

ORIGINAL ARTICLE

Association of Vitamin D with Obesity in Premenstrual Syndrome: A Study of Female Population of Hyderabad, SindhAQSA NAEEM¹, UROOJ BHATTI², SARWAT BATOOL³, KHALIDA SHAIKH⁴, ARSALANUQAILI⁵, KEENJHER RANI⁶¹Lecturer Physiology Department Liaquat University of Medical and Health Sciences Jamshoro, Sindh²Assistant Professor Physiology Department LUMHS Jamshoro Sindh³Lecturer. Physiology Department LUMHS Jamshoro Sindh⁴Professor. Physiology Department LUMHS Jamshoro Sindh⁵Assistant Professor Physiology Department LIMHS Jamshoro Sindh⁶Associate Professor. Physiology Department LIMHS Jamshoro Sindh
Corresponding author: Aqsa Naeem, Email: dranbughio@gmail.com**ABSTRACT****Introduction/Objectives:** The affiliation between decreased vitamin D and obesity is well built up. Females with Premenstrual Syndrome (PMS) are more prone to gain weight. Obese women's low calcifediol levels are impacted by diets and inactive lifestyles. The study focused to discover out the relationship between vitamin D and obesity in premenstrual syndrome females.**Materials & Methods:** Two hundred fifty (250) females between 15-45 years with a history of PMS were selected from OPD-Gynecology, Liaquat University of Medical & Health Sciences (LUMHS), Jamshoro and Hyderabad in collaboration with Physiology Department LUMHS Jamshoro and samples were analyzed in Diagnostic and Research lab Hyderabad. Information was collected on marital status, vitamin D3 levels, PMS intensity, and BMI. The Chi-square test compared the vitamin D levels with BMI and PMS scores.**Results:** Mean age of the patients was 29.89±5.206 years. 64.8% of patients were married. 42.8% had normal weight and 40.8% were obese. 35.2% of patients had mild PMS scores and 36.4% had extreme PMS. 61.2% of patients had vitamin D lack with only 4.8% having adequate serum vitamin D levels. 22.8% of normal-weight patients had inadequate serum vitamin D levels. 35.6% of obese patients had vitamin insufficiency in their blood. The relationship between obesity and vitamin D levels was significant (P-value: 0.001). 18.8% of patients who had mild PMS scores had deficient serum vitamin D levels. The relationship between PMS scores and vitamin D levels was remarkable (P-value: 0.001).**Conclusion:** We found a significant, inverse relationship between vitamin D levels and BMI, showing that losing weight through vitamin D and calcium-enriched diets may result in typical vitamin D levels, and so PMS may be treated.**Keywords:** Vitamin D (Vit D), Premenstrual Syndrome, body-mass index (BMI)**INTRODUCTION**

Premenstrual syndrome (PMS) of moderate to extreme seriousness influences 8%–20% of reproductive-aged ladies. PMS is characterized by physical, enthusiastic, behavioral, and cognitive indications that happen during the luteal stage of the menstrual cycle and cause critical disability in interpersonal interactions and regular activities. Many females around the globe, counting those in Pakistan, endure from PMS. PMS can be caused by assortment of causes, including hormone changes, sustenance, and lifestyle¹⁻². Females enduring from PMS are more likely to have picked up weight or experienced upsetting occasions within the past year³⁻⁵. Low Calcifediol levels are affected by dietary and/or behavioral changes in obese women⁶. Calcifediol levels are affected by a few factors, including age, sedentary ways of life, BMI (body-mass index), and nonappearance of physical activity⁷⁻⁸. Neurotic identity, higher cramp intensity, expanded BMI, overall self-perceived well-being, and social varieties are all thought to affect premenstrual complaints⁹. Mood swings, uneasiness, outrage, depletion, misery, disabled concentration, breast tenderness and extension, stomach bloating, and general pains are among the foremost regularly expressed premenstrual side effects, indeed in spite of the fact that there are over a hundred of them⁹. Mason et al. (2011)¹⁰ conducted a study on obese postmenopausal members who experienced a 12-month weight lose plan. Diminished estrogen levels, in specific, can modify the bone mineral thickness and actuate discouragement, headaches, and muscular pains¹¹⁻¹². Young age, destitute well-being, stress, overwhelming monthly cycle, dysmenorrhea, and need of basic supplements were all associated to the seriousness of PMS symptoms¹³.

