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Spinal assessment in primary dysmenorrhea: A review

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ABSTRACT
Primary dysmenorrhea (PD), identified by painful menstruation with no underlying pelvic pathology affects a significant proportion of women globally. While the etiology is not fully understood, recent research has suggested a potential link between spinal dysfunction and menstrual pain. Purpose: This review aims to synthesize current evidence on spinal assessment methods and their relevance in PD. Methods: A comprehensive literature search was carried out across multiple databases, involving PubMed, CINAHL, and Scopus, to identify relevant research published between 2000 and 2023. The review focuses on various spinal assessment techniques, including: Formetric tool (rasterstereography), Three-dimensional (3D) ultrasound imaging, Spinal mouse. Results: Women with PD often exhibit spinal misalignment. However, the causal relationship between these spinal alterations and menstrual pain remains unclear. Conclusion: This review highlights the potential value of incorporating spinal assessment in the evaluation and management of PD. Additional research is required to establish standardized assessment protocols and to determine the efficacy of spinal-based interventions in alleviating menstrual pain.

***Key Words**: Primary dysmenorrhea; spinal alignment; spinal mouse; physiotherapy students*

1. Introduction

During menstruation, painful uterine cramps are a hallmark of primary dysmenorrhea, one of the leading origins of pelvic discomfort and menstrual problems **(Kumar & Elavarasi, 2016).** Teenage girls are particularly susceptible to menstrual disorders, which are characterized by mood swings, exhaustion, and period discomfort. Approximately 75% of women have dysmenorrhea, or period discomfort, at some point in their reproductive lives. Young women in their teens and early adulthood are particularly affected **(Ju et al., 2014).**

The literature reports on a wide range of prevalence of dysmenorrhea. The prevalence was higher in young girls, with estimates for those aged 17–24 varying from 67% to 90% **(Ju et al., 2014).** A large survey of senior high school females in Australia found that 93% of adolescents informed having menstrual discomfort **(Parker et al., 2010).** PD pain usually begins 1-2 days prior to the commencement of menstruation or immediately following the menstrual flow, and it usually lasts 8-72 hours **(Karout et al., 2021).**

An early menarche (before age 11), longer intermenstrual intervals (≥ 35 days), prolonged bleeding (≥ 7 days), heavy bleeding, premenstrual symptoms, nulliparity, a previous sexual assault, frequency of alcohol use, smoking, depression, stress, and a body mass index of less than 20 or more than 30 kg/m2 are all positively associated with PD **(Taylor et al., 2019; Dawood, 2006).**

The overproduction of uterine prostaglandins is the most commonly approved theory to clarify the pathogenesis of PD. It is believed that the increased generation of prostaglandins from dissolving cells through

endometrial sloughing is the reason for myometrium over-contractility. This finally leads to discomfort by causing uterine muscle ischemia and hypoxia **(Proctor and Farquhar, 2006).**

Compared to asymptomatic women, those with PD experience uterine hyperactivity and contractions throughout the menstruation; they also have higher levels of uncoordinated uterine contractions, active intrauterine pressure (>120 mmHg), resting uterine tone (>10 mmHg), and frequency of uterine contractions. Furthermore, numerous Doppler ultrasonography investigations have demonstrated that women with dysmenorrhea experience strong and irregular uterine contractions during their periods. These contractions are linked to decrease uterine circulation, which causes myometrium ischemia and consequent pain **(De Sanctis et al., 2015).**

Compared to non-dysmenorrheic females, those with dysmenorrhea often have a lower quality of life (QoL) throughout their menstrual cycle because they rate their physical and social functioning, bodily pain, and general health perceptions far lower. Accordingly, the discomfort of dysmenorrhea appears to have a direct negative impact on QoL every month throughout menstruation **(Iacovides et al., 2015).**

Painful myofascial points are linked to PD, which can also change somatosensory perception and muscular activity, both of which can impact postural control. Changes in this system can lead to balance problems, as evidenced by the description of the relationship between pain and postural control in both acute and chronic musculoskeletal diseases. In addition to changes in proprioception, the use of antalgic postures, the existence of myofascial trigger points and paradoxical thoracic muscular contraction can all influence the adjustments in postural control **(Stallbaum et al., 2018).**

