

Status of Serum Vitamin D Levels in Pregnant women from Balochistan

NARGIS HAIDER KAKAR¹, YASMEEN LASHARI², ZAHID ALI¹, MOHAMMAD TAHIR KAKAR³, AURANGZEB KAMAL⁴, MUHAMMAD BILAL⁵, MUHAMMAD IKRAM ULLAH⁶, MUHAMMAD ATIF⁶

¹Department of Physiology, Bolan University of Medical and Health Sciences, Quetta, Pakistan.

²Department of Pathology, Bolan University of Medical and Health Sciences, Quetta, Pakistan.

³Department of Paediatric, Sandeman Provincial Teaching Hospital, Quetta, Pakistan.

⁴Health Department, UNICEF Wing, Quetta, Pakistan.

⁵Department of Mathematical Sciences, Balochistan University of Information Technology, Engineering and Management Sciences, Quetta,

⁶Department of Clinical Laboratory Sciences, Jouf University, Kingdom of Saudi Arabia.

Correspondence to Dr. Nargis Haider Kakar, Assistant professor of Physiology, BUMHS, Quetta. Email: Dr.nargishaider@gmail.com

ABSTRACT

Background: Malnutrition mainly micronutrients malnutrition is one of the tasks of public health problem in Pakistan.

Aim: To determine the vitamin D status in pregnant women of Baluchistan.

Methods: This cross-sectional study was conducted on 101 pregnant women who were recruited from the public teaching hospital. Total 3 ml of blood was collected from all the subjects and serum was separated after centrifugation. ELISA technique was used to determine serum vitamin D levels and all the samples were analyzed using CobasE411 analyzer. Data analysis was performed by using SPSS version 22.

Results: The pregnant women showed lower levels of vitamin D with a rate of 51% population. Other women presented with normal or high serum vitamin D because they were utilizing nutritional sources of vitamin D and also sufficient exposure to the sunlight was available.

Conclusion: Vitamin D deficiency is a growing public health problem which should be addressed seriously specially in the pregnant women. Food decreases this hypovitaminosis D it should also be addressed at National level like that of Vitamin A and Iodine supplementation programs.

Keywords: Pregnant women, Vitamin D levels, Deficiency, Balochistan.

INTRODUCTION

Vitamin D is a seco-steroid and considered as an imperative pro-hormone¹. Meanwhile, the receptors for vitamin D (VDRs) are existing in variable cells and tissues of the whole body. In various reports, the role of vitamin D has been remarkably established in bone and muscle strength². During the process of pregnancy, vitamin D shows a dynamic part in the embryonic growth, particularly the skeletal expansion of fetus and main the homeostasis of calcium. The deficiency of vitamin D is a growing health apprehension wide-reaching in both children and adults¹. Numerous studies recommend the growing prevalence of vitamin D insufficiency in pregnancy and the connected antagonistic fetal and maternal consequences like pre-eclampsia, gestational diabetes mellitus (GDM) and pre-term births amid others³.

During pregnancy, calcium utilization from mother to fetus upturns to encounter fetal requirements of bone mineralization. Therefore, variable physiological activities happen like higher serum level of maternal vitamin D binding protein (DBP), placental VDR, calcitriol, renal and placental CYP27B1 activity to continue normal serum 25-OHD and calcium levels⁴. Maternal 25-OHD crosses the placenta and is the main form of vitamin D for the fetus. Calcitriol escalates during pregnancy, and becomes twice during the third trimester and normalizes soon after the delivery⁵. During pregnancy, maternal levels of serum reduce which result in decreased in serum albumin, although, concentration of ionized calcium does not alter⁶. Actually, the calcium levels in fetus are higher than the mother, thus demanding specific carriers to transfer

calcium against the concentration gradient of placenta⁴. The calcium-binding proteins like calbindin D-9k and D-28k mediate the transfer of the calcium across the placenta⁷. All these effects indicate the vital importance of vitamin D during gestation and the potential role of its deficiency on adverse maternal-fetal outcomes.

