

Association between Vitamin D Deficiency and Primary Dysmenorrhea

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ABSTRACT

Background: Primary dysmenorrhea is very common in younger women and often greatly impairs normal functioning. Vitamin D may affect menstrual pains' inflammatory and muscle activity components. In young women, understand the relationship between the vitamin D level in serum and the existence and degree of primary dysmenorrhea.

Methods: This cross-sectional study was conducted at the Khyber Teaching Hospital, Peshawar, from January to December 2022. Eighty-three females aged between 18 to 25 years were enrolled for the study. Information related to menstrual history, pain intensity, lifestyle, and sun exposure was gathered through a documented interview. '25-hydroxyvitamin D levels' in the serum were determined using a chemiluminescence immunoassay. A numerical rating scale evaluates pain intensity. SPSS version 25 was employed for statistical analysis, with a p-value < 0.05 taken as significant.

Results: Among the participants, 73.5% reported experiencing primary dysmenorrhea. 'A significant association was found between vitamin D deficiency and the presence of menstrual pain (p=0.001)'. Additionally, mean vitamin D levels decreased progressively with increasing severity of dysmenorrhea, showing a statistically significant difference across mild, moderate, and severe pain groups (p<0.001).

Conclusion: According to the findings, primary dysmenorrhea's occurrence and severity are significantly linked to low vitamin D levels. In young women, managing and screening for vitamin D deficiency could be an easily applicable means of effectively diminishing menstrual pain.

Keywords: Primary dysmenorrhea, Vitamin D deficiency, Menstrual pain, Young women, Serum 25(OH)D, Menstrual health

INTRODUCTION

Primary dysmenorrhea is a frequent gynecological issue affecting young women, typically emerging within a few years following the onset of menstruation. It is characterized by lower abdominal cramps that occur before or during menstrual periods, in the absence of any underlying pelvic disease. Although it is commonly overlooked as part of the menstrual cycle, dysmenorrhea pains can have quite an influence on daily activities, school work, and overall life satisfaction¹⁻³.

Multiple causes have been investigated regarding the etiology and severity of dysmenorrhea, including hormonal factors, contractions of the uterus, prostaglandin levels, and hereditary factors. 'More recently, there has been a focus on the potential role of vitamin D in modulating menstrual symptoms'. Vitamin D is critical for skeletal development; however, it modulates immune responses, inflammation, and muscles, which might affect menstrual pain and its intensity⁴⁻⁶.

Women, especially those residing in areas with colder climates or conservative clothing customs, face a high risk of vitamin D deficiency. This has led researchers to assess if possible links exist between low vitamin D levels and dysmenorrhea. There have been 'claims that women with lower vitamin D levels tend to suffer more from menstrual cramps; on the other hand, claims support the use of supplementation for managing symptoms'⁷⁻⁹.

Given the 'high prevalence of both vitamin D deficiency and primary dysmenorrhea in young females, this study was designed to explore the association between these two conditions'. Understanding this link may help in identifying a modifiable factor that could offer a simple and non-pharmacological approach to managing menstrual pain.

METHODOLOGY

The current investigation was conducted in the Obstetrics and Gynaecology Unit of Khyber Teaching Hospital, Peshawar, from January to December 2022. It aimed to determine the linkage between serum levels of vitamin D and primary dysmenorrhea in

young women of 18 to 25 years of age. This age range was captured with non-probability consecutive sampling, bringing the total number of participants to 83. Only females exhibiting regular menstrual cycles were enrolled in the study, meaning no chronic pelvic or systemic conditions should be present. The study excluded participants with previously diagnosed gynaecological pathologies such as endometriosis or fibroids, chronic illness, recent hormonal medication or vitamin D usage, and those who were pregnant or in the postpartum period.

Data collection was carried out through structured interviews after obtaining ethical approval and written informed consent. Information on age, body mass index (BMI), residence, dietary patterns, sun exposure, physical activity, menarche age, and family history of dysmenorrhea was gathered. Menstrual cycle details such as the presence and severity of dysmenorrhea, regularity, flow duration, and associated symptoms were also recorded. Pain severity was assessed using a Numerical Rating Scale and categorised as mild, moderate, or severe.

To determine vitamin D status, 5 ml of venous blood was drawn from each participant during the follicular phase of their menstrual cycle. The serum was analyzed using a chemiluminescence immunoassay to measure '25-hydroxyvitamin D [25(OH)D] levels'. Based on standard cutoffs, levels were 'classified as deficient (<20 ng/mL), insufficient (20–29 ng/mL), or sufficient (≥30 ng/mL)'.