Since the genuine unfavorable impacts, especially the lessening in bone thickness, calcium and vitamin D admissions is strongly exhorted, and utilization ought to be confined to six to nine months without advance estrogen and progesterone supplements. According to epidemiological investigate, vitamin D lacking is getting to be more common in diverse societies. A few studies, in any case, hypothesized that vitamin D inadequate might actuate weight or prevent weight lessening. Since vitamin D is fat-

soluble, it is hypothesized that a sequestration handle happens in body fat stations, coming about in diminished bioavailability within the obese condition¹⁴.

Polycystic ovarian syndrome (PCOS) is the foremost predominant endocrine condition in ladies of reproductive age. Obesity and overweight are well-known hazard variables for reproductive issues such as PCOS which could be a disease characterized by hyperandrogenism and menstrual inconsistencies¹⁵. Acne or excessive hair development PCOS (polycystic ovarian disorder) hormonal imbalances, which are characterized by an overabundance of androgens, can cause mood swings and other PMS symptoms before the menstrual period¹⁶. Tehrani et al. (2014)¹⁷ reported that females, on average, had a significantly higher recurrence of a normal menstrual cycle and the nearness of a prevailing follicle than the rest.

Vitamin D and calcium supplements, in expansion to metformin treatment, might progress a range of PCOS indications, including month to month normality and ovulation. They proposed that vitamin D and calcium supplementation, in addition to metformin treatment, might progress a range of PCOS indications such as monthly regularity, ovulation, and certain viewpoints of hyperandrogenism (hirsutism), and BMI in ladies with PCOS. Given that both Vitamin D and calcium are secure, reasonable, and broadly accessible medications in patients with PCOS, it is prompted that this treatment methodology be utilized especially for those who are insufficient in Vitamin D. In any case, more prominent inquire about into the effectiveness of the proposed treatment alternatives as well as their pathophysiology is essential to urge more authoritative comes about¹⁷. An examination of 686 community-dwelling grown-ups uncovered that a volumetric dilutional show accounted for about all of the changeability in blood 25D concentrations owing to obesity¹⁸.

Since an affiliation between diminished 25D concentrations and obesity is well established. The current consider centered on examining the affiliation of vitamin D with weight in females enduring from premenstrual disorder.

MATERIAL AND METHODS

Study Design & Setting: A six-month cross-sectional study was carried out at the Liaquat University of Medical & Health Sciences (LUMHS), Jamshoro Hyderabad, Pakistan, Out -Patient Department (OPD) of Gynecology in collaboration with Physiology Department LUMHS Jamshoro and samples were analyzed in Diagnostic and Research lab Hyderabad The WHO Sample size calculator was used to calculate the sample size n= 250.

Inclusion & Exclusion Criteria: Patients in the study ranged in age from 15 to 45 years old and had a history of PMS. Patients with hypertension, diabetes mellitus, chronic kidney disease, autoimmune diseases, cardiac and endocrine disorders, and those on corticosteroids or anti-psychotic medications were not included.

Data Collection: The research was carried out with the approval of the Ethical Review Committee (ERC). Patients who satisfied the inclusion criteria were included. Those who did not provide informed consent were excluded. To collect participant data, a pre-designed proforma was employed. Each individual provided a 5cc blood sample, and the Vitamin D3 test was carried out in collaboration with the diagnostic and research facility Jamshoro/Hyderabad, using a Vitamin D3 kit and a Cobas E411 Analyzer (Roche Cobas system). The premenstrual syndrome scale was used to determine the severity of PMS (mild/moderate/severe).

Statistical Analysis: The data was analyzed by using SPSS version 26.0. The Chi-square test was used to compare two quantitative variables (vitamin D levels with BMI, and PMS scores). Statistical significance was defined as a P-value of 0.05. Pearson correlation was used to examine the relationship between vitamin D and BMI.

