# THE ASSOCIATION BETWEEN THE PREMENSTRUAL SYNDROME WITH VITAMIN D AND CALCIUM STATUS AMONG UNIVERSITY STUDENTS

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Submitted: 4/5/2019; Accepted: 29/7/2019; Published: 21/9/2019

## ABSTRACT

### *Background*

Premenstrual syndrome causes both psychological and physiological adverse effects on women in reproductive age. Calcium and vitamin D may have an effect on the development of premenstrual syndrome through their relation to endogenous estrogen.

### *Objectives*

The current study aimed to assess student's calcium serum level and vitamin D level and determine their relation with premenstrual syndrome among Sulaimani University students.

### *Material and Method*

This observational study included 42 female students (21 participants diagnosed with Premenstrual syndrome and 21 participants as their controls) within the age ranges from 21-29 years who were students in Sulaimani University from March 2018 to March 2019. Serum level of Calcium and vitamin D were measured for each of them. Data collected by questionnaire form and data analysed by SPSS and for the relationship between variables Chi-square and T-test used.

### *Results*

Students in both of control and premenstrual syndrome cases had a deficient level of vitamin D, with the level of 15.51±8.64 ng/ml and 13.09±6.02 ng/ml subsequently with non-significant relation. The level of serum calcium was below normal range in the premenstrual syndrome group (8.21±3.3 mg/dl) compare with the control group (9.01±0.47 mg/dl) was in normal range with significant relationship between case and control group (P-value 0.03).

### *Conclusion*

The mean level of vitamin D was below the normal range in both case and control groups but they were lower in premenstrual Syndrome cases compare with control cases among students in Sulaimani University and the mean level of serum calcium was low in case group with significant relation between case and control groups.

**Keywords:** *Premenstrual Syndrome, Vitamin D, Serum Calcium .*

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https://doi.org/10.17656/jsmc.10211

## INTRODUCTION

Premenstrual syndrome (PMS) is one of the most adverse problems in reproductive age women. Although many hypotheses have been proposed for its pathophysiology, none are still fully confirmed, the cause of Gamma Amino Butyric Acid (GABA) and progesterone in the creation of symptom have been determined [1].

Premenstrual syndrome encompasses a wide array of psychological symptoms such as anxiety, depression, irritability, loss of confidence, insomnia, drowsiness, head ache, nervousness and mood swings. Also there are physical symptoms typically bloatedness and mastalgia. The diagnosis criteria of the American psychiatry Association for diagnosis PMS are as follow: At least five of the symptoms and signs mentioned above are present in dairy symptom record form during luteal phase of the cycle and are relieved with the onset of menstruation or soon after for at least two cycles, the sign and symptoms of PMS do not came from the psychiatry disorders but interfere with the everyday life and relationship of individual [2]. Forty percent of women (40%) experience symptoms of PMS and 5-8 % of them suffer from severe PMS [3].

Premenstrual syndrome is not caused by one factor but its basis is multifactorial, with genetic, environmental and underlying psychological influences being important. There are no objective tests (physical, biochemical, endocrine or imaging) to assist the diagnosis of PMS and so the use of prospectively completed symptom charts is essential [4]. Symptoms diaries can sometime be confusing and inconclusive in this situation Gonadotropin releasing hormone agonist GnRH should be used for three months to establish a definitive diagnosis [5].

Calcium and vitamin D may have an effect on the development of PMS through their relationshio with endogenous estrogen, Vitamin D has been observed to fluctuate during the menstrual cycle. The women with PMS there serum Vitamin D level during luteal phase is lower than in women without the syndromes [6]. This relationship is justified through the effect of this vitamin in calcium metabolism [7].

The aim and objectives of the study is to assess student's serum calcium serum level and vitamin D level and determine their relation with premenstrual syndrome among Sulaimani university students. Also, to assess of signs and symptoms of oremenstrual syndrome among Sulaimani university students.

