International Journal of Community Medicine and Public Health
Raut S et al. Int J Community Med Public Health. 2022 Sep;9(9):3540-3543
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20222221

Original Research Article

An observational study to determine prevalence of vitamin D_3 deficiency and insufficiency in pregnant mothers of rural and urban health centres in Panvel block of Maharashtra

Sonal Raut[1], Rishikesh Wadke[1]*, C. S. Srinivas[2]

[1]Department of Public Health, [2]Director Academics Sri Sathya Sai Sanjeevani Centre for Child Heart Care and Training in Paediatric Cardiac Skills, Plot no. 2A Sector 38, Kharghar Navi Mumbai, Maharashtra 410210, India

Received: 18 July 2022
Revised: 11 August 2022
Accepted: 12 August 2022

***Correspondence:**
Dr. Rishikesh Wadke,
E-mail: drrishikesh.wadke@srisathyasaisanjeevani.com

ABSTRACT

Background: Severe deficiency of vitamin D_3 leads to increased risk of pre-eclampsia, gestational diabetes, preterm labour, and reduced bone mineral density in mother as well as child. Objectives were to know prevalence of vitamin D_3 deficiency and insufficiency in pregnant mothers and to understand rural urban difference in vitamin D_3 levels.
Methods: An observational cross-sectional study was done on data of 1100 pregnant mothers coming to ANC clinics at Rural and urban health centres, of Panvel block, Maharashtra, for Serum 25-hydroxyvitamin D using venous blood samples. The duration of study was from June 2019 to December 2021.Two study groups were made rural and urban. Statistical software's like Excel, SPSS were used.
Results: Fifty five per cent pregnant mothers were from rural and 45% from urban settings. Study revealed that in rural study group 16% were grossly deficient, and 69% had insufficient levels. In urban group15% had deficient and 70% had insufficient levels of Vitamin D_3. An overall inadequacy of 85% was found at the end of study. Out of the total study population 26% of pregnant mothers were in first and third trimester and 48%in second trimester. No relationship was established in vitamin D_3 levels and demographic settings or gestational age.
Conclusions: In India vitamin D_3 supplementation is not part of antenatal care, but seeing the high prevalence of deficiency and insufficiency, which indicate an on-going hidden epidemic, prophylactic vitamin D_3 supplementation can be thought of in national health programs like RMNCH+A.

Keywords: Vitamin D_3, Deficiency, Insufficiency, Panvel block, Pregnant mothers, Prevalence, Primary health centres, Urban health centres

INTRODUCTION

Deficiency of 25-hydroxyvitaminD is a worldwide epidemic.[1] Pregnant mothers are not spared from it.[2] Mother's deficient in 25-hydroxyvitaminD can lead to vitamin D_3 deficiency in the foetus .As the active trans placental transport of calcium and vitamin D_3 is the only source for the foetus, the problem worsens.[3] Function of vitamin D is to regulate calcium and phosphate metabolism. It is essential for good skeletal health, immune system, brain development of the foetus.[4] Making it a vital nutrient for healthy pregnancy and good foetal outcome .Severe deficiency of vitamin D_3 leads to increased risk of pre-eclampsia, gestational diabetes, preterm labour, and reduced bone mineral density in mother as well as child.[6] Lab investigations are a major component of essential ANC care but estimation of vitamin D_3, serum calcium is not done as a routine, so many are left undiagnosed and untreated .By looking at the results we got, there is an on-going hidden epidemic of vitamin D_3 inadequacy in women which needs immediate attention.