RESULTS

Clinical Information: Figure 1 shows the patients' age distribution. The mean age of the patients was 29.89±5.206 years. Table 1 shows 162(64.8%) patients were married and 88(35.2%) were single. 107 (42.8%) had normal weight and 102 (40.8%) were obese. 35.2% of patients had mild PMS scores and 36.4% had severe PMS. 61.2% of patients had vitamin D deficiency with only 4.8% having sufficient serum vitamin D levels.

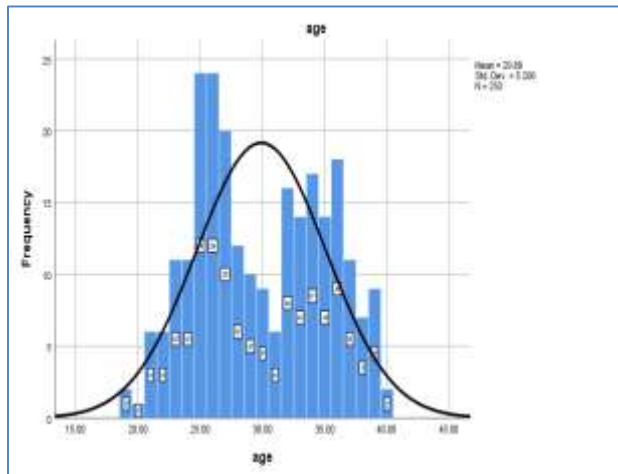


Figure 1: Patients' age distributions

Vitamin D levels according to BMI, and PMS scores: Table 2 shows serum Vitamin D levels in patients based on their basal metabolic index. Fifty-seven (22.8%) of normal-weight patients had insufficient serum vitamin D levels. Eighty-nine (35.6%) of obese patients had vitamin deficiency in their blood. The association between obesity and vitamin D levels was significant with a P-value of 0.001.

Table 1: Clinical Information of the patients (n=250)

Marital status	Frequency	Percent
Married	162	64.8
Un-married	88	35.2
BMI	Frequency	Percent
Under-weight	19	7.6
Normal	107	42.8
Overweight	22	8.8
Obese	102	40.8
PMS score	Frequency	Percent
Mild	88	35.2
Moderate	71	28.4
Severe	91	36.4
Vitamin D level	Frequency	Percent
Deficiency	153	61.2
Insufficiency	85	34.0
Sufficiency	12	4.8

Table 2: Vitamin D levels according to BMI (n=250)

BMI	Vitamin D status			Total	p-value
	D	Ins	S		
Underweight	13	4	2	19	0.001 (significant result)
	5.2%	1.6%	0.8%	7.6%	
Normal healthy weight	40	57	10	107	
	16.0%	22.8%	4.0%	42.8%	
Overweight	11	11	0	22	
	4.4%	4.4%	0.0%	8.8%	
Obesity	89	13	0	102	
	35.6%	5.2%	0.0%	40.8%	
Total	153	85	12	250	
	61.2%	34.0%	4.8%	100.0%	

Key: D= deficiency, S= Sufficiency, Ins=Insufficiency

Table 3 shows, that 18.8% of patients who had mild PMS scores had insufficient serum vitamin D levels. Those who suffered severe PMS symptoms (34.4%) had a deficiency of vitamin D. The correlation between PMS scores and vitamin D levels was significant at a P-value of 0.001.

As per the Pearson correlation (moderate, negative; r: -0.413), the association between vitamin D levels and BMI was found significant (P-value: 0.000).

Table 3: Vitamin D levels according to PMS Scores (n=250)

PMS score	Vitamin D status			Total	p-value
	D	Ins	S		
Mild	35	47	6	88	0.001 (significant result)
	14.0%	18.8%	2.4%	35.2%	
Moderate	32	35	4	71	
	12.8%	14.0%	1.6%	28.4%	
Severe	86	3	2	91	
	34.4%	1.2%	0.8%	36.4%	
Total	153	85	12	250	
	61.2%	34.0%	4.8%	100.0%	

Key: D= deficiency, S= Sufficiency, Ins=Insufficiency

Table 4:

		Vitamin D	BMI
Vitamin D	Pearson Correlation	1	-.413**
	Sig. (2-tailed)		.000
	N	250	250
BMI	Pearson Correlation	-.413**	1
	Sig. (2-tailed)	.000	
	N	250	250

** . Correlation is significant at the 0.01 level (2-tailed).

DISCUSSION

Vitamin D lacking increases the probability of creating weight which comes about from lower intestinal retentions, and disabled hydroxylation in fat tissue¹⁹. The connect between low vitamin D levels and weight is broadly recognized. Females enduring from PMS are more inclined to procure weight. Destitute diets and stationary ways of life contribute to obese women's low calcifediol levels. The study looked for to find out the affiliation between vitamin D and weight in females enduring from premenstrual

syndrome. Our patients' normal age was around 30 years. Sixty-four percent of patients were married. 42.8 percent were of ordinary weight, while 40.8 percent were obese. 35.2 percent of the patients experienced direct PMS, though 36.4 percent had extreme PMS. Sixty-one percent of our patients were vitamin D insufficient, with as it were 4.8 percent having satisfactory blood vitamin D levels.

Serum vitamin D levels were insufficient in 22.8 percent of normal-weight members. Vitamin lack was found in 35.6 percent of obese individuals' blood. Weight and vitamin D levels were appeared to be altogether related. Deficient blood vitamin D levels were found in 18.8 percent of our females with mild PMS. Vitamin D inadequate was found in 34.4 percent of those enduring from extreme depression. The Pearson relationship uncovered a modestly negative relationship between vitamin D levels and BMI, indicating that losing weight through vitamin D and calcium-enriched diets may result in typical vitamin D levels, and thus PMS may be treated. In bone mass and depression research, calcifediol concentrations were altogether decreased in 89 premenopausal females as compared²⁰. After altering for age, smoking status, sex, and BMI, Hoogendijk et al. (2008)²¹ found that Calcifediol was altogether related with depression severity.

Premenstrual syndrome (PMS) is one of the most distressing disorders in women of reproductive age; nevertheless, its etiology is still unknown. Vitamin D, as an immunomodulator, may help to reduce inflammation before and during menstruation²². Adiposity may be linked to PMS via a range of hormonal, neurological, and behavioral pathways, and multiple studies have revealed that women with PMS or monthly symptoms are more likely to be overweight or obese than women who do not have PMS. Furthermore, it is uncertain whether a big weight increase in a short period or recurrent weight gain and loss referred to as "weight cycling," is related to PMS risk irrespective of overall adiposity. In nested prospective research, Bertone-Johnson et al. (2010)²³ investigated how adiposity, fat distribution, and weight change were related to the onset of PMS. Furthermore, they investigated whether obesity influences the development of certain menstrual symptoms. Kia et al. (2015)²⁴ evaluated the nutritional status of vitamin D, calcium, and magnesium in young students with PMS to that of healthy volunteers. Their research was carried out on 62 pupils aged 20-25 in the city of Abadan. PMS patients' nutritional state is depleted in terms of vitamin D, calcium, and magnesium. Because PMS is a common health issue among young women, it deserves more attention in terms of improving their health and nutritional condition²⁴. Between four and six ovulatory menstrual cycles, the midfollicular and midluteal food intakes of 18 women were assessed by²⁵. Basal body temperatures and urine luteinizing hormone excretion were used to calculate phase durations. 6-8 days after menstruation beginning and 6-8 days after ovulation, midfollicular and midluteal diet records were taken, respectively. Midluteal phase energy, protein, carbohydrate, and fat consumption increased significantly as compared to midfollicular phase. Vitamin D, riboflavin, potassium, phosphorus, and magnesium intakes were also considerably greater throughout the midluteal phase. These findings confirm the control of food intake by menstrual cycle hormones and suggest that investigations of nutrient intake in premenopausal women must take the menstrual cycle phase into account²⁵. We discovered a substantial, inverse relationship between vitamin D levels and BMI. Rajaei et al. (2016)²² also looked if there was a link between blood vitamin D levels and PMS. This case-control research, which was done at Shahid Akbar-Abadi hospital, had 82 women in total. In the luteal phase, levels of 25 hydroxyvitamin D3 (25OHD) were measured using a 25-OH Vitamin D ELISA kit. Women with PMS had a substantially shorter menarche age than normal women. However, body mass index did not differ significantly in their research. In both the PMS and non-PMS groups, we found a significant proportion of vitamin D insufficiency, as well as a severe deficit. However, there was no significant

change in serum 25OHD levels between the two groups in their investigation²².