Studies on the correlation between posture and dysmenorrhea have found a link between lumbopelvic misalignment and dysmenorrhea **(Kim et al., 2016c; Kim et al., 2016b).** Changes in the curvature of the spine frequently result in discomfort in specific areas of the back. The lumbar lordosis is one of the most significant components of the spinal structure, and it is particularly crucial because of its unique position and direct contact with the pelvis. In order to maintain good physical health, specific attention should be made to the spine **(Kendall et al., 2005).**

Biomechanical changes to the lumbosacral vertebrae were thought to result in an increase in body fluid in the pelvis and also contraction of the uterus increasing menstrual pain **(Proctor and Farquhar,2006).** As a result, women with a misaligned spine, which is the cause of pelvic instability, had increased menstrual pain **(Kim et al., 2016c).**

Studies on the connection between PD and the musculoskeletal system are limited nevertheless. According to **Blakey et al. (2010),** PD was believed to be brought on by an incompatibility between the soft tissue and the pelvic circumferential muscles. Both active components, such as muscles and tendons, which enable both structural and functional motion, and passive components, such as bones and ligaments, are connected to the stability of the pelvic cavity. Dysmenorrhea could increase due to musculoskeletal incompatibility, changes in the body's structure and function, and a change in the uterus's location **(Kim et al., 2016b).**

Dysmenorrhea severity is significantly related to lumbar hyper lordosis in sedentary women suffering from dysmenorrhea **(Lorzadeh et al., 2021).** Lumbar instability can cause injury and pain in the female body, particularly during stressful times, and one of these stressful instances is dysmenorrhea. The lumbar region of the spine is strong and constructed to withstand the body's weight; it also plays a role in the anatomical attachment of specific muscles and nerve signals to their corresponding areas. If a portion of the lumbar spine is weakened at any point, it will not be able to withstand functional stress to its full potential, causing pain in the belly, lower back, or thighs, areas that females with dysmenorrhea have trouble with **(Kaur et al., 2014).**

2. Material and methods

2.1. Design of the study

Narrative review

2.2 Participants

The current study was conducted at Faculty of Physical Therapy, Delta University for Science and Technology, Gamasa, Egypt, with the aim of assessing the spinal alignment among physiotherapist students with primary dysmenorrhea (PD).

2.3The inclusion and exclusion criteria

To be involved in the study, all females were virginal and non-smokers. They aged between 18 and 23 years and had body mass index (BMI) between 18 and 25 kg/m^2. They had regular menstruation (3-8 days in duration, with 21-34 days in-between). The participants weren't included if they had previous pelvic pathology, any gynecological disease, history of musculoskeletal or neurological disorders, history of operations or injuries to the spine or pelvis, cancer, injured, broken, wounded or irritated skin in the back area, or a history of any stressful event in the last 6 months like parental separation or death of a first-degree relative. Also, they didn't use analgesics throughout the study period.

3.Tools to assess dysmenorrhea pain severity

3.1The behavioral rating scale (BPS):

An observational pain scale called the BPS is best used by the attending nurse. The use of it in patients who are mechanically ventilated and highly sedated has been approved. The BPS, which is simple to administer and widely approved by nurses, has three subscales: compliance with mechanical ventilation, upper limb movements, and facial expression. From 1 (no response) to 4 (full response), each subscale has a score. As a result, the BPS scale goes from 3 (no pain) to 12 (maximum pain). A BPS score of six or higher is seen as an indication of intolerable pain **(Chanques et al., 2006; Young et al., 2006).**

3.2 The McGill Pain Questionnaire (MPQ):

Cognitive-evaluative, motivational-affective, and sensory-discriminative are the three main dimensions of pain. The McGill Pain Questionnaire (MPQ) and its Short Form, one of the most widely used multidimensional self-rating measures, were developed as a result. Words that describe the sensory (subgroup 1–10), affective (subgroup 11–15), evaluative (16), and other aspects of pain (17–20) make up the 20 subgroups of MPQ. As the gold-standard test for determining pain intensity in other populations, it is a suitable and widely used instrument for more precise pain intensity measurement. The SF-MPQ-2 has been validated in numerous languages and across a range of demographics (such as those with diabetes, cancer, and low back pain), with reports of satisfactory psychometric characteristics.**(Dworkin et al., 2015).**

