Osteopathic Structural Findings in Women During Menstruation

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ORIGINAL CONTRIBUTION

Abstract

Context: Menstruation, although a normal physiologic process, can result in cramping and discomfort in women. The symptomatology may manifest as musculoskeletal changes that can be identified and addressed to provide relief for suffering patients.

Objective: To evaluate for common somatic dysfunctions and Chapman's reflex points by performing full-body osteopathic structural exams (OSE) on women during menstruation compared to when they are not menstruating.

Methods: Participants were menstruating, female faculty, staff and students recruited from Kansas City University. Data was gathered in the form of OSE findings from 2 intervals of menstruation and compared to data gathered from 2 intervals of non-menstruation.

Each participant was evaluated at 4 visits: visit 1 during menstruation, visit 2 during non-menstruation, visit 3 during their subsequent cycle of menstruation, and visit 4 during their subsequent cycle of non-menstruation. At each visit, the participant was evaluated separately by the fellow and the physician.

Results: Of the 32 potential participants, 23 completed the study. In this population, 23 participants (100%) had a lumbar somatic dysfunction during one menstrual cycle, with only 14 (60.9%) having a lumbar dysfunction during non-menstruation (P=0.004). Of the 5 posterior Chapman's reflex points evaluated, 17 participants (73.9%) had at least 1 of the Chapman's points with dysfunction during 1 menstruation cycle compared to only 10 participants (43.5%) during non-menstruation (P=0.039). Three participants (13%) were found to have a left-sided innominate dysfunction during 1 menstrual cycle compared to only 1 participant (4%) having a left-sided innominate dysfunction during non-menstruation (P<0.001).

Conclusion: This study found 3 common areas of dysfunction in menstruating women that could be targeted by physicians for evaluation and treatment: the lumbar spine, the left innominate, and two posterior Chapman's points. These findings aid in closing the gap from previously published data regarding the presence of somatic dysfunction in women during menstruation.

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Introduction

Menstruation is the normal physiological cyclic discharge of blood and mucosal tissue from the inner lining of the uterus through the vagina. The process of menstruation may result in cramping and discomfort; however, some women experience more intense pain during menstruation, termed dysmenorrhea. Dysmenorrhea occurs in approximately 75% of women and is often accompanied by other symptoms, including sweating, tachycardia, headaches, nausea, vomiting, and diarrhea.[1] Women without dysmenorrhea may still experience symptoms during menses including but not limited to hunger, excessive tiredness, vaginal clot excretion, and gastrointestinal (GI) issues such as bloating and nausea.[2]

The principles of osteopathic medicine focus on a holistic approach to patients and the belief that the body has the innate ability to aid in healing itself. It is important that osteopathic physicians evaluate the patient's musculoskeletal system, including assessing for somatic dysfunctions, Chapman's reflex points, and viscerosomatic reflexes. Somatic dysfunctions are diagnosed using palpation and motion testing to evaluate particular structures. Chapman's reflex points are fascial reflections of stressed viscera that manifest as palpable, often tender, nodular masses.[3] Visceral pathologies can also produce

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tissue texture changes, like warmth, spasm, and tenderness at corresponding vertebral levels, known as viscerosomatic reflexes.[4] These musculoskeletal findings can aid in the diagnosis and treatment of many conditions, including symptoms during menstruation.

Our hypothesis is that findings from the osteopathic structural exam (OSE) in women are associated with menstruation, such that when a female is menstruating, she will exhibit identifiable patterns of OSE findings that differ from when she is not menstruating. The purpose of this study is to perform a full-body OSE to evaluate somatic dysfunctions and Chapman's reflex points in women who are menstruating, compared to when they are not menstruating, to assess for potential differences in patterns of dysfunction. Knowledge gained from this study may aide in enhanced assessment, identification, and earlier treatment of somatic dysfunction in women during menstruation.

Methods

Design

This study used a nonexperimental design that included a noninterventional, single group, interrupted time series with participants serving as their own control group. A convenience sample of 390 women, including students, staff, and faculty at a single medical school, were invited to participate in the study.

Participants

Recruitment occurred on the campus of Kansas City University (KCU) in January 2015, using flyers and emails sent to KCU email addresses. Recruitment included female faculty, staff, and students between the ages of 16-50 years. The initial recruitment email was sent to approximately 390 female KCU students, faculty, and staff. Interested participants responded via email and were then sent a short questionnaire to determine their eligibility. The following exclusion criteria were used: individuals of the male sex; individuals who were not currently employed by or enrolled in KCU; women who had undergone hysterectomy; and women who were menopausal, pregnant, or breastfeeding.