Data analysis was performed using SPSS version 25. 'Descriptive statistics summarized demographic and clinical characteristics'. The chi-square test 'assessed associations between vitamin D status and the presence of dysmenorrhea, while one-way ANOVA compared mean vitamin D levels across different pain severity groups'. A p-value less than 0.05 was considered statistically significant.

RESULT

The demographic analysis of 83 participants revealed that the average age was around 21 years, and the mean BMI fell within a healthy range. Most participants were undergraduate students, highlighting a younger educational cohort. More than half belonged to urban areas, and a significant proportion nearly two-thirds had

Received on 28-05-2023

Accepted on 05-11-2023

sunlight exposure of less than 15 minutes per day, suggesting limited natural vitamin D synthesis. Notably, 47% of participants reported a family history of dysmenorrhea, indicating a possible hereditary influence in the development of menstrual pain.

Table 1: Demographic Characteristics of Participants (n = 83)

Variable	n (%)
Educational Status	
– Undergraduate	62 (74.7%)
– Graduate	21 (25.3%)
Residence	
– Urban	48 (57.8%)
– Rural	35 (42.2%)
Sunlight Exposure (<15 min/day)	54 (65.1%)
Family History of Dysmenorrhea	39 (47.0%)
St deviation variables	
Age (years)	20.8 ± 1.9
BMI (kg/m ²)	21.6 ± 2.7

In terms of clinical findings, primary dysmenorrhea was present in more than 70% of the participants. Among these, the majority described their pain as either moderate or severe, underscoring the burden of discomfort in this group. The average age at menarche was 12.5 years, which aligns with expected norms. Most participants had regular menstrual cycles, and their average bleeding duration was nearly five days. More than half reported using pain relief medications, and common associated symptoms included fatigue, headaches, and nausea, further demonstrating the disruptive impact of dysmenorrhea on overall well-being.

Table 2: Clinical Characteristics and Severity of Dysmenorrhea

Variable	Mean ± SD / n (%)
Presence of Dysmenorrhea	61 (73.5%)
Severity (among those affected)	
– Mild	14 (23.0%)
– Moderate	26 (42.6%)
– Severe	21 (34.4%)
Age at Menarche (years)	12.5 ± 1.3
Cycle Regularity (Regular)	66 (79.5%)
Duration of Menstrual Bleeding (days)	4.7 ± 1.1
Use of Pain Medication	38 (62.3%)
Associated Symptoms	
– Nausea	20 (32.8%)
– Headache	26 (42.6%)
– Fatigue	33 (54.1%)

Vitamin D analysis revealed a strikingly high rate of deficiency in this young female population. Over half of the participants had levels below 20 ng/mL, which is classified as deficient. Another quarter had insufficient levels, leaving only a small fraction with adequate vitamin D. The average serum concentration was 18.4 ng/mL, reinforcing the notion that hypovitaminosis D is prevalent in this group and might be an underlying factor contributing to their menstrual discomfort.

Table 3: Distribution of 'Serum Vitamin D Levels'

Vitamin D Status	n (%)
'Deficient (<20 ng/mL)'	49 (59.0%)
'Insufficient (20–29 ng/mL)'	23 (27.7%)
'Sufficient (≥30 ng/mL)'	11 (13.3%)
'Mean Vitamin D (ng/mL)'	18.4 ± 6.5

Table 4: Association between Vitamin D Status and Dysmenorrhea

Vitamin D Status	With Dysmenorrhea n (%)	Without Dysmenorrhea n (%)	p-value
Deficient	40 (81.6%)	9 (39.1%)	0.001*
Insufficient	15 (30.6%)	8 (34.8%)	
Sufficient	6 (12.2%)	5 (21.7%)	

*Chi-square test applied Significant at p < 0.05'.

When comparing vitamin D status with the presence of dysmenorrhea, a strong and statistically significant relationship

emerged. Among those with menstrual pain, over 80% had vitamin D deficiency, while less than 40% of those without pain were deficient. This difference was confirmed by 'a p-value of 0.001' indicating a significant association. These results suggest that 'lower vitamin D levels may play a role in the pathophysiology or severity of dysmenorrhea'.

The relationship between vitamin D levels and pain intensity was also clear. Those experiencing mild dysmenorrhea had the highest vitamin D levels, while individuals reporting severe pain had significantly lower levels. This trend was statistically significant, with a p-value below 0.001, indicating that lower vitamin D levels may not only be linked with the presence of dysmenorrhea but also with how intense the pain is.