There are very few reports regarding the levels of vitamin D in different women groups of Pakistani origin. Serum levels of 25-OHD have been found remarkably low in various women populations including 98.8% in female medical students of public sector hospital⁸, about 98.9% in premenopausal volunteers⁹ and over 97% in pregnant women¹⁰⁻¹¹. There are no reports of vitamin D status in women of Baluchistan province. This study has been focused to explore the status of Vitamin D in pregnant women of Baluchistan to estimate the nutritional and health status of the pregnant women.

METHODS

A cross sectional study of 101 pregnant women irrespective of trimester was recruited from outdoor of Obstetrics and Gynecology, Sandeman provincial teaching hospital Quetta. The pregnant women who visited the hospital for antenatal management having no drug history, no chronic disease and irrespective of trimester were included in the study.

Demographic information, including the age of maternal period, parity, lifestyle and the status of socio-economic conditions were obtained from all the participants through a questionnaire on pre-designed research proforma. A questionnaire about lifestyle was inquired to

the participants, comprising the questions about duration of sun exposure, physical activity, working status and use of sunscreen. Calculation of sun exposure was considered as an index in which pregnant women spent the hours per day by exposing to sunlight.

Total 3.0 ml of blood sample was collected aseptically from each pregnant woman after taking informed consent. Samples were centrifuged and serum was separated by centrifugation at 3500 rpm at 4°C for 10 min, then stored and kept the sample aliquots at -80°C till further analysis. The serum 25-OH vitamin D was performed by using ELISA kit and results were measured by Auto-analyzer Cobase 411 (Electro-Chemi-Luminescence). Data analysis was done by using SPSS 22.0. Frequency and descriptive analysis was done for non-parametric variables. The mode was calculated which is considered as good suitable average in categorical data and reflected the most frequent value in the data set for a specific variable. Binary regression model was run to assess the correlation of vitamin D levels with qualitative and quantitative variables. P-value was statistically significant ≤ 0.05 .

RESULTS

In this study, total 101 pregnant women were investigated for their status of vitamin D. The mode of age was 30 years with range of 16 to 45 years. This is indicating early marriages irrespective of waiting for legal marriage age in Baluchistan Province. Percentiles shows 22 out of 101 cases are under 25% of data set, 29 cases are under 50% of data set, 35 cases are under 75% of the data set while majority of cases (66 cases) are over 75% (top 25%) of the data set.

Trimester for majority patients is 3rd and 75% of the data lies 3rd or less trimester. Parity shows happy families

having an average 2 kids, maximum number of kids are 9 reported in the data set. We found heterogeneous behavior for Vitamin Intensity (Vitamin Intensity) due to less awareness about health education in Baluchistan. We have noticed that majority of patients neither have health basic facility nor health awareness in checking their Hb levels so, a huge number of missing values was observed in Hb (52 cases out of 101).

The graphical work is done for categorical variables. Chief complaints on average are reported “General Weakness to No Complaints”, which is indicating majority of patients are either in good health during pregnancy or they use traditional domestic methods to avoid complaints. However, chief complaints limits are from “General backache to General joint pain”. Diet pattern during pregnancy is poor, majority of patients rely on grain, milk or both. Sun exposure is alright, it is because of vast expanse area of Baluchistan where people work in open environment. Medication and Performed VIT.D (vitamin D supplement) is poor as less family income can't bear medical treatment. Binary Regression Model was run to assess Vitamin D on all available variables and its significance with each variable in the model. The overall result of the regression model is given in table 2.

Regression analysis of vitamin D was performed to correlate with different variables (Sun exposure, age, trimester, parity, chief complaints, diet pattern, performed vitamin D, vitamin intensity) to assess whether these are playing significant role in Vitamin D or not. Adj. R² is showing 83.4% variation explained by predictors in Vitamin D which is indicating a good model fit. The second table shows almost high significant results with high partial correlation for each of the variable in assessing vitamin D except parity.

Table 1: Description of different parameters in pregnant women of Balochistan.

