 3.7</td>
<td>20.4 ± 2.6</td>
<td>0.130</td>
</tr>
<tr>
<td>Menarche (years)</td>
<td>12.5 ± 1.3</td>
<td>12.3 ± 1.3</td>
<td>12.5 ± 1.3</td>
<td>0.590</td>
</tr>
<tr>
<td>Menstrual period</td>
<td>5.6 ± 0.9</td>
<td>5.6 ± 0.8</td>
<td>5.6 ± 1.0</td>
<td>0.875</td>
</tr>
<tr>
<td>Basal NRS score</td>
<td>7.49 ± 1.9</td>
<td>7.48 ± 1.9</td>
<td>7.52 ± 1.8</td>
<td>0.681</td>
</tr>
</tbody>
</table>

BMI - body mass index; NRS - numeric rating scale

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Table 2 illustrate the NRS score change in the control and yoga group. There was no difference in basal NRS between the control and yoga groups (p=0.681). The yoga group’s second and third NRS were significantly below the control group (p=0.027 and <0.01, respectively). No difference in NRS over time was found in control (p=0.889). NRS over time was significantly changed in yoga (p=0.02). Tukey post hoc indicated that the second and third NRS were lower than basal NRS (p=0.038 and 0.01, respectively). The third was also lower than the second NRS (p=0.039).

### Table 2. NRS score changes over time

<table>
<thead>
<tr>
<th>Group</th>
<th>Basal NRS</th>
<th>Second NRS</th>
<th>Third NRS</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>7.48 ± 1.9</td>
<td>7.54 ± 1.7</td>
<td>7.50 ± 1.9</td>
<td>0.889</td>
</tr>
<tr>
<td>Yoga group</td>
<td>7.52 ± 1.8</td>
<td>5.60 ± 1.8</td>
<td>4.43 ± 1.9</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Note: *Anova, §Unpaired student, Compared to basal, Compared to second

NRS-numeric rating scale

The magnitude of NRS change (Δ) is presented in Table 3. The first ΔNRS was basal NRS subtracted from the second NRS, while the second ΔNRS was basal NRS subtracted from the third NRS. An unpaired student t-test was applied to test the significance. Within the group, there was no difference between the first ΔNRS and the second ΔNRS in the control (p=0.416). The second ΔNRS was significantly greater than the first ΔNRS in yoga (p=0.018). Between-group, first and second ΔNRS in yoga was greater than in control (p=0.013 and 0.004, respectively).

### Table 3. The magnitude of NRS change

<table>
<thead>
<tr>
<th>Group</th>
<th>first ΔNRS</th>
<th>second ΔNRS</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0.06 ± 1.1</td>
<td>0.02 ± 1.6</td>
<td>0.416</td>
</tr>
<tr>
<td>Yoga group</td>
<td>1.92 ± 2.4</td>
<td>3.09 ± 2.8</td>
<td>0.018</td>
</tr>
</tbody>
</table>

NRS-numeric rating scale

Several associated factors might influence pain. Three possible factors were analyzed to identify their correlation with pain. Age, BMI, and age at menarche did not correlate with the first, second, and third NRS. The p-value of the correlation is presented in Table 4.

### Table 4. The correlation between NRS score and possible influencing factors

<table>
<thead>
<tr>
<th></th>
<th>1st NRS</th>
<th>2nd NRS</th>
<th>3rd NRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.543</td>
<td>0.499</td>
<td>0.437</td>
</tr>
<tr>
<td>BMI</td>
<td>0.498</td>
<td>0.700</td>
<td>0.372</td>
</tr>
<tr>
<td>menarche</td>
<td>0.211</td>
<td>0.215</td>
<td>0.270</td>
</tr>
</tbody>
</table>

NRS-numeric rating scale
DISCUSSION

A positive effect of yoga among females with primary dysmenorrhea has been demonstrated in previous studies. Many yoga exercises have been delivered to diminish or relieve pain in primary dysmenorrhea. Hatha yoga is a type of yoga that participants frequently practice. Hatha yoga has many exercises or poses, while only a few body poses are applied and varies between studies. The present study applied Hatha yoga with certain poses (Vajrasana, Ustrasana, Bhujangasana, and Supta Baddha Konasana) for twelve weeks involving fifty female students of medical school. The results revealed a significant reduction in pain intensity, as measured by NRS, compared to the control. Pain reduction was not associated with age, BMI, and age at menarche.