METHODS

An observational cross sectional study was carried out on 1100 pregnant mothers in the age group of 18-35 years from Wavanje PHC-subcentres and five urban health centres in Panvel block for serum 25- hydroxyvitamin D levels. The study was approved by the institutional Ethics Committee. The pregnant mothers came from a lower socio-economic stratum of rural, tribal, urban and semi urban areas. The pregnant mothers were registered with ANC clinics from June 2019 till April 2021. The venous blood samples of pregnant mothers were collected at their first visit to the clinics as an essential component of ANC care. Vitamin D_3 estimation was done from the sample collected for essential investigations like HIV, HbsAg, VDRL, and TSH. No separate blood collection was done. The ANC mother was not subjected to any stress or undesirable effects. The mothers were informed and counselled before collecting the blood samples, if not willing the sample was not collected. The sample size of 1100 pregnant mothers was obtained by using the formula $4PQ/L^2$ where P is the percentage of prevalence of vitamin D_3 deficiency which after extensive review of literature was taken as 85% and L is the allowable error which was kept very low at 2.5%. Out of five PHC's Wavanje PHC was selected using random sampling technique and all five urban health centres of Panvel were selected. The study groups were divided into Rural and Urban groups. The data was analysed to know the prevalence of vitamin D_3 deficiency and insufficiency in pregnant mothers. Serum 25-hydroxyvitamin D is the globally accepted biomarker for determination of vitamin D_3 levels.[5,6] The estimation of serum 25-hydroxyvitamin D was done using venous blood on certified and standardized 25-hydroxyvitamin D assays (i-chroma). 25-hydroxyvitamin D levels below 10 ng/ml were considered as deficient in vitamin D_3, levels between 10 to 30 ng/ml considered as Insufficient.[7] Statistics were derived from various descriptive correlational statistical software's like Excel, SPSS version 21. A pretested and validated format was used for data collection. The data was recorded on ANC cards; data entry was done online in Growayu software for pregnant mothers, and Excel sheets.

RESULTS

Demographic distribution of the pregnant mothers is represented in Figure 1.

Table 1 shows distribution of pregnant mothers according to the trimester and vitamin D_3 levels in rural and Table 2 represents the urban group.

At the end of the study 16% rural and 15% pregnant mothers from urban group were found to be grossly deficient. The percentage of vitamin D_3 status in relation to demography and trimester in urban and rural group is represented in Figure 2. The prevalence of insufficiency was 69% and 70% in rural and urban group respectively.

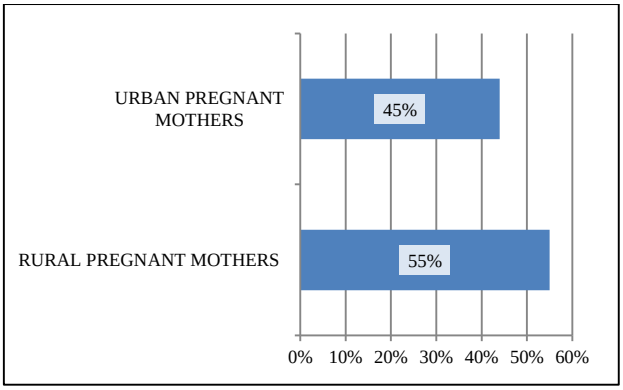

Figure 1: Demographic distribution of pregnant mothers.

Table 1: Trimester wise vitamin D_3 levels in rural pregnant mothers.

Trimester	Deficient	Insufficient	Sufficient	Total
First	25 (14%)	126 (16%)	25 (17%)	176
Second	49 (71%)	200 (68%)	45 (69%)	294
Third	29 (11%)	113 (15%)	21 (12%)	163
Total	103 (16%)	439 (69%)	91 (14%)	633

Chi square test p>0.05 not significant

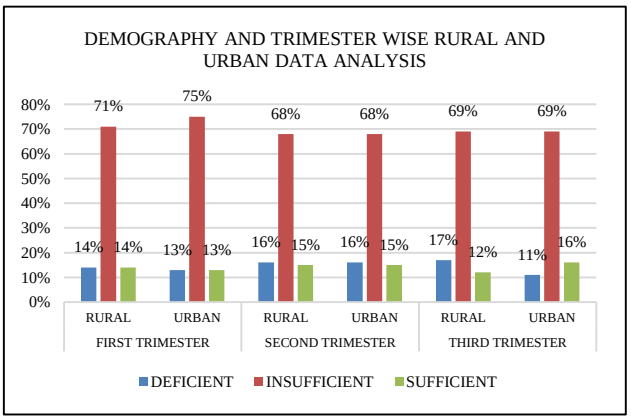

Figure 2: Vitamin D_3 status in relation to demography and trimester in urban and rural group.