N	Valid	Age	Trimester	Parity	vitamin D	Hb
	Missing	0	0	0	0	0
Mode		30	3	2	3	11 ^a
Std. Deviation		7.103	.733	2.429	22.432	1.461
Minimum		16	1	1	3	7
Maximum		45	3	9	150	14
Percentiles	25	22.00	2.00	2.00	6.33	11.00
	50	29.00	2.00	4.00	13.50	12.00
	75	35.00	3.00	7.00	21.20	13.00

a. Dependent Variable: VitD

Figure 1: General features in pregnant women of Balochistan.

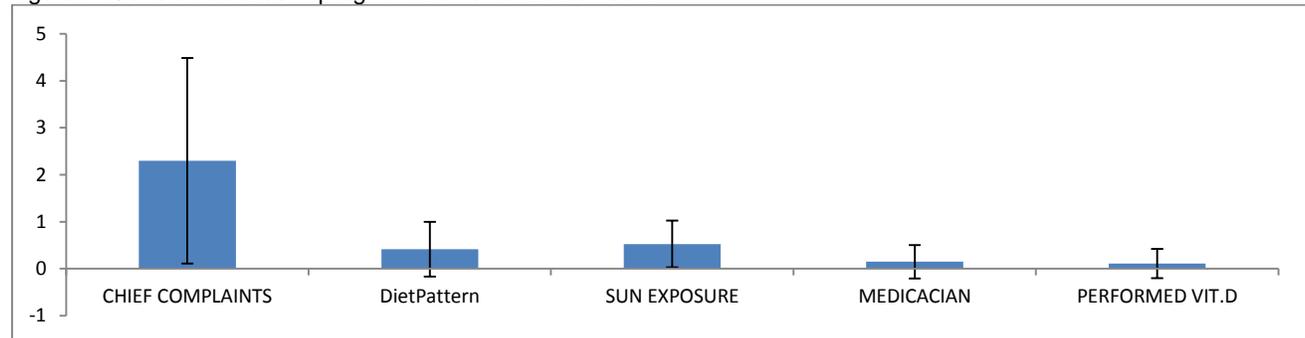


Table 2: Correlation of different variables in pregnant women of Balochistan.

Model	Beta in (β)	T	P value
Age	0.034	2.248	0.001*
Trimester	0.942	1.481	0.005*
Parity	1.291	3.521	0.451
Chief complaints	0.084	0.542	0.001*
Diet pattern	0.719	0.124	0.000**
medication	0.397	1.540	0.001*
Vitamin D	2.278	1.871	0.005*
Hb	0.994	2.367	0.0001*
Vitamin intensity	0.087	0.127	0.001*

b. Predictors in the Model: Sunexposure, Age, Trimester, Parity, Chiefcomplaints, Dietpattern, Performed Vitamin D, Vitamin intensity

DISCUSSION

Vitamin D deficiency is a global epidemic affecting people of all age groups with the principal cause being the lack of exposure to sunlight. Others include darker skin (high melanin content), aging, use of sunscreen and winters, all associated with decreased dermal synthesis of vitamin D¹².

In this study, total 101 pregnant women were investigated for their status of vitamin D from the Balochistan province. Percentiles shows 22 out of 101 cases are under 25% of data set, 29 cases are under 50% of data set, 35 cases are under 75% of the data set while majority of cases (66 cases) are over 75% (top 25%) of the data set. Mostly the women were in 3rd trimester and parity shows happy families having an average two kids. It was found heterogeneous behavior for vitamin intensity due to less awareness about health education in Baluchistan. It was noticed that the majority of patients neither have basic health facility nor health awareness for their Hb levels (52 cases out of 101).

Chief complaints on average are reported “general weakness to No Complaints”, which is indicating majority of patients are either in good health during pregnancy or they use traditional domestic methods to avoid complaints. However, chief complaint limits are from “general backache to general joint pain”. Diet pattern during pregnancy is poor, majority of patients rely on grain, milk or both. Sun exposure is sufficient because of vast expanse area of Baluchistan where people work in open environment. Medication and Performed vitamin (vitamin D supplement) was unremarkable due to poor socio-economic conditions. Regression analysis of vitamin D was showed high correlation with different variables (Sun exposure, age, trimester, parity, chief complaints, diet pattern, performed vitamin D, vitamin intensity) in pregnant women of Baluchistan.

