

Frequency of Vitamin D Deficiency and associated Factors Among Pregnant Women Visiting Tertiary Care Hospital, Gujranwala, Pakistan

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Abstract

Objectives: To assess the frequency of vitamin D deficiency and associated factor among gravid women following up at antenatal clinic of social security hospital, Gujranwala

Method: It was a cross-sectional study carried out at antenatal clinic social security hospital, Gujranwala. Total 100 pregnant females who were on follow-up visits and gave consent were enrolled in this study through a non-probability purposive sampling technique. A semi-structured and pre-tested questionnaire with anthropometric measurements and blood sample for vitamin D levels assessment was used to collect data and analysis was performed through SPSS version 23

Results: Among one hundred participants, two participants had deficient levels, 41 had insufficient and 57 had sufficient levels of vitamin D. Study participants had mean age of 28.8 ± 4.23 years. Mean duration of marriage and gestational period were 6.49 ± 4.0 years and 30.49 ± 10.49 weeks respectively. The mean vitamin D level was 29.9 ± 8.1 ng/ml. Complaints such as backache, leg cramps, fatigue and factors such as, gravidity, parity and low systolic Blood pressure were significantly associated with insufficient/low vitamin D levels.

Conclusion: Deficiency of vitamin D is high in study participants hence need based supplementation to gravid women is suggested.

Keywords: Vitamin D levels, Pregnant Women, Vitamin D deficiency, Sun exposure.

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Introduction

Vitamin D is a significant vitamin for development, growth and maintenance of healthy bones from cradle to death. Requirements in humans are fulfilled by vitamin D ingestion or sun exposure.¹

Vitamin D decreases cell proliferation, enhances cell

differentiation and has substantial anti-inflammatory effects. Vitamin D has a protective effect against cancers, cardiovascular diseases, pelvic floor disorders and age-related macular degeneration (AMD). It is identified to support the body in absorption of calcium and contributes in bone health.^{1,2}

Deficiency of vitamin D is noted globally in all age groups. Vitamin D deficiency (VDD) or insufficiency has been assessed globally in 1 billion people. Deficiency of vitamin D is labeled when 25-hydroxyvitamin D concentration is less than 30ng/ml.^{3,4} Scarcity of vitamin D is prevalent in South Asia due to dark complexion and its geographical location. Sunscreen of sun protection factor (SPF) 360 leads to 95% less vitamin D protection. Dark complexion individuals need 3-5 times more exposure than fair skin tone due to natural sun protection. Obesity is inversely proportional to VDD especially with body mass index (BMI) more than 30

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kg/m².^{5,6,7}

Vitamin D deficiency is evident through National Nutritional Survey (2018) which reflected Vitamin D deficiency in 79.9% women in reproductive age. Studies conducted in Karachi and Rawalpindi showed 99.5% and 61.5% vitamin D deficiency among women respectively.³

Vitamin D is indispensable for fetal progress and development as it enhances the calcium absorption in the digestive tract.⁸ Undesirable obstetric outcomes including maternal osteomalacia, abortion, preeclampsia, gestational diabetes, primary cesarean section and neonatal outcomes for instance fetal intrauterine growth restriction (IUGR), low birth weight (LBW), premature birth, neonatal hypocalcaemia, and juvenile obesity are also associated with lower levels of maternal vitamin D.⁸

According to literature review, there is scarcity of local data available regarding vitamin D deficiency in pregnant women in Gujranwala. The estimation of frequency will help define burden of disease. Hence, this study has been formulated to determine the frequency of vitamin D deficiency and associated factors among gravid women at ante-natal OPD of social security hospital, Gujranwala.

Material and Methods

It was a cross-sectional study carried out at antenatal clinic social security hospital, Gujranwala. Total 100 pregnant females who were on follow-up visits and gave consent were enrolled in this study. The selection of females was done by using non-probability purposive sampling technique. Duration of study was one month. After the approval by ethical committee and informed consent, with the help of a semi-structured pilot tested questionnaire, data were collected along with anthropometric measurements & blood sample for serum vitamin D calculation. Questionnaire included sociodemographic characteristics (age, education, occupation, residence place, family income), Obstetric history (duration of marriage, parity status, duration of current pregnancy, number of children, abortions) common complaints associated with vitamin D deficiency (Backache, leg cramps, fatigue) and attributes related to vitamin D deficiency (physical activity, sun exposure, duration of sun exposure, outside work, covering clothing, type of fabric, sunscreen application, vitamin D and calcium supplementation, dietary calcium intake). Anthropometric measurements (weight and height) were obtained.

