

# Effect of Lumbar Spinal Mobilization on Primary Dysmenorrhea Among University Students

Suvinlal Stalin Russel \*, Yen Wen Lau, Rahul Krishnan, Priya Kesar.

Department of Physiotherapy, Faculty of Health Sciences, MAHSA University, Malaysia.

## ABSTRACT

**Background:** Lumbar spine mobilization provides a bodily inducement that affects one or more of the joint mechanoreceptors, muscle spindle systems, or Golgi tendon organs, resulting in reduced muscle tone and decreased pain. As primary dysmenorrhea is one of the common problems among half of adolescent girls and it is one of the reason for female's absenteeism in class or work. All over the world, many studies have concluded the signs and symptoms of dysmenorrhea such as pain and mood swing. Hence, this investigation is used to catch on the effect of using non-pharmacology management to alleviate the pain for females suffering from primary dysmenorrhea.

**Objective:** This study intention is to find out the effect of lumbar spinal mobilization on primary dysmenorrhea among university students.

**Methods:** A quantitative, quasi-experimental research design with pre and post-test was used in this study. 20 subjects who met the inclusion criteria and aged between 18 to 26 were included and dispensed into two groups. Participants in Group A (n=10) were given LSM and hot pack whereas those in Group B (n=10) were only provided with hot pack. Treatment was commenced on the second day of menstrual cycle. Numerical pain rating scale (NPRS) was collected before and after the treatment.

**Results:** Data was analysed by using SPSS version 26. Parametric paired 't' and unpaired 't' tests were used to analyse the data. Paired 't' test was used to analyse the data with each group while unpaired 't' test was to analyse the data between two groups. Both group A and B have shown a significant reduction in NPRS score ( $p < 0.001$ ). However, when comparing the two groups, unpaired 't' test exhibited no significant differences ( $p > 0.05$ ).

**Conclusion:** In closure, lumbar spinal mobilization had proven no significant effect for university students who suffered from primary dysmenorrhea.

**KEYWORDS:** Hot Pack, Lumbar Spinal Mobilization, Primary Dysmenorrhea, University Students.

**Address for correspondence:** Suvinlal Stalin Russel, Department of Physiotherapy, Faculty of Health Sciences, MAHSA University, Jln SP 2, Bandar Saujana Putra, 42610 Jenjarom, Selangor, Malaysia. **E-Mail:** [Suvinlal@mahsa.edu.my](mailto:Suvinlal@mahsa.edu.my)

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## INTRODUCTION

Manipulative therapy has a few numbers of physician referral and practice amongst the many forms of complementary rehabilitation [1]. The common treatment modality is spinal manipulation therapy. Joint mobilization may induce several physiological responses including pain reduction, improved joint mobility,

hypoalgesia, and change in muscle activity/contraction. There is argument about its use to treat visceral conditions (conditions related to the internal organs) such as dysmenorrhea [2]. A case record of treatment with spinal manipulation has demonstrated effective management of dysmenorrhea [3].

Dysmenorrhea is a painful or difficult monthly flow [4], it is a common gynecological problem among young female” [5,6].

Dysmenorrhea usually started 6-12 months after menarche, sometime until the labor [7,8]. Symptoms of dysmenorrhea involve pain, mental distress, impaired concentration, and behaviour change. It can broadly be divided into two categories: primary and secondary dysmenorrhea. Primary dysmenorrhea (PD) is cramping pain in the lower abdomen before or during menses with no pelvic pathology. Sometimes, the pain may even radiate down into the hips and thighs [5]. Half of adolescent female are believed to be affected and of these 13% women reported severe pain for the first to three days half of the time [9]. PD regularly accompanies with mood swings, tiredness and headache which affect quality of life and it disturbed education [9-12].