Eligible participants were then asked to complete an online pre-study survey and sign a document of informed consent after study details were provided. This 29-item pre-study survey included questions assessing menstruation history, level of personal menstrual pain customarily experienced during menstruation, gynecological and obstetrical histories, birth control use, surgical history, tobacco and alcohol use, exercise habits, and perceived stress level. Answers were gathered using multiple choice and free-text styled questions, including a 10-point universal scale for pain evaluation with the following rating anchors: (0=no pain, 5=moderate pain, 10=worst pain possible). This study was approved by KCU's Institutional Review Board (#644885-2).

Evaluations

Participants were evaluated at 4 time frames over 2 menstrual cycles. Study visits 1 and 3 occurred on days 1-3 of menstruation of 2 consecutive menstrual cycles, and visits 2 and 4 occurred 4-6 days after completion of menstruation of the same 2 menstrual cycles. Participants were instructed to contact study investigators on the first day of their menstruation and then again after the completion of menstruation over 2 consecutive menstrual cycles to ensure that evaluations were completed during the desired time intervals.

The participant was evaluated during each study visit by the osteopathic manipulative medicine (OMM) fellow investigator, a fourth-year osteopathic medical student who has received a year-long OMM-focused specialty training fellowship. At each visit, participants also underwent a separate examination by 1 of 2 osteopathic clinical faculty physicians participating as co-investigators. The dual clinical evaluations of each patient during each study visit enabled for validity assessment of OMM fellow evaluations. No discussions of patient visit evaluations occurred between the fellow and physicians.

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The osteopathic structural examination included evaluation of the sacrum; the cervical, thoracic, and lumbar spine regions; ribs; innominates; gynecologically-associated Chapman's reflex points; and tissue texture changes surrounding mesenteric ganglia and abdominal lymph nodes. Vital signs, deep tendon reflexes, and upper and lower extremity muscle strength were also collected during each visit. The osteopathic structural exams assessed for the presence or absence of specific dysfunctions. Results were recorded on the pre-designed physical exam document. Data gathered from both the OMM fellow and the overseeing physician were assessed and compared for interrater reliability.

Statistical Analysis

Descriptive statistics including mean and standard deviation were generated for participants' ages, cycle lengths, birth control methods, use of sanitary napkins and tampons, menstruation symptoms, gynecological diagnoses, and medications used to alleviate menstrual symptoms. Specific somatic dysfunctions were characterized using percentages and frequencies. Data analysis was performed using IBM SPSS Statistics (IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.).

Participants' findings were grouped by body region for data analysis, and specific dysfunctions were given a numerical code for data evaluation. Further dichotomous categorization was performed by placing physical assessment data into presence or absence of dysfunction.

The McNemar test was used to compare consistency response through the frequency of dysfunction by body region determined by the OMM fellow between women during menstruation vs non-menstruation. The body regions found to have a significant difference ($P \leq 0.05$) in dysfunction between menstruation vs non-menstruation were further examined for interrater reliability between the OMM fellow and the osteopathic physician using the McNemar and Sign tests. The McNemar test is a statistical method used to evaluate marginal homogeneity of paired nominal data, and the Sign test assesses for persistent differences between pairs of observations.

Results

Of the 390 invited, 32 participants (8%) responded, met criteria, and were enrolled in the study. Of the 32 enrolled, 23 participants (72%) completed the history, survey, and study evaluations. Of the 9 participants who failed to complete the study, 6 dropped out due to scheduling conflicts, 2 due to changes in a menstrual cycle resulting in continuous or sporadic menstruation, and 1 due to personal reasons.

Of the 23 participants who completed the study, participant ages ranged from 23 to 43 years with a mean age of 27.17 years (SD +/- 5.84 years). Twelve women (52.2%) reported using birth control pills, 1 woman (4.3%) had a birth control implant, and 10 women (43.5%) used no form of birth control. Twenty-two (96%) participants reported having menstrual cycles lasting 2-7 days on average, with 1 participant (4%) reporting cycles lasting greater than 7 days on average. Participants reported that the time span between the first day of each of their cycles ranged from 21-35 days.