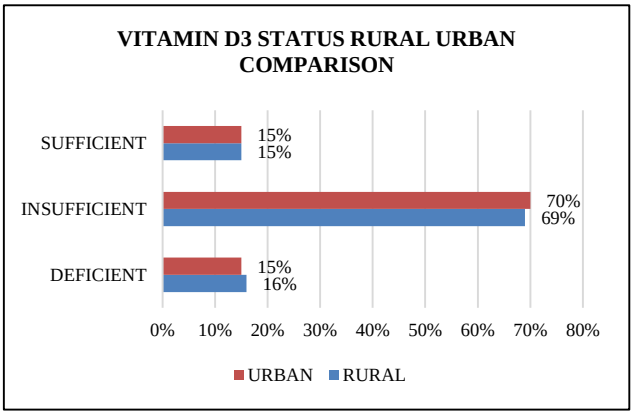

Figure 3: Vitamin D_3 status rural and urban comparison.

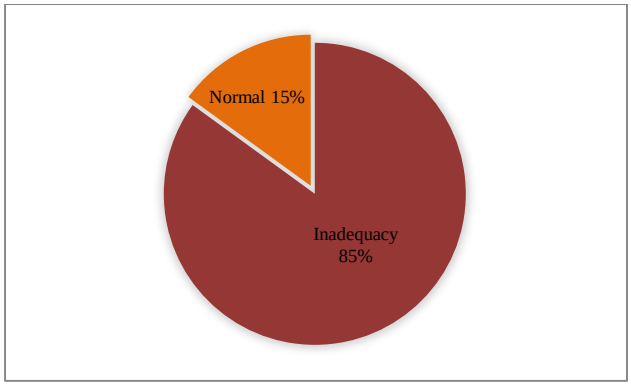

Figure 4: Vitamin D_3 overall inadequacy in pregnant mothers.

Our study revealed that there is a generalized inadequate state of vitamin D_3 in pregnant women irrespective of gestational age and demographic settings. Median of vitamin D_3 in rural group was 16.1 ng/ml and 16.6 ng/ml in urban group. The median value is representative of insufficiency in both the study groups. As evident from Figure 3 the vitamin D_3 deficiency and insufficiency is seen in the same range in urban as well as rural study group, thus the study reveals that there is no relationship between vitamin D_3 status and demography. An overall inadequacy i.e., deficiency and insufficiency of vitamin D_3 was found to be 85% at the end of the study (Figure 4) that means only 15% mothers had normal vitamin D_3 values.

DISCUSSION

This study focused on estimation and knowing the prevalence of vitamin D_3 deficiency and insufficiency in relation to the demographic settings of ANC mothers . Serum 25 OH D level is the best metabolite for reflecting vitamin D levels as stated by Holick et al and FOGSI Recommendations.[5,6] 16 %mothers were grossly deficient and 69 %were found to have insufficient levels from rural group and 15 %had gross deficiency and 70 %insufficient vitamin D_3 levels from the urban study group .Overall prevalence of 85 %was found at the end of the study .A similar study apart from this study Marwaha et al states an overall prevalence of 96.3 %which included women from all gestation, with 36·8%, 41·8% and 17·7% falling into the mid, moderate and severe deficiency.[2] FOGSI clinical recommendations state a prevalence of hypovitaminosis D from 42% to 74% among pregnant women. Overall, a high prevalence of vitamin D deficiency (>65%) was reported among infants, pregnant and lactating mothers.[6]

Our findings also concur the high prevalence rate .An important finding of our study was that vitamin D_3 inadequacy was common and in the same ranges irrespective of demographic settings [8].No relationship was established between gestational age and vitamin D_3 levels .The only natural source of vitamin D_3 is sun exposure .In essential ANC care the pregnant mothers are supplemented with folic acid, calcium, and iron but not vitamin D_3 .Pregnant mothers do not undergo investigations for vitamin D_3 and serum calcium levels in the ANC profile as a routine, leaving many pregnant mothers undiagnosed of having vitamin D_3 inadequacy and are therefore left untreated .