Globally, number of prevalence studies about dysmenorrhea publicised differently and provide a variety of outlook. In Malaysia, Jaiprakash [13] conducted a cross sectional study on 215 female’s medical students in university concluded that dysmenorrhea had highly occurred in female medical students and affected their social life adversely. Severe pain would negatively affect school performance of a young girl. It was proven by another prevalence study in Malaysia which was done by Htut [14]. Furthermore, the International Association for the Study of Pain, by Lefebvre [15] mentioned that approximately 15 % female were not able to work and study for 1-3 days during their menstrual cycle. In Northern Ghana, the study published by Ameade [16] also found that there was high prevalence of dysmenorrhea among female university students which led to negative effects in the daily activity. Moreover, study conducted by Polat [17] on 1266 young female university students with an average age of 21 showed around 45% of young females were suffering painful menstruation in each menstrual period while 43% females suffered it sometimes.

However, the causes of PD remain unknown. Most symptoms like pain can be explained by excessive production and release of

endometrial prostaglandins (PGs) during the onset of menstruation which induces hypercontraction of the myometrial thereby causing uterine ischemia and sensitization of nerve endings [18]. Management of dysmenorrhea includes surgical, pharmacological, and non-pharmacological or conservative management. Pharmacological management is widely used for pain relief in PD, mostly focus on relaxing uterine muscles contraction. One of the prevalence studies in South India indicated that about 24.4% of young females consumed pharmacological management while 14.2% of them were on medical advice [19]. Undeniably, the pharmacological management has its efficacy in promoting immediate pain relief, but the side effect may bring harm to human body. For example, it may cause nausea, vomiting, gastrointestinal and visual disturbances [20,21]. Many women seek substitutes to conservative medical treatments. The usage of complementary or alternative therapy has become popular with both consumers and mainstream medical practitioners. Their definition is deliberately broad as what are considered complementary practices in one country could be conventional therapies in another. Studies suggest that between 30% to 50% of the adult population in industrialised nations use some form of complementary therapy to prevent or treat health related problems.

Non-pharmacological or conservative management for relieving signs and symptoms on PD such as relaxation techniques, acupuncture, heat therapy, transcutaneous electrical nerve stimulation (TENS) and joint mobilization has a significant potential value in reducing pain without any side effects [22].

As summarized by Proctor [23], spinal manipulation may be effective due to the innervation parasympathetic and sympathetic of uterus origin closely along with spinal vertebrae especially T10 to L2 therefore there is an effect over nerve supply which may help in reducing pain. Spinal mobilization (SM) is one of the reliable techniques that relieves pain by using small amplitude oscillation on the vertebrae [24] which help to increase the spinal mobility. This is because the boost in

spinal mobility may improve pelvic blood supply and thus bring more nutrients through an influence on the autonomic nerve which supplied to the avascular structures therefore relieving pain [23]. Based upon potential neuromechanical mechanisms, one of the studies suggested that dysfunction of the spine, at T10 and L1 was the highest in women suffering from PD [25]. SM at these relevant vertebral levels not only corrects the dysfunction, sympathetic response, but also inhibits uterine contraction as well as increases blood flow to the pelvic region [26]. Moreover, SM helps to relieve tension on the broad ligament of the uterus and pelvic nerve roots, which may alleviate menstrual pain [27].

In Malaysia, approximately 56–85% of adult women use CATs for women health issues including: pregnancy, labour, post-menopausal symptoms and infertility [28]. As there is very less evidence to prove whether SM is effective in treating PD in Malaysia, the aim of this design is to find out the effect of lumbar spinal mobilization (LSM) in reducing the pain level on PD among university students.