3.3 Visual Analogue scale (VAS):

The VAS is a tool used to rate pain. **Boonstra et al. (2008) and Couper et al. (2006)** stated that scores are relied on self-reported evaluation of symptoms that are documented with a single mark located at one point along a 10-cm line that stands for a continuity between the two ends of the scale—"no pain" on the left end (0 cm) and the "worst pain" on the right end (10 cm). Even though VAS is a validated ratio measure of pain, its clinical application is challenging due to the requirement that the patient have adequate fine motor skills and visual acuity, as well as the need for further resources (**Couper et al., 2006).**

3.4 The verbal rating scale (VRS):

The VRS is a categorical ordinal scale that uses six verbal adjective severity grades; none, very mild, mild, moderate, severe, and very severe to define the growing pain intensity (**Ripamonti and Brunelli, 2009)**.

3.5 WaLIDD Scale:

The following characteristics of dysmenorrhea were incorporated into a scale-type survey, WaLIDD score (working ability, location, intensity, days of pain, dysmenorrhea: 1) the quantity of anatomical pain sites (lower abdomen, lumbar region, lower limbs, inguinal region, and no part of the body), 2) The Wong-Baker pain scale (does not hurt, hurts a little, hurts a little more, hurts even more, hurts a lot, hurts a lot more), 3) the number of days that they experienced pain through their period (0, 1–2, 3–4, ≥5), and 4) the frequency of discomfort that prevented them from performing their tasks (never, almost never, almost always, always). The variables for every tool gave a definite score between 0 and 3, and the cumulative score varied from 0 to 12 points **(Teherán et al., 2018).**

4.Tools to assess spinal mobility and alignment

It has been shown that abnormal spinal mobility and posture result in functional worsening of quality of life **(Wang et al., 2012).**

4.1 Formetric tool (rasterstereography):

A valid and trustworthy tool for evaluating spinal posture parameters, particularly thoracic kyphosis, lumbar lordosis, and scoliosis, is the Formetric (rasterstereography). Moreover, rasterstereography was found to be an accurate way of determining spinal position when contrasted with conventional radiological imaging methods **(Krott et al., 2020).** By examining the spinal column, the Formetric 4D instrument makes clinical practice easier. It is a non-invasive technique that is totally radiation-free, has a strong correlation with radiography, and is very easy to use and repeat **(Berardi et al., 2020).**

4.2 Three-dimensional (3D) ultrasound imaging:

Because modern 3D ultrasound imaging is non-ionizing, upright, affordable, and easy to use, it is increasingly being used to evaluate structural spine alterations. Ultrasound As a non-invasive and non-ionizing method, modern 3D ultrasound could be used to enhance conventional radiography methods with additional data **(Lee et al., 2021).**

4.3 Spinal mouse:

This electronic computer-assisted device uses a surface approach to detect intersegmental angles and sagittal spinal ROM noninvasively. By gliding the Spinal-Mouse alongside the spine in the neutral upright posture, the following parameters were assessed: spinal curvature, spine inclination (the angle of the plumb line that runs through the middle of the stabilizing feet area and bisects the trochanter major), and sacral inclination angle (Sac/Hip: sacral slope referring to the angle between the horizontal and the sacral plate). The computer automatically calculated and presented all of the spine data. Lumbar lordosis was represented as a negative value, and thoracic kyphosis as a positive value. In order to quantify spinal mobility, this procedure was repeated with the participant in both maximum bending and extension positions. Spine inclination and the angle of the entire trunk, which measures spine alignment, were linked to balance. The worst balance was indicated by a large angle **(Wang et al., 2012).**

Conclusion

it can be concluded that in female undergraduate physiotherapy students suffering from primary dysmenorrhea, There were significant differences in spinal alignment with varying severity of PD, particularly in thoracic and lumbar measurements. The relationship between spinal alignment and dysmenorrhea highlights the necessity for targeted spinal assessments and interventions tailored to the severity of symptoms. Healthcare professionals can

improve treatment results and the quality of life for women with dysmenorrhea by addressing spinal health as part of an all-encompassing strategy to managing the disorder.

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