Table 5: Mean Vitamin D Levels by Severity of Dysmenorrhea

Severity of Dysmenorrhea	Mean Vitamin D (ng/mL) ± SD	p-value
Mild	24.2 ± 5.1	<0.001*
Moderate	18.1 ± 4.6	
Severe	14.7 ± 3.9	

*ANOVA used. 'p- value < 0.05 considered significant'.

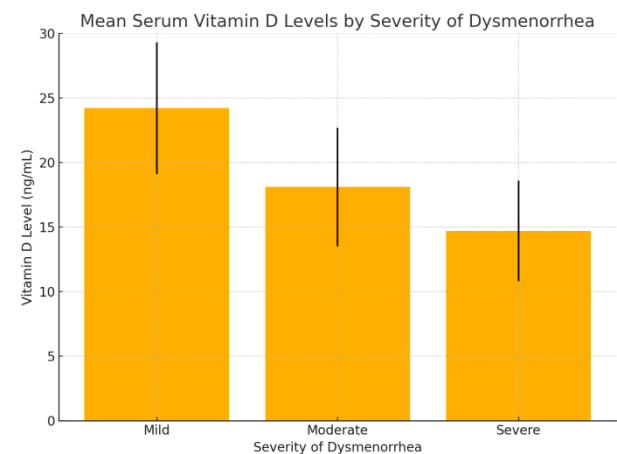


Figure 1: Mean Serum Vitamin D Levels by Severity Dysmenorrhea

The graph clearly 'illustrates an inverse relationship between serum vitamin D levels and the severity of primary dysmenorrhea'. Participants with mild symptoms had the highest average vitamin D levels, whereas those suffering from severe pain had significantly lower concentrations. This downward trend suggests that as vitamin D levels decline, the intensity of menstrual pain tends to increase. The differences between groups, supported by standard deviation error bars, highlight the consistency of this pattern. These findings strengthen the evidence 'that vitamin D deficiency may contribute not just to the presence but also the severity of dysmenorrhea among young women'.

DISCUSSION

The present study aimed to examine the relationship between vitamin D levels and primary dysmenorrhea among young females. Our findings revealed a significant association between low serum vitamin D levels and the presence and severity of menstrual pain. A majority of participants who experienced dysmenorrhea had 'deficient or insufficient levels of vitamin D, and those with the most severe pain reported the lowest serum concentrations' ¹⁰⁻¹².

These results are consistent with several previously published studies. Studies demonstrated that young women with primary dysmenorrhea had significantly lower vitamin D levels compared to those without menstrual pain, suggesting a potential role of vitamin D in modulating uterine muscle contractions¹³⁻¹⁵. Similarly, research found that vitamin D supplementation reduced both the frequency and intensity of menstrual cramps, indicating that adequate levels may have a protective or therapeutic effect¹⁶⁻¹⁸.

Vitamin D plays a known role in calcium homeostasis and muscle function. Its deficiency may lead to increased prostaglandin production in the endometrium, which is one of the primary mechanisms believed to cause uterine contractions and pain in dysmenorrhea. Our findings support this theory, as women with sufficient vitamin D levels reported significantly milder symptoms¹⁹⁻²¹.

Another study also observed an inverse correlation between serum vitamin D and pain scores in dysmenorrheic patients^{22, 23}. The authors suggested that vitamin D deficiency may exacerbate inflammatory processes during menstruation, leading to increased discomfort. Our study aligns with this notion and further emphasizes 'the need for routine screening and possible correction of vitamin D status in symptomatic women'.

While our results are promising, it is important to consider some limitations. The cross-sectional nature of the study restricts our ability to establish causality. Additionally, lifestyle factors such as dietary intake, physical activity, and stress, which might also influence menstrual symptoms, were not extensively evaluated. Nevertheless, the consistent pattern observed between vitamin D levels and dysmenorrhea severity across participants strengthens the credibility of our findings.

CONCLUSION

This study found a clear and statistically significant association between vitamin D deficiency and primary dysmenorrhea in young women. Participants with lower vitamin D levels experienced more frequent and severe menstrual pain. These findings underscore the need to assess vitamin D levels as part of the evaluation and treatment approach for dysmenorrhea. Routine assessment and correction of vitamin D deficiency could serve as a simple, non-invasive strategy to alleviate symptoms and improve quality of life in affected individuals. Further interventional studies are recommended to explore the potential therapeutic role of vitamin D supplementation in managing primary dysmenorrhea.

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This article may be cited as: Pathan NF, Khuhro BN, Nasir S, Khakwani F, Khurshid S, Razaq M: Association between Vitamin D Deficiency and Primary Dysmenorrhea. *Pak J Med Health Sci*, 2023; 17(12): 268-270.