In our study, about 51% pregnant women presented with low serum D levels and have low socio-economic status. Several reports documented the increasing prevalence of vitamin D insufficiency and deficiency in the tropical countries¹³⁻¹⁶. Recently, a study from Pakistani population reported 42% prevalence of vitamin D deficiency in pregnant women¹⁷. A report from Malaysia described 61% prevalence of vitamin D deficiency and inadequacy in pregnant women having third trimester¹⁴. In Vietnamese women, about 60.0% showed low levels of vitamin D during 32rd week of gestation¹⁵. In Thailand, 75.5% of the pregnant

women presented with hypovitaminosis during the labor process¹⁶.

Consequences of low or deficient serum 25-OHD level could result in osteoporosis, high bone turnover and hyperparathyroidism. This study also pointed out that there was low risk of vitamin D deficiency in pregnant women who were taking vitamin D supplements¹⁸. Another study investigated similar outcome in pregnant women with higher concentrations of vitamin D as vitamin D intake was appropriate¹⁹. This can be related to the high consumption of food rich with vitamin D. Also, another report recently demonstrated that dairy and milk products were the major food sources contributing to vitamin D intake among pregnant women²⁰.

On the other hand, due to religious and culture impact, the pregnant women using veil and covering were at high risk for vitamin D deficiency than the women who were exposed to the direct sunlight¹³⁻¹⁴. In Malaysian population, the variations of the prevalence of vitamin D deficiency in variable ethnic groups described the differences according to the religious practicing pregnant women and women without covering their body²¹. Therefore, it may be suggested that the high prevalence of vitamin D deficiency might be due to religious and cultural reasons. Muslim women are adopting obligatory practices to cover entire body parts²²⁻²³ and this reduces the probability for these pregnant women to get sufficient sunlight, which ultimately reduces the vitamin D production in their body. Some studies from other Muslim countries like Pakistan and Iran reported the higher rates of vitamin D deficiency among the pregnant women who are wearing veils²⁴.

CONCLUSION

Our results showed the significant deficiency of vitamin D levels in pregnant women of Baluchistan. Vitamin D deficiency is a growing public health problem which should be addressed seriously specially in the pregnant women. Food decreases this hypovitaminosis D it should also be addressed at National level like that of Vitamin A and Iodine supplementation programs.

Acknowledgment: We are grateful to the individuals who participated in this research.

Conflict of interest: The authors declare that they have no competing interests.

Funding: No funding was available for this study.

REFERENCES

- Weinert LS, Silveiro SP. Maternal-fetal impact of vitamin D deficiency: a critical review. *Matern Child Health J.* 2015;**19**(1):94-101.
- Joergensen JS1, Lamont RF, Torloni MR. Vitamin D and gestational diabetes: an update. *Curr Opin Clin Nutr Metab Care.* 2014;**17**(4):360-367.
- Palaniswamy S, Hyppönen E, Williams DM, Jokelainen, Lowry E, Keinänen-Kiukaanniemi S, Herzig KH, Järvelin MR, Sebert S. Potential determinants of vitamin D in Finnish adults: a cross-sectional study from the Northern Finland birth cohort 1966. *BMJ Open.* 2017;**7**(3):e013161.
- Olmos-Ortiz A, Avila E, Durand-Carbajal M, Díaz L. Regulation of calcitriol biosynthesis and activity: focus on gestational vitamin D deficiency and adverse pregnancy outcomes. *Nutrients.* 2015;**7**(1):443-480.