## **MATERIALS AND METHODS**

In this study quantitative, quasi experimental with pre-test and post-test design is used to find out the effects of LSM on PD among university students. Initially, online announcement was posted on social media like a group on WhatsApp. 36 feasible subjects were volunteers for this study. The link of screening form was provided via WhatsApp during the first stage. 10 subjects were excluded because of irregular menstrual cycles and consuming pain killer regularly. The remaining 26 subjects were later contacted via Google meet to ask for consent and confirm with their next menstrual date. 6 of them were excluded after this due to some personal issues. In the end, 20 subjects who met the criteria were included and then assigned into two groups. Group A was given LSM and hot pack (HP) while Group B was using only HP. Pre-NPRS was assessed for both groups. A softcopy of information sheet and consent form were given to all the subjects who were willing to participate in the research to ensure that the subjects understand the procedures of the

research. Also, the subjects were briefed about their role in both assessment and treatment of the study. Firstly, subjects would inform the researcher on the first day of their menstrual cycle. The treatments were then given on their second days of menstrual cycle. Group A (n=10) underwent LSM and HP. LSM was performed by using Maitland's Grade 1 and Grade 2 techniques with the subject lying on a pillow beneath the abdominal to make the subject more comfortable. Untreated part was covered by a towel. Physiotherapist, in standing position, adjusted the couch height until the comfortable height and then asked for consent before exposing the subjects. A posterior-anterior with Grade 1 mobilization was given from T10 to L2. 2-3 oscillation would apply for each vertebral level and repeat 3 times and then followed by Grade 2. After LSM, subjects were given a HP within 15 minutes. HP were wrapped with a towel and placed at T10-L2 vertebral level.

Group B (n=10) was given HP. HP was performed with subjects in prone lying position same as Group A. HP was wrapped with a towel before applying. HP was placed on T10-L2 level for 15 minutes. No home exercise program was given to both groups. Post-NPRS were assessed for both groups after treatment was given.

The NPRS results from the subjects during pre and post treatments were documented into an Excel data collection sheet. The results would be recorded and tabulated correspondingly and eventually be sent for statistical analysis of data. All data collected would then be analysed and interpreted via SPSS version 26.

### **Inclusion Criteria**

1. University students.
2. Aged between 18 to 26.
3. Presence of menstrual pain with NPRS (4-7) during 2<sup>nd</sup> days onset of menstruation.
4. Regular menstrual cycles (occurred every 24-32 days).

### **Exclusion Criteria**

1. Subjects with any pathology/deformities of spine.
2. Subjects with any contraindication to intervention.

3. With history of pregnancy/delivery.
4. Receiving of other therapies 1 month before the treatment.

**RESULTS**

**Table 1:** Mean age of Group A (LSM and HP) and Group B (HP)

|                   | Group A (LSM and HP)<br>(n=10) | Group B (HP only)<br>(n=10) | Total (n=20) |
|-------------------|--------------------------------|-----------------------------|--------------|
| Age,<br>Mean ± SD | 23.60 ± 1.35                   | 23.50 ± 1.08                | 23.60 ± 1.19 |

S.D = STANDARD DEVIATION

A total of 20 subjects who met the inclusion criteria was randomly allocated into two groups. Each group consists of 10 subjects. The age of both group subjects were ranged from 18 to 25 years old. As Table 1 shows the summary of group A subjects with an average age of 23.60 ± 1.35 years whereas group B 23.50 ± 1.08 years. An average age for both groups were 23.60 ± 1.19.

NPRS is considered interval level data. Interval data usually starts with a zero point and there cannot be a genuine zero or an absolute value for it. Also, interval data fulfilled the use of parametric test. Hence, to find out the importance of treatment in each group, a parametric paired t-test which was also known as dependent ‘t’ test was used to analyse the pre and post NPRS during the second days of menstrual cycle. On the other hand, to compare the results between group A and B, unpaired-t test was used.

**Table 2:** Paired t- Test for Pre and Post NPRS in Group A (LSM and HP).

| Outcome | Pre- treatment<br>(Mean ± S.D) | Post-treatment<br>(Mean ± S.D) | Mean<br>Difference | t-value | p value |
|---------|--------------------------------|--------------------------------|--------------------|---------|---------|
| NPRS    | 5.50 ± 0.71                    | 3.90 ± 0.74                    | 1.6                | 9.8     | 0       |