Confounding factors like skin pigmentation, seasonal variations, calcium and vitamin D_3 supplement intake, parathyroid levels were not analysed .All these women came from a lower economic stratum of the society and had a consistent nutritional, educational background . Lack of proper fortified diets, Indian skin tone, traditional clothing can be the reasons for generalized inadequacy.

CONCLUSION

We concluded that there is generalized insufficiency of vitamin D_3 in pregnant mothers and it has no relation with gestational age and demography the mother belongs to. The high prevalence rate indicates an on-going hidden pandemic which needs immediate attention. In India prophylactic vitamin D_3 supplementation is not a part of essential antenatal care, but seeing the evidence of high prevalence rate of deficiency and insufficiency, prophylactic vitamin D_3 supplementation could be included in National Health programs like RMNCH+A. Steps can be taken to include vitamin D_3 supplementation in the essential ANC care at all levels. FOGSI (Federation of Obstetric and Gynaecological Society of India) recommends supplementation of vitamin D_3 over the period of gestation with maximum dose of 4000IU which is found to be safe and effective second trimester onwards.[6] Fortification of staple foods could also be thought of as a preventive and promotive measure. Maternal vitamin D inadequacy can result in infant vitamin D deficiency which is projected to be very high, this can be easily prevented by including vitamin D supplementation in RCH programs. More research studying the effects of maternal vitamin D_3 on infants is the need of the hour.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Gupta S, Aparna P, Muthathal S, Nongkynrih B. Vitamin D deficiency in India. J Fam Med Prim Care. 2018;7(2):324.
2. Marwaha R, Tandon N, Chopra S, Agarwal N, Garg M, Sharma B, et al. Vitamin D status in pregnant Indian women across trimesters and different seasons and its correlation with neonatal serum 25-hydroxyvitamin D levels. Br J Nutr. 2011;106(9):1383-9.
3. Sachan A, Gupta R, Das V, Agarwal A, Awasthi P, Bhatia V. High prevalence of vitamin D deficiency

among pregnant women and their newborns in northern India. Am J Clin Nutr. 2005;81(5):1060-4.
4. Jani R, Palekar S, Munipally T, Ghugre P, Udipi S. Widespread 25-hydroxyvitamin D deficiency in affluent and nonaffluent pregnant Indian women. BioMed Res Int. 2014;2014:1-8.
5. Holick M, Binkley N, Bischoff-Ferrari H, Gordon C, Hanley D, Heaney R, et al. Evaluation, treatment, and prevention of vitamin D deficiency: an endocrine society clinical practice guideline. J Clin Endocrinol Metabol. 2011;96(7):1911-30.
6. FOGSI Clinical Recommendations. Vitamin D in pregnancy, lactation, PCOS, infertility, menopause and bone health. Mumbai: FOGSI; 2019:3-22.
7. Raubenheimer EJ, Noffke CEE. Vitamin D and health: a historical overview. SA Orthopaed J. 2011;10(2):39-43.
8. Haliloglu B, Ilter E, Aksungar FB, Celik A, Coksuer H, Gunduz T, et al. Bone turnover and maternal 25 (OH) vitamin D_3 levels during pregnancy and the postpartum period: should routine vitamin D supplementation be increased in pregnant women? Eur J Obstet Gynecol Reprod Biol. 2011;158(1):24-7.

Cite this article as: Raut S, Wadke R, Srinivas CS. An observational study to determine prevalence of vitamin D3 deficiency and insufficiency in pregnant mothers of rural and urban health centres in Panvel block of Maharashtra. Int J Community Med Public Health 2022;9:3540-3.