The incidence of hypovitaminosis D among students was reported to be 65%. Vitamin D deficiency was discovered in 12% of all pupils, with inadequacy reported in 53%. Female students were approximately twice as likely as boys to be vitamin D deficient. Serum 25OHD levels decreased as BMI rose in obese and overweight kids with hypovitaminosis D. Vitamin D inadequacy and insufficiency are frequent in fat and overweight children, particularly females. Obesity may be a risk factor for teenage hypovitaminosis D. Vitamin D supplements should be given to teenage girls in particular²⁶. Łagowska (2018)²⁷ examined blood vitamin D levels in young women of various body weights and related them to the menstrual cycle. 40 percent of individuals in the low vitamin D group reported having extended cycles, 27 percent had oligomenorrhoea, and 13 percent had amenorrhoea. Only 12% of those in the normal vitamin D group experienced menstrual cycle abnormalities, 6% had oligomenorrhoea, and 6% had amenorrhoea. Those who did not achieve the acceptable level of 25(OH)D of 30 ng/mL had nearly five times the risk of having menstrual cycle abnormalities as women who met the prescribed level. A link was found between the incidence of menstruation problems and low vitamin D levels. Supplementation is required in women with low vitamin D levels to correct for this deficit and to evaluate its influence on menstrual problems²⁷.

Vitamin D insufficiency is widespread in women with polycystic ovarian syndrome (PCOS), with lower blood values of 25-hydroxy vitamin D (25OHD) in up to 85 percent of PCOS women. There is some, but limited, evidence that vitamin D supplementation can help with menstrual disorder and insulin resistance in people with PCOS. Vitamin D deficiency may contribute to the exacerbation of PCOS²⁸. Jafari-Sfidvajani et al. (2018)¹⁵ looked at how vitamin D supplementation combined with a low-calorie diet affected anthropometric indices, reproductive hormones, and menstrual regularity in overweight and obese PCOS women. Obesity causes a complicated interplay between the pituitary gland, pancreas, and ovary, resulting in a different hormonal production pattern. In PCOS patients, there is a link between the severity of both metabolic and clinical symptoms and BMI. Women with PCOS who are obese and have abdominal obesity are at risk of developing insulin resistance. The postulated alternate mechanism for insulin resistance in PCOS includes a lack of insulin action, pancreatic beta-cell malfunction, an increase in insulin production in response to food intake, and a reduction in insulin clearance in the liver. Weight loss has been demonstrated to improve both metabolic and reproductive health in PCOS women¹⁵. A high vitamin D consumption may minimize the incidence of (PMS) by influencing calcium levels, and cyclic sex steroid hormone variations. The findings across all research participants revealed the potential of an inverse relationship between vitamin D consumption from dietary sources and overall menstrual symptom severity. After controlling for age, BMI, and increased intake of vitamin D from foods was related to a significantly decreased prevalence of PMS. Late luteal phase 25-hydroxyvitamin D3 levels was not linked to common PMS. The findings show that there may be a link between vitamin D and PMS²³.

CONCLUSION & RECOMMENDATION

Obesity and low blood vitamin D levels have been linked. We identified a substantial, inverse connection between vitamin D levels and BMI, indicating that weight loss through vitamin D and calcium-enriched diets or supplements might result in normal vitamin D levels, and therefore PMS may be managed. In women with severe premenstrual syndrome, supplementation and reduction of blood vitamin D levels can help prevent and treat metabolic illnesses such as obesity, diabetes, hypertension, and depression. Larger studies are needed to further study this association and to see if 25-hydroxyvitamin D3 levels in the

follicular or early luteal stages of the menstrual cycle are connected to PMS risk.

Authors report no conflict of interest.

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