p value <0.05

**Table 3:** Paired t- Test for Pre and Post NPRS in Group B (HP only)

| Outcome | Pre- treatment<br>(Mean ± S.D) | Post-treatment<br>(Mean ± S.D) | Mean<br>Difference | t-value | p value |
|---------|--------------------------------|--------------------------------|--------------------|---------|---------|
| NPRS    | 5.30 ± 0.68                    | 4.10 ± 1.10                    | 1.2                | 4.81    | 0.001   |

p value <0.05

Paired t-Test was used to analyse the data in group A and group B. Referring to Table 3.2, it showed pre and post-NPRS mean score in group A (LSM and HP). The pre-mean score was 5.50 ± 0.71 and it reduced after treatment to 3.90 ± 0.74. Mean difference between pre and

post-treatment was 1.60. Group A (LSM and HP) showed a significant improvement in the NPRS score on PD with t-value was 9.80 and p=0.000.

Table 3 showed the pre and post- NPRS mean score in group B (HP only). The pre-mean score was 5.30 ± 0.68 and it decreased after treatment to 4.10 ± 1.10. Mean difference showed 1.20. In group B (HP only) also showed significantly improve NPRS score on PD with t-value was 4.81 and p= 0.001.

**Table 4:** Unpaired t- Test for Group A and Group B.

|      | p value | Mean<br>Difference | Std Error<br>Difference | 95% CI |       |
|------|---------|--------------------|-------------------------|--------|-------|
|      |         |                    |                         | Lower  | Upper |
| NPRS | 0.2     | 0.4                | 0.3                     | -0.23  | 1.03  |

p value > 0.05

Table 4 showed unpaired t-Test was used to analyse both group A and group B. The mean difference for both groups was 0.40. The standard error difference was 0.30. The results showed that there is no significant difference between both groups on reducing NPPS (p= 0.20) which meant both groups had similar effect in treating PD among university students.

**DISCUSSION**

This study was aimed to determine the effectiveness of LSM on PD among university students. There are several studies that proved that PD is the most common gynecology problem that would lead to absenteeism in women in life [29-32]. In Malaysia, the prevalence of university students who suffered from PD was 78 %, 58 % and 69.4% respectively [13-14, 32]. Moreover, Jaiprakash [13] also mentioned that dysmenorrhea can be correlated with population, family history and social life. In this study, out of 36 subjects were screened out. A total of 20 subjects were recruited and divided into two groups. Group A was provided with LSM and HP while Group B was provided with only HP. NPRS was as an outcome measure. Based on the table 3.2 and 3.3, it has been proven that pain of PD has shown significant improvement in both Group A and B. Mean of pain in Group A was reduced from 4.5 to 2.8 with p=0.000 while in Group B it was reduced from 4.35 to 3.40 with p=0.00. In the other hand, the independent t-test showed there is no significant difference

between Group A and Group B therefore accepting null hypothesis. This can be discussed in different perspectives.

LSM performed in low-velocity, passive movement within the limit of joint range [24, 35]. Grade 1 and Grade 2 mobilization techniques had been highly suggested in reducing pain [36,37]. This is because parasympathetic and sympathetic pelvic nerve pathways are connected at spinal vertebrae particularly from T10 to L2. Therefore, researchers believed when LSM was applied, the passive, small amplitude oscillation movements would stimulate the mechanoreceptors which may inhibit the transmission of nociceptive at spinal cord or brain stem [38]. Besides, the small amplitude gliding on the vertebrae may encourage more blood supply and nutrients via an autonomic nerve supply to the avascular structures hence alleviate pain relief [39]. Also, it has been proven that musculoskeletal structure dysfunction such as lumbar spine, pelvic and hip may be correlated with dysmenorrhea. Soft tissues injury such as ligament, joint capsule, discs, and muscle could lead to hormonal change which may cause pain in PD as well [23]. Holtzman [40] also mentioned that reduced stress on ligament on vertebra which also had possible pain with PD could be reducing with mobilization on lumbosacral spine. In a study, Prazeres [41] concluded that sedentary females showed a higher prevalence of PD compared to non-sedentary females.