A digital weight machine was used to measure weight and stadiometer was used to measure height. These measurements were used to calculate. Body Mass Index (BMI) through the following formula: BMI = kg/m²

Blood pressure was measured through a digital instrument, three readings were taken and a mean was recorded. Then a competent phlebotomist drew blood in clotted vial through aseptic technique. Vials were labeled with serial no and name of the participant and stored in a cold box. Later all vials were centrifuged and frozen. On the next day, whole batch was thawed and ELISA was performed as per directions by manufacturer's instructions. ELISA kit used was from Global Diagnostics B 25 – OH Vitamin D (total) ELISA Kit and its reference range was used to interpret results for classification of 25 OH Vitamin D status: deficiency: 0-10 ng/ml, insufficiency: 10-29 ng/ml, sufficiency: 30-100 ng/ml, potential toxicity: >100 ng/ml.⁹

Data were then entered and analyzed through SPSS (Statistical Package for Social Sciences) 24.0. The qualitative and quantitative variables were presented in mean & standard deviation and frequency & percentages respectively. Chi square test was applied to find out statistical significance. Means were compared using student's t-test. p-value ≤ 0.05 was taken as statistically significant.

Results

The present study comprised of 100 pregnant females with average age of 28.8 ± 4.23 years. About 13% were uneducated and 92% were housewives. About 57% women were residing in urban area and 71% were living in joint family system. Mean duration of marriage was 6.49 ± 4.0 years and mean monthly family income was 19400 ± 8689 rupees. In terms of their obstetrical history, the mean duration of gestational period was 30.49 ± 10.49 weeks. About 60% of women were ≤ 3 gravidity, 21% were primigravida, 24% had a history of abortion and 47% had spontaneous vaginal delivery (SVD) in previous pregnancy. About 23% of study participants were hypertensive, with mean BMI and mean vitamin D levels to be 27.7 ± 5.03 and 29.9 ± 8.1 ng/ml respectively. The distribution of the study members on the basis of their levels of vitamin D is displayed in **Table-1**. The physical aspects of the study participants such as their physical activity, presence of sun exposure, place of work as well as the type of clothing worn in outdoors are shown in **Fig-1**. The various symptoms observed in

the study participants were backache (60%), leg cramps (78%) and fatigue (59%).

Various factors were analyzed for an association with vitamin D levels, and it was observed that complaints recorded such as backaches, leg cramps and fatigue were found to have a significant association. Analysis was executed to measure the association of various categorical and continuous variables with levels of Vitamin D. Through which gravidity, parity and blood pressure (systolic) were found to have a significant

Table 1: Frequency Distribution of Vitamin D Levels among Participants.

Vitamin D Levels	Frequency	Percentage
Deficient (<10 ng/ml)	2	2
Insufficient (10-29 ng/ml)	41	41
Sufficient (30-100 ng/ml)	57	57
Total	100	100

Table 2: Comparison of VDD with different factors in pregnant women.

Variables	Deficient /Insufficient		Sufficient		P values
	n	%	n	%	
Backache					0.003
No	10	25	30	75	
Yes	33	55	27	45	
Leg cramps					0.001
No	27	34.6	51	65.4	
Yes	16	72.7	6	27.3	
Fatigue					0.001
No	14	27.5	37	72.5	
Yes	29	59.2	20	40.8	

*P-value <0.05 significant.
Test Applied: Chi-square*

Table 3: Comparison of VDD with different factors in pregnant women

Variables	Deficient/Insufficient Mean ± SD	Sufficient Mean ± SD	P Value
Gravidity	4.3 ± 2.1	2.8 ± 1.7	<0.001
Parity	2.7 ± 1.7	2.7 ± 1.8	0.003
Systolic Blood Pressure	111.9±12.2	122.3 ± 17.5	0.001

*P-value <0.05 significant.
Test Applied: t-test*

association. Variables associated with vitamin D are shown in Table 2 and 3 .