Twenty women (87%) reported using some type of medication prior to or during menstruation to relieve symptoms. The most common medication used by participants to alleviate symptoms

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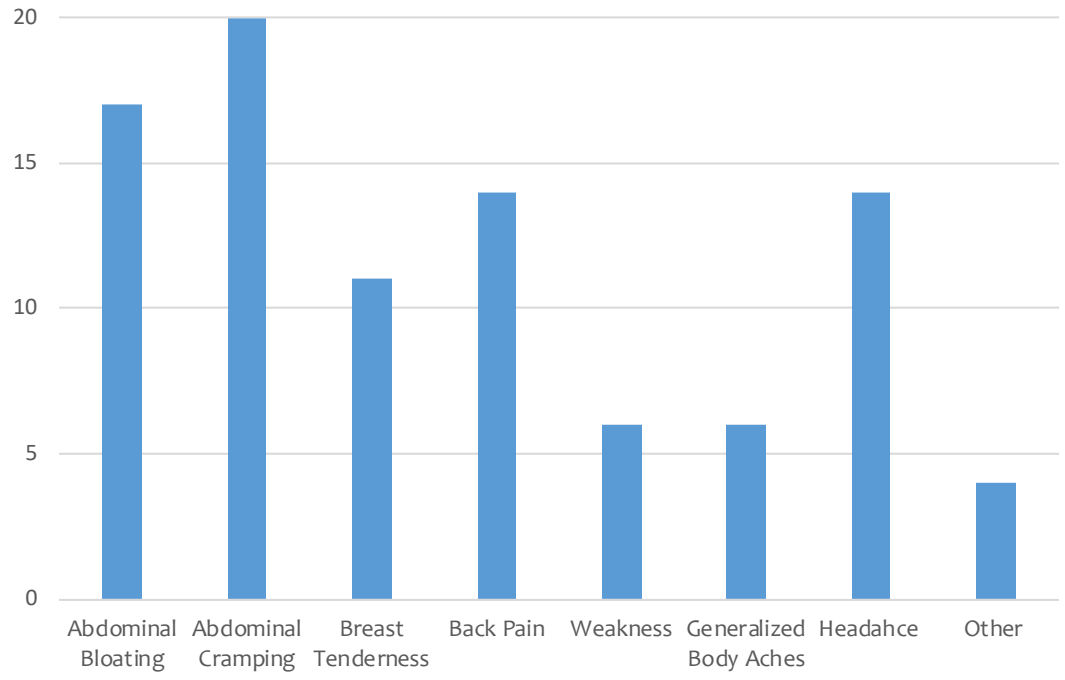
Chart 1. *Common symptoms reported by study participants prior to or during menstruation*



**Other: Hunger, excessive tiredness, nausea, vomiting, migraines, clotting, and overactive gastrointestinal system*

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during menstruation was ibuprofen (14/20; 60.9%). Using a 10-point universal scale to indicate the level of pain experienced during menstruation, participants reported a mean pain level of 4.43 (SD +/- 2.35) and a mode of 2. *Chart 1* displays common symptoms participants reported experiencing prior to or during menstruation.

Eight participants (34%) indicated a gynecological diagnosis, with 3 of these women having more than 1 diagnosis. Specifically, 4 of these 8 women (50%) reported having a diagnosis of dysmenorrhea; 3 (38%) had endometriosis; 1 (13%) indicated having fibroids, and 3 (38%) reported being diagnosed with other gynecological conditions, ie, ovarian cysts, menorrhagia, and cervical dysplasia.

Of the 13 body regions evaluated for dysfunction during the study visits, 3 regions were found to have a statistically significant difference in presence of dysfunction during menstruation compared to non-menstruation, including the lumbar spine, posterior Chapman's reflex points, and the left innominate. During each evaluation of L1-L5, the 6 dysfunctions assessed for were NRrSl (neutral, rotated right, sidebent left), NRlSr (neutral, rotated left, sidebent right), FRrSr (flexed, rotated right, sidebent right), FRlSr (flexed, rotated left, sidebent right), ERrSr (extended, rotated right, sidebent right), and ERlSl (extended, rotated left, sidebent left).