HP, known as a superficial heat therapy, had been used in this study on the thoracolumbar region (T10-L2) which helped to reduce pain caused by PD. One of the previous studies also concluded that heat promoted pain relief in PD by inhibiting pain signals. In addition, the applying of heat could help in relaxing muscle and relieving joint stiffness and simultaneously helps in reducing the symptom of PD [42-43]. Furthermore, heat could stimulate the cutaneous thermoreceptors which are connected to the cutaneous blood vessels causing the release of bradykinin. Bradykinin helps in relaxing smooth muscles thereby resulting in vasodilation. Vasodilation increases blood circulation, metabolisms and also accelerates the nutrients to the uterus.

In one of the study by Akin [44] showed that heat therapy was as efficient as medication like ibuprofen in treating PD.

Pain is the main complaint of most of the adolescent girls in PD because of production of the increase of endometrial prostaglandin which may cause the blood to contain high concentrated of prostaglandins [38].

The pain-related biomolecular induction of prostaglandin and cyclooxygenase (COX-2) are strongly suspected with the severity of PD [35]. In addition, sympathetic supply to the myometrium of uterine wall increased hence reducing the blood supply into myometrium [45]. Thereby, when LSM and HP applied at T10-L2, both interventions could stimulate the mechanoreceptors as well as large diameter fibres which inhibit the pain sensation at spinal cord or brainstem level. Thus, result showed no significant difference between both groups with  $p=0.20$ . Medications such as oral contraceptive, ibuprofen and pain killer are normally used by patients with PD as those are the main common options to lessen symptoms of PD. Many studies have suggested replacing medication with therapeutic exercises or intervention as it could prevent the possible complications of the pharmaceutical methods [30, 46]. In this study, LSM has showed that there is no any significant effect in relieving pain of PD for a short duration which was similar with the previous studies [46]. Also, there is still lack of studies on the effectiveness of LSM on PD among women [47]. In the future, longer duration and more sample sizes should be included to find out the effect of spinal mobilization on PD for females.

## CONCLUSION

This objective of this study is to find out the effect of LSM on PD among university students. 20 subjects who met the criteria were randomly allocated into two groups, Group A (n=10) LSM and HP were provided while Group B (n=10) was only provided with HP. NPRS was used as an outcome measure in this study to assess pain. The result showed both groups are effective in reducing pain on PD among university students ( $p < 0.05$ ). Even so, there is no significant difference between group A and

group B ( $p > 0.05$ ). In conclusion, LSM has showed no significant effect on PD among university students.

#### Ethical approval:

The procedures for this study were reviewed and has passed the ethical committee board from Mahsa University (Ref no: FOHS/MI/21/UG109) to ensure subjects' and researchers' safety. Subjects are required to read and sign the informed consent form prior to this study. Next, information about the study will be given to the subjects in simple words and language. None of the subjects shall be forced to engage in this study. The treatment process and risk of the study will be clearly explained to the subjects before they sign the consent form.

During the study, subjects shall not feel uncomfortable and shall be told as to the right to withdrawal at any time. All the subjects' personal information about the health condition will be kept confidential in accordance with Personal Data Protection Act 2010 at all times and will not be published without prior consent. Also, as this study was carried out during COVID-19 pandemic, all the safety and precautionary measures will follow the standard protocols by the Malaysian Ministry of Health (MoH).

#### ORCID

**Suvinlal Stalin:** <https://orcid.org/0000-0002-9290-4327>

**Rahul Krishnan:** <https://orcid.org/0000-0001-7819-6005>

**Priya Kesar:** <https://orcid.org/0000-0003-2315-446X>

#### Authors' contributions

**Corresponding author:** Research process, review of literature, research design and discussion,

**Yen Wen Lau:** Data collection, manuscript drafting, research analysis and review of literature.

**Rahul Krishnan:** Research analysis, discussion, and review of literature.

**Priya Kesar:** Summary, editing, manuscript drafting and review of literature.

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#### Conflicts of interest: None

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