The effect of exercise on the decrement of menstrual disorders symptoms has been documented. Moderate-intensity aerobic exercise has been reported to attenuate premenstrual syndrome (PMS) (15). Another type of aerobic exercise also positively affected menstrual disorders. Cycling exercise for eight weeks in female students demonstrated a decrease in the amount and duration of bleeding and decreased pain in primary dysmenorrhea (16). Further study was developed to investigate the impact of specific exercises, such as yoga, on pain due to primary dysmenorrhea. A meta-analysis of randomized controlled trial studies found that yoga was effective in alleviating menstrual pain in women with primary dysmenorrhea (17). It was also documented that the effect of yoga did not just relieve pain but also improved physical fitness and quality of life (QOL) in a young female with primary dysmenorrhea (–10).

Hatha yoga is a type of yoga that consists of a set of yoga poses (physical posture) and breathing exercises. Typical Hatha yoga is conducted more slowly and more static poses maintained than other types of yoga. Hence, Hatha yoga emphasizes the force of the body. In this study, 50 female medical students were instructed to exercise yoga for 30 minutes each session, 3 days a week, for 12 weeks. The findings of a recent study indicated that Hatha yoga exercise could significantly reduce dysmenorrhea pain in female college students. Prior research involved nursing students with PD and employed yoga training for 60 minutes each session, once a week, for 12 weeks (18). They reported that menstrual cramps and distress were significantly relieved (18). Tele Hatha yoga exercises were performed in a previous study (19). The tele exercise was conducted using the Zoom application, 45 minutes each session, twice a week, for 6 weeks. The results indicated that yoga exercise improved menstrual symptoms, depression, quality of life, and body awareness (19).

Mechanisms of yoga in alleviating dysmenorrhea pain due to exercise have been hypothesized, which appears to be similar to the effect of other physical exercises. Pain intensity was associated with stress level, anxiety, and depression in women experiencing primary dysmenorrhea (20,21). Increased stress levels, anxiety, and depression could trigger the release of a neurotransmitter associated with pain (22). Consequently, diminishing stress levels, anxiety, and depression can alleviate pain intensity. Studies have shown that exercise regularly can ameliorate pain levels due to its effect on neurotransmitters, hormonal change, and increased endorphin release,
improving mood and pain perception (23,24).

The recent study employed some poses in the Hatha yoga training program, which train the large muscles around the hip. Vajrasana poses train pelvic floor muscles, while Ustrasana, a camel-like pose, trains the back, quadriceps, abdomen, chest, and shoulders muscles. Bhujangasana, a cobra-like pose, train buttocks, back, abdomen, and shoulders muscle, whereas Supta Baddha Konasana train thigh and pelvic muscles (25,26). We assumed the above poses could stretch the muscles, increasing muscle flexibility and strength. Muscle cramps around the pelvis are thought to be related to pain in PD (27). Therefore, performing yoga poses as above will train pelvic muscles to increase flexibility and strength, release spasms, and reduce pain in PD.

Many factors are associated with dysmenorrhea. Age, BMI, and age at menarche had been believed as associated risk factors for dysmenorrhea (25,28,29). However, the correlation between the associated risk factors with pain in PD lacks evidence. A study on the relationship between pain and age has been investigated, but it observed chronic pain in orofacial disorder (30). The association between BMI and chronic pain has also been confirmed (31). To our knowledge, the association between Age, BMI, and acute pain, especially in PD, is less evident. Despite many studies on the relationship between menarche's age and dysmenorrhea, pain intensity predictors have yet to be much explored and reported. A study on pain intensity in PD and its predictors has been performed (32). They found some predictors of pain but did not find the age of menarche to be a predictor of pain (32). Our finding also confirmed no correlation between age, BMI, and age of menarche and pain intensity.

This study had several limitations. Symptoms of PD and the benefits of Hatha yoga exercise cover many aspects and have been well documented. By providing pain as a single parameter, the comprehensive treatment effect of yoga exercise could not be seen, e.g., the effect on mood, anxiety, body awareness, quality of life, etc. Besides, no other possible influencing factors were included. Alteration in pain perception might be affected by several factors or more prominent in certain circumstances. By including those factors, their contribution to change in pain perception can be observed. Also, predictors of pain are necessary to investigate. By recognizing the pain predictors, pain in PD could be attenuated, and absenteeism from work and school could be minimized.

CONCLUSION AND RECOMMENDATION

This RCT study investigated the effect of Hatha yoga on pain reduction in female university students with PD. Overall, we concluded that the Hatha yoga exercise improved the severity of pain and suggested that Hatha yoga can be considered non-pharmacological therapy for PD. We recommend the further research including more independent variables (mood, anxiety, quality of life) to see the comprehensive effect of Hatha Yoga.

REFERENCES

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