## MATERIAL AND METHODS

It is a Case-Control study. Sample size of the current study calculated by GPower version 3.1 statistical program and the estimation yielded to be 42 students in (>95%) study power with 0.05 error by using t-tests-Correlation: Point biserial model. For that study included 42 female students were divided on case group included 21 participants diagnosed with PMS by gynaecologist according to international journal of obstetrics and gynecology guidelines [5] after conduction of a preliminary screening and control group included 21 normal females within the age ranged from 21-29 years old, who were students in Sulaimani university/ medical school. Non-probability Convenience sampling method used to collect data from March 2018 to March 2019.

The current study included all students in Sulaimani University/Medical School and study the excluded students with past medical disease of anxiety disorder, uncontrolled hypothyroidism, irregular menstruation and those who were consuming calcium and vitamin D or herbal supplements.

A questionnaire form used for collecting data, included demographic questions and questions on menstrual symptoms used by the obstetrics and gynaecology textbooks and guidance as a diagnostic criteria to indicate PMS for example; insomnia, drowsiness, headache, feeling disappointing, nervousness, breast tenderness, sweating, abdominal pain, increased appetite, depression, anger and irritability. In addition, each of the mentioned symptoms classified to 3 degrees (mild, moderate, severe) according to international journal of obstetrics and gynecology guidelines [5]. The self-filling method used to fill the questionnaire form by participants in both groups and they were asked to fill the form in two consecutive periodic cycles, symptoms of those began in the luteal phase and ending at the end of menstruation as recommended by PMS diagnosis guideline.

Blood was drawn from each participant according to protocols, serum concentration of calcium has been assessed by KEnZA 240TX with cut off range 8.5 to 10 mg/dl as a normal level and vitamin D by LIAISON XL with considering cut off 50 to 100 ng/mg as a normal range.

Ethical approval obtained from Sulaimani maternal hospital scientific council and Sulaimani university

scientific committee, also medical school head departments. The participant's confientiality and anaminity was preserved and consent obtained with the clarification of the study. In addition, there was no hazard or risk such as intervention methods been used in this study except drawing a blood sample from students.

Collected data were recorded and analysed in SPSS Version 20. Frequency, percentage, mean and standard deviation produced for descriptive statistic and for the correlationship between different variables, using T-test and Chi-square tests used with considering P-value equal to or lower than 0.05 as a significant rate.

## RESULTS

This study included 42 female students their age range form 21-29 years old with the mean and standard deviation 25.45 ± 3.02 years old. Furthermore, mean age of female participation in PMS group 24.67 years old were higher in comparison with the control group while standard deviation was higher in the control group and there was non-significant relation between age in the case and control group (P-value 0.7). Table 1

Body mass index (BMI) mean and standard deviation was higher in PMS group (24.276 ± 3.544 kg/m$^2$) comparing with control group (23.645 ± 3.015 kg/m$^2$) and there was non-significant relation between BMI in the case and control groups (P-value 0.5). Table 1

Finally, the mean and standard deviation of the age of female menarche was higher in PMS group (12.81 ± 1.25 year) in comparison with control group (12.67 ± 0.5 year) and there was a non-significant relationship between age of menarche among case and control groups (P-value 0.1).

Table 2 shows the frequency and percentage characteristics of signs and symptoms that used for diagnosing a female with PMS, nervousness and breast tenderness were most repeated 22 positive rates for each and followed by depression 21, feeling disappointed 17, abdominal pain 17, increase sweating 14 and increase appetite 14 respectively.

To investigate the effect of serum calcium and vitamin D level between case and control groups, mean and standard deviation compared between case and control groups. The results show that, mean and standard deviation level of vitamin D was below the normal range in both groups but rate of vitamin D was higher in control group (15.5 ± 8.64 ng/ml) in comparison with PMS group (13.09 ± 6.02 ng/ml) with a non-significant relationship between vitamin D level among case and PMS groups (P-value 0.5). Furthermore, mean and standard deviation level of serum calcium was higher in the control group (9.01 ± 0.47 mg/dl) in comparison with PMS group (8.21 ± 0.33 mg/dl) with a significant relation between serum calcium with case and control groups (P-value 0.03). Table 3.