A significantly higher frequency of dysfunction was noted in the lumbar spine during menstruation compared to non-menstruation between visits 1 and 2. All 23 participants (100%) had a lumbar somatic dysfunction during visit 1, with only 14 participants (60.9%) having a lumbar dysfunction during visit 2 (P=0.004). Twenty participants (86.9%) had a lumbar dysfunction during visit 3; this percentage remained unchanged during visit 4. The most common lumbar dysfunction identified during menstruation at both visits 1 and 3 was NRlSr (57.0%).

Of the 115 segmental evaluations of the lumbar spine during each visit (5 segments for each of the 23 subjects), 82 segments (71.3%) were found to be NRlSr during visit 1, and 49 segments (42.6%) were NRlSr during visit 3. Additionally, a higher frequency of dysfunction was found in L1-L3 (90% at visit 1 and 77% at visit 3) compared to L4-L5 (78% at visit 1 and 56.5% at visit 3). *Table 1* reports the frequencies of all dysfunctions found in the lumbar spine during menstruation vs non-menstruation.

Of the 5 posterior Chapman's reflex points evaluated, 17 participants (73.9%) were found to have at least 1 of the Chapman's points with dysfunction at visit 1 compared to only 10 participants (43.5%) during visit 2. Similar to the lumbar findings, there were significantly higher frequency of dysfunctions in posterior Chapman's points during visit 1 than visit 2 (P=0.039). Although not significant, 14 participants (60.9%) were also found to have dysfunctional posterior Chapman's points at visit 3 (menstruation) compared to 12 (52.2%) during visit 4 (non-menstruation) (P=0.687).

The most common posterior Chapman's points found to reflect dysfunction during menstruation at both visits 1 and 3 were the fallopian tube (19/46; 52.2%) and vagina/uterus reflex points (20/46; 34.8%). During visits 2 and 4, the frequency of dysfunctional posterior Chapman's points decreased substantially with patients exhibiting dysfunction in the fallopian tube and vagina/uterus reflex points only 21.7% (10/46) of the time. The frequencies of all dysfunctional posterior Chapman's reflex points found when menstruating vs non-menstruating are recorded in *Table 2*.

A significantly higher frequency of dysfunctions were noted in the left-sided innominate during visit 1 compared to visit 2 (P<0.001). During visit 1, 3 participants (13%) were found to have a left-sided dysfunction compared to only 1 participant (4%) having a left-sided innominate dysfunction during visit 2. Of the 3 left-sided innominate dysfunctions noted during visit 1, 2 (66.7%) were found to be posterior rotations and 1 (33.3%) an anteriorly rotated

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Table 1. *Frequency and type of somatic dysfunctions in the lumbar spine (L1-L5) identified by OMM fellow during menstruation (visits 1 and 3) and during non-menstruation (visits 2 and 4).*

	L1		L2		L3		L4		L5		% Total	
	M	Non	M	Non	M	Non	M	Non	M	Non	M	Non
No dysfunction	6	13	8	13	9	15	15	20	15	20	23%	35.2%
NRrSl	6	5	6	5	6	4	6	4	6	4	13%	9.6%
NRlSr	29	26	28	26	28	25	23	21	23	21	57%	51.7%
FRrSr	0	0	0	0	1	0	0	0	0	0	0.4%	0%
FRlSr	3	2	2	2	0	2	1	1	1	1	3.0%	3.5%
ERrSr	0	0	0	0	0	0	0	0	0	0	0%	0%
ERlSl	2	0	2	0	2	0	1	0	1	0	3.5%	0%

Key: M=Menstruating (visits 1 and 3); Non=Non-Menstruating (visits 2 and 4); NRrSl=neutral rotated right side bent left; NRlSr=neutral rotated left side bent right; FRrSr=flexed rotated right side bent right; FRlSl=flexed rotated left side bent left; ERrSr=extended rotated right side bent right; ERlSl=extended rotated left side bent left.

Table 2. *Frequency of dysfunctions in specific posterior Chapman's reflex points identified by OMM fellow during menstruation (visits 1 and 3) and non-menstruation (visits 2 and 4).*

			% Total	
	M	Non	M	Non
Bladder	4	3	1.7%	1.3%
Uterus	7	6	3%	2.6%
Vagina/Uterus	20	10	8.7%	4.3%
Fallopian Tubes	19	10	8.3%	4.3%
Vagina/Clitoris	10	5	4.3%	2.2%

Key: M=menstruating (visits 1 and 3); Non=non-menstruating (visits 2 and 4).