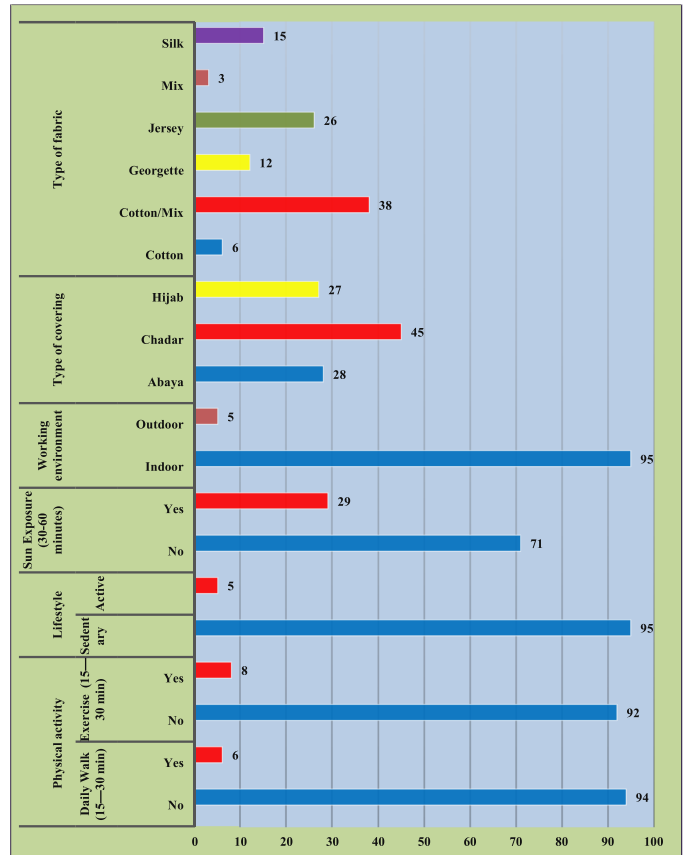


Fig-1: Various attributes of the study participants.

Discussion

This study found high frequency of deficiency of vitamin D among pregnant females in Gujranwala, Pakistan. The current study showed the average age of the study participants was 28.8±4.23 years, which was comparable to a Chinese study carried out by Song Hong-Bi in which the reported mean of the pregnant mothers was 29.3 ± 4.5 years.¹⁰ Another factor observed in the current investigation was the systolic blood pressure (p-value: 0.001) with readings of 111.9±12.2 mmHg and 122.3±17.5mmHg respectively. However, a different study piloted by Aji et al. in expecting Indonesian mothers did not find a significant relation between vitamin D levels and systolic blood pressure (p-value: 0.994) with readings of 110.39±11.32 mmHg.¹¹

The current analysis showed that 43% of expectant women were vitamin D deficient/insufficient. Deficiency of vitamin D has been stated in more than a few investigations in recent studies. The frequency of VDD among pregnant women was found to be 61.3% in a

recent research performed in West Sumatra, Indonesia.¹¹ In a study conducted in Pakistan, 99.5% and 89% women were vitamin D deficient in Karachi and Jehlum.¹² In a recent systemic review and metanalysis, it was concluded that Pakistan has highest prevalence of vitamin D deficiency (76%) following then India (67%), Bangladesh (64%) and then Nepal(14%).¹³

Deficient vitamin D concentration is related to osteomalacia while insufficiency can lead to hyperparathyroidism, augmented bone turnover and osteoporosis.^{14,15} Investigations have shown that in the Middle East and North Africa (MENA) region, about 54-90% pregnant women are vitamin D deficient.¹⁶ In Beijing, China, a study showed vitamin D deficit in 99.4% women with mean 25-(OH)D levels of 27.28 ± 6.64 nmol/L. Wang et al.¹⁷ described that nearly 90% of pregnant women had vitamin D dearth. In Nanjing city, Jiangsu Province, the average Vitamin D levels in pregnant women were 26.4 ± 10.7 nmol/L and 22.7 ± 4.8 nmol/L in summer and winter respectively as stated by Xie et al.¹⁸ Owing to religious and cultural reasons, women who cover their whole body, had decreased sun exposure and decreased vitamin D production.¹⁹ In the same way, earlier investigations performed in countries such as Iran, Malaysia and a local study from Pakistan described high frequency of vitamin D deficit^{20,21} In the Netherlands, vitamin D levels were 15.2 nmol/l & 20.1 nmol/l among Turkish & Moroccan women respectively, which were comparatively lesser than those found for Western females.²² Alago et al. found that there was a significant difference in vitamin D levels depending upon body covering.²³ In our study, most of the participants had covered dressing style and vitamin D3 levels were evidently lower than numerous former investigations. In our study, parity was a substantial risk factor for vitamin D deficiency, as vitamin D dearth was less in nulliparous compared to multiparous.^{24,25} The strength of this study is the addition of lab testing. Data was calculated through a questionnaire regarding sociodemographic characteristics, clinical complaints regarding vitamin D deficiency, different attributes leading to vitamin deficiency and Laboratory test determining serum vitamin D levels which provides a scientific evidence for the study. Limitations included purposive sampling and a small sample size, as results cannot be generalized for whole community.

Conclusion

Pakistan has abundant sunlight all the year. Lack of

vitamin D was remarkably predominant among the pregnant women. Mode of delivery, backache, leg cramps, fatigue, gravidity, parity and high blood pressure were associated with the Vitamin D deficiency among pregnant females.

Conflict of Interest

None

Funding Source

None

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Authors Contribution

DF: Conceptualization of Project

DF: Data Collection

SK: Literature Search

AR: Statistical Analysis

RH: Drafting, Revision

SA: Writing of Manuscript