**Table 1. Compare of mean and standard deviation of the participant's characteristics between the case and control groups**

| Characteristics | Control | | PMS | | P-value |
|---|---|---|---|---|---|
| | Mean | S.D | Mean | S.D | |
| **Age (year)** | 24.67 | 3.071 | 26.24 | 2.862 | 0.7 |
| **Body mass index (BMI) (kg/m2)** | 23.645 | 3.015 | 24.276 | 3.544 | 0.5 |
| **Age of Menarche** | 12.67 | 1.22 | 12.81 | 1.25 | 0.1 |

**Table 2. Distribution of premenstrual syndrome signs and symptoms.**

| Signs and Symptoms | Positive rate | Negative rate |
|---|---|---|
| Depression | 21 (77.8%) | 6 (22.2%) |
| Feeling disappointed | 17 (63%) | 10 (37%) |
| Insomnia | 9 (33.3%) | 18 (66.7%) |
| Head ache | 13 (48.1%) | 14 (51.9%) |
| Nervousness | 22 (81.5%) | 5 (18.5%) |
| Breast tenderness | 22 (81.5%) | 5 (18.5%) |
| Sweating | 14 (51.9%) | 13 (48.1%) |
| Abdominal pain | 17 (63%) | 10 (37%) |
| Increase appetite | 14 (51.9%) | 13 (48.1%) |
| Drowsiness | 15 (55.6%) | 12 (44.4%) |

**Table 3. Comparison of mean and standards deviation of the serum calcium and serum vitamin D level between the case and control groups.**

| Variables | Control | PMS | P-value |
|---|---|---|---|
| Vitamin D (ng/ml) | 15.5 ± 8.64 | 13.09 ± 6.02 | 0.5 |
| Serum calcium (mg/dl) | 9.01 ± 0.47 | 8.21 ± 0.33 | 0.03 |

## DISCUSSION

Premenstrual Syndrome (PMS) is considered one of the common suffering among women of childbearing age. Presence of PMS has been related to many factors included vitamin D deficiency and low serum level of calcium [8]. In the current study, there was a non-statistically significant correlation between the level of vitamin D among PMS and control groups while the correlation between serum level of calcium was a significant with PMS and control groups (P-value=0.03). In addition, the mean of vitamin D level and serum calcium level were lower in the PMS group in comparison with the control group, this result in agreement with Kia's conclusion [8].

Low vitamin D and calcium it is common in Middle-East countries included Kurdistan region and the same result observed in the current study [9]. This low rate might be related to limited sun exposure due to different factors and low intake of calcium sources.

Vitamin D is considered one of the vitamins that blamed of being deficient in patients with PMS, the same observation regarding to the level of vitamin D can be found in other studies conducted previously for example; Rajaei's study at 2015 in University of Tehran stated that, in a group of women under study menarche age of women with PMS was significantly lower than normal women (P-value 0.04) [6].

The intake of diet of high Calcium contnet inversely effected PMS; compared women with a low intake (median, 529 mg/dl) and women with the highest intake (median, 1283 mg/dl) had a relative risk of 0.70 to PMS with significant relation (P-value 0.02 for trend) [10]. Furthermore, Calcium intake as a supplement, Akhlaghi [11] concluded that 1000 mg of calcium if prescribed daily in PMS women decrease 62% of psychological symptoms and 61% of physical symptoms and same result concluded by other studies [7, 12].

Body mass index, age and age of menarche participate women were not statistically significant between case and control groups in the current study. This result in agreement with Kia who stated that there were non-significant relation of BMI and age between PMS group and control group [8] and Rajaei concluded non-significant relation for age and BMI but significant relation for menarche age between case and control groups [6].

In conclusion, the mean level of vitamin D were below normal range in both case and control groups but they were lower in PMS cases compare with control cases among students in Sulaimani University and the mean level of serum calcium were low in case group with significant relation between case and control groups. In addition, nervousness and breast tenderness among other signs and symptoms were most repeated for diagnosing of PMS.

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