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dysfunction. The total dysfunctions of the left innominate from menstruating visits 1 and 3 (4/46; 8.7%) were higher than those noted on non-menstruating visits 2 and 4 (3/46; 6.5%). The right-sided innominate shared a similar trend with 27 (58.7%) dysfunctions found during menstruation (visits 1 and 3) compared to 24 (52.2%) dysfunctions found during non-menstruation (visits 2 and 4). Of the 27 right-sided innominate dysfunctions noted during menstruation, the majority were found to be anterior rotations (25/27; 92.6%).

Interrater reliability analysis found no significant difference in the frequencies of lumbar spine somatic dysfunctions noted between the OMM fellow and the osteopathic physician during visit 1 (P=0.50) or visit 2 (P=0.79). Similarly, no significant difference was found between the OMM fellow and osteopathic physician in the frequencies of dysfunction determined in posterior Chapman's reflex points for visits 1 and 2 (P=0.12, P=1.0, respectively). The OMM fellow and the osteopathic physician found greater dysfunction in posterior Chapman's points during visit 1 (17 and 13, respectively) compared to visit 2 (10 and 11, respectively).

Lastly, the presence/absence of dysfunction of the left innominate found during visits 1 and 2 by the OMM fellow showed no significant difference when compared to the findings during visits 1 and 2 by the physician (P=1.0 and P=0.12, respectively). Both groups of investigators found greater dysfunctions during menstruation vs non-menstruation.

Discussion

Few studies have been published evaluating common osteopathic structural examination findings in women during menstruation. Most publications have only evaluated select regions of the body. For example, Walsh and Polus[5] evaluated spinal dysfunction indexes and found higher dysfunctions in the premenstrual syndrome (PMS) study group in the cervical and thoracic regions and in the symptoms of lower back tenderness and muscle weakness. This publication supports the current findings of significant somatic dysfunction in the lumbar spine during menstruation.

Coyne[6] evaluated the relationship between muscle tension and PMS. Although this was not a focus of the current study, Coyne found the frontalis muscle to have greater tension during the premenstrual phase. Genders et al[7] assessed for pelvic dysfunction in women diagnosed with dysmenorrhea and found increased sacroiliac joint motion dysfunction in the dysmenorrhea study population. Their findings support the presence of significant somatic dysfunction of the innominate during menstruation found in this study. Four particular studies evaluated postural stability throughout the menstrual cycle.[8-11] Each of these studies found significant changes in posture throughout a woman's menstrual cycle. These results may relate to the findings here since postural changes can result in somatic dysfunction.

The purpose of the current study was to work towards filling the gap in the literature by evaluating common OSE findings in menstruating women throughout the entire body. Of the full-body OSEs completed, only 3 body regions in the study participants were found to have statistically significant differences during menstruation vs non-menstruation: the lumbar spine, posterior Chapman's reflex points, and the left innominate. A better understanding of these patterns of dysfunction during menstruation can open up avenues into investigation of specific somatic dysfunctions associated with specific gynecological pathologies like primary dysmenorrhea.

There have been several studies published showing that OMM can be effective in alleviating symptoms of primary dysmenorrhea, including low back pain and pelvic pain. For example, Zecchillo and colleagues[12] performed a randomized, single-blinded, control trial using OMM on women ages 18-40 years with regular menstrual cycles and the clinical diagnosis of primary dysmenorrhea. They found that the women in the OMM group had decreased menstrual pain and improved quality of life compared to those in the control group.[12] Molins-Cubero et al[13] performed a pilot, double-blinded, randomized, controlled study in Spain to assess the effect of OMM on women with regular menstrual cycles and clinically diagnosed primary dysmenorrhea. Their results displayed a significant reduction in the pressure pain threshold for both sacroiliac joints adjacent to the posterior superior iliac spines in the women who received manipulation.[13] Additionally, Schwerla and colleagues[14] in Germany also performed a study on women with clinically diagnosed primary dysmenorrhea and found a significant

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reduction of pain intensity, reported days of general pain, and reported duration of intense pain after manipulative intervention.