5. Marshall I, Mehta R, Ayers C, Dhupal S, Petrova A. Prevalence and risk factors for vitamin D insufficiency and deficiency at birth and associated outcome. *BMC Pediatr.* 2016;**16**(1):208
6. Olausson H, Goldberg GR, Laskey MA, Schoenmakers I, Jarjou LM, Prentice A. Calcium economy in human pregnancy and lactation. *Nutr Res Rev.* 2012;**25**(1):40-67.
7. Halhali A1, Figueras AG, Diaz L, Avila E, Barrera D, Hernández G, Larrea F. Effects of calcitriol on calbindins gene expression and lipid peroxidation in human placenta. *J Steroid Biochem Mol Biol.* 2010;**121**(1-2):448-451.
8. Kanani F, Hossein N, Noor F, Jamil F, Khanani R, Vitamin D. Deficiency in healthy female medical students of a public sector hospital. *Pak J Med Res.* 2013;**52**(1).
9. Dar FJ, Iqbal R, Ghani F, Siddiqui I, Khan AH. Bone health status of premenopausal healthy adult females in Pakistani females. *Arch Osteoporos.* 2012;**7**(1-2):93-99.
10. Sharif S, Farasat T, Shoaib H, Saqib M, Fazal S. Vitamin d levels among pregnant and lactating women. *J Coll Physicians Surg Pak.* 2013;**23**(12):862-865.
11. Aslam M, Sattar A, Masood Z, Qudsia M. VITAMIN D DEFICIENCY; PREVALENCE IN PREGNANT WOMEN. *Professional Med J.* 2012;**19**(2): 208-213.
12. Holick MF, Binkley NC, Bischoff-Ferrari HA, Gordon CM, Hanley DA, Heaney RP, et al. Evaluation, treatment, and prevention of vitamin D deficiency: an Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab.* 2011; **96**(7): 1911-1930.
13. Woon FC, Chin YS, Ismail IH, Batterham M, Abdul Latiff AH, Gan WY, Appannah G, Mohammed Hussien SH, Edi M, Tan ML, Chan YM. Vitamin D deficiency during pregnancy and its associated factors among third trimester Malaysian pregnant women. *PLoS One.* 2019;**14**(6):e0216439.
14. Aji AS, Yerizel E, Desmawati, Lipoeto NI. The association between lifestyle and maternal vitamin D during pregnancy in West Sumatra, Indonesia. *Asia Pac J Clin Nutr.* 2018; **27**(6): 1286-1293.
15. Hanieh S, Ha TT, Simpson JA, Thuy TT, Khuong NC, Thoang DD, et al. Maternal vitamin D status and infant outcomes in rural Vietnam: a prospective cohort study. *PLoS One.* 2014; **9**(6):e99005.
16. Pratumvinit B, Wongkrajang P, Wataganara T, Hanyongyuth S, Nimmannit A, Chatsirichaoenkul S, et al. Maternal vitamin D status and its related factors in pregnant women in Bangkok, Thailand. *PLoS One.* 2015; **10**(7):e0131126.
17. Nasim Ilyas, Fouzia Hanif, Nurain Baig Moghul, Uzma Hassan, Usman Nawaz, Misbah ul Hassan Ghani. Vitamin D status among pregnant ladies attending Gynecology and Obstetrics department of Railway Hospital, Rawalpindi, Pakistan. *RMJ.* 2019; **44**(3): 581-583.
18. IOM. Dietary reference intakes for calcium and vitamin D. Washington, DC; 2011.
19. Shiraishi M, Haruna M, Matsuzaki M, Murayama R. Demographic and lifestyle factors associated with vitamin D status in pregnant Japanese women. *J Nutr Sci Vitaminol.* 2014; **60**(6): 420-428.
20. Yong HY, Zailah MS, Tan CW, Koo SJ. Pre-pregnancy BMI and intake of energy and calcium are associated with the vitamin D intake of pregnant Malaysian women. *Fam Med Prim Care Rev.* 2017; **19**(4):417-423.
21. Chin KY, Soelaiman IN, Suraya I, Isa Naina M, Wan Zurinah WN. Vitamin D status in Malaysian men and its associated factors. *Nutr.* 2014; **6**(12):5419-5433.
22. Muhammad Tahir J, Kalthom A. Fashion: Malaysian muslim women perspective. *Eur Sci J.* 2015; 438-454.
23. Nasir JA, Imran M, Zaidi SAA. Pattern of vitamin D among Pakistani pregnant women. *J Coll Physicians Surg Pak.* 2018; **28**(3):233237.
24. Tabrizi R, Moosazadeh M, Akbari M, Dabbaghmanesh MH, Mohamadkhani M, Asemi Z, et al. High Prevalence of vitamin D deficiency among Iranian population: a systematic review and meta-analysis. *Iran J Med Sci.* 2018; **43**(2):125-139.