The current study found that when evaluating the lumbar region, the spinal levels of L1-L3 were the most common site for dysfunction in menstruating women. The most common dysfunction of the lumbar spine found during visits 1 and 3 (during menstruation) was L1-L3 NRlSr. Similarly, the viscerosomatic reflex levels to the uterus and the fallopian tubes are located at T9-L2 and T10-L2, respectively.[3] The location of the most common lumbar dysfunctions found in the menstruating women within this study can potentially be attributed to the shared location of the gynecologic viscerosomatic reflex levels as stated above. Additionally, the distal proximity of the psoas muscle to the gynecologic organs can also play a role in creating this common upper lumbar dysfunction. Inflammation of the gynecologic organs during menstruation may cause subsequent viscerosomatic dysfunction of the psoas, which could manifest as dysfunction at its origin on the lumbar spine, including levels L1-L3.[15,16]

The significant dysfunctions in posterior Chapman's points that were found during menstruation in this study included the fallopian tubes and vagina/uterus posterior points. The vagina/uterus posterior Chapman's point is located on the superior articular processes of the sacrum bilaterally. The fallopian tube posterior Chapman's points are located at the superior portion of the sacroiliac joint bilaterally and at the junction of the femoral head and ischium bilaterally.[3] As Chapman's reflex points are palpable tissue texture changes representing internal pathology of an organ system, the finding of these significant points in the study population alludes to an inflammatory process occurring in the fallopian tubes and/or vagina/uterus during menstruation.

In this study, dysfunction of the left innominate during menstruation was found to be statistically significant, with anterior and posterior rotations being the most common dysfunctions. Although not significant, the most abundant dysfunction found in the right innominate during menstruation was also an anterior rotation. Women may be more susceptible to developing dysfunction of the innominates approximately 1 week prior to the onset of menstruation due to pelvic ligamentous laxity secondary to the release of the hormone relaxin.[17] If these dysfunctions are not corrected, they may be pervasive, extending into the woman's menstrual cycle, at which time the hormone relaxin is no longer bioavailable.

While menstruation alone is not an indication for OMM, knowledge of these common somatic dysfunctions found during menstruation may assist osteopathic clinicians in creating a more targeted approach when evaluating and treating women with generalized somatic dysfunctions and symptoms related to menstruation and potentially primary dysmenorrhea.

Limitations of the Study

It should be noted that this study has several suggested limitations. Potential bias could stem from an unblinded participant population. Specifically, the Chapman's reflex points were considered present when the patient reported tenderness at the area being palpated. There is the possibility of a Hawthorne effect with study participants reporting more tenderness during their menstruating evaluations vs during the non-menstruating evaluations due to simply being evaluated in a study environment.

Additionally, the medical students enrolled in our study, as part of their ongoing osteopathic medical education, were required to participate in biweekly OMM training sessions where they were evaluated and treated by peers. Involvement in these sessions could have resulted in OSE changes from one evaluation to the next.

Other limitations of this study include only examining diagnostic findings but not treating any of the somatic dysfunctions noted or present. As the dysfunctions were not treated, we are unable to determine the clinical impact of treatments. It also was not documented if participants were symptomatic at the time of evaluation during visits 1 and 3 (during menstruation). The presence or lack of symptoms during evaluation could have impacted the presence of somatic dysfunctions.

Another limitation was the small sample size and narrow patient population. The 23 active participants represented a small, select population of women, with only 8 of the participants reporting a diagnosis of a gynecological disorder.

Lastly, as participants had varying gynecological pathologies, birth control usage, and social histories, it is difficult to assume that all study members could be placed in the same cohort. These important differences in the study population could be potential confounding variables to the results. Due to the small sample size, however, these confounding variables could not be further evaluated.

Conclusion

This study begins to address the gap in the literature regarding common osteopathic structural examination findings in women during menstruation. The study defines 3 common areas of dysfunction in menstruating women that physicians could target for evaluation and potential treatment.

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Future studies could further examine the presence of somatic dysfunctions in the lumbar spine, innominates, and posterior Chapman's reflex points when the patient is menstruating and symptomatic. Symptomatic patients could then be treated using OMM, and changes in symptomatology post-treatment could be evaluated to provide additional evidence for osteopathic treatments in addressing menstrual manifestations.

Common dysfunctions found within specific gynecologic disease states could also be investigated to help the practitioner create a more targeted assessment and treatment plan for affected patients. Additionally, future studies could evaluate differences of somatic dysfunctions found within a symptomatic, menstruating group of women compared to an asymptomatic, menstruating group. Lastly, a larger patient population should be evaluated in order to obtain a more accurate depiction of common somatic dysfunction found during menstruation.

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