Prevalence of serum 25-hydroxy vitamin D deficiency in mother with small for gestational age newborns

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Abstract

Background: Vitamin D deficiency in pregnancy has many adverse effects like gestational diabetes, premature delivery, and hypertension. Vitamin D deficiency can also affect the developing fetus and it can result in small for gestational age babies.

Objective: To determine the prevalence of vitamin D deficiency in the mothers who have small for age neonates.

Methodology: It was a cross-sectional study conducted from 18th October 2016 to 17th April 2017 at Obstetrics &Gynecology Unit, Jinnah Hospital, Lahore. All patients included in the study were assessed for having small for gestational age fetus clinically and ultrasonogra-phically and the mode of delivery was decided according to the individual patient's condition. The weight of the neonate was recorded after birth, and 25 hydroxyvitamin D levels of mothers' blood were done. All data were recorded on the pre-designed Performa and analyzed through statistical software of SPSS version 22. Chi-square test was applied taking p-value ≤ 0.05 as significant.

Results: A total of 100 women were included in this study. All of these 100 women had small for gestational age newborns. Mean age of the women included in the study was 31.72±7.19 years. The mean gestational age of the fetus was 38.35±2.32 weeks. Vitamin D deficiency was present in 56% of females included in this study.

Conclusion: This study showed that more than half of the mothers who had small for age neonates.

Keywords: Small for gestational age, Newborns, Vitamin D deficiency, Mothers

Article Citation: Fayyaz S, Ahsan A, Masood H, Riaz F, Tariq R, Prevalence of serum 25-hydroxy vitamin D deficiency in mother with small for gestational age newborns. JSZMC, 2022;13(1):18-23. **DOI:** https://doi.org/10.47883/jszmc.v13i01.205

Introduction

Vitamin D plays an important role in normal body functions like bonemetabolism, calcium regulation, growth, and reproduction.[1] Vitamin D deficiencycan cause rickets in children and in adults it may cause osteoporosis and chronicbone pain.[2] There is a high prevalence of vitamin D deficiency among the general population. It may be due to inadequate exposure to sunlight and insufficientdietary intake.[3,4] Vitamin D insufficiency is highest among people who areelderly, institutionalized or hospitalized. In the United States, 60% of nursing homeresidents and 57% of hospitalized patients were found to be vitamin D deficient.[5] Vitamin D deficiency in pregnancy has many adverse effects likegestational diabetes, premature delivery, and hypertension.[6] The rate of Cesareansection is four times more common among women with low levels of vitamin Dthan women with normal levels of vitamin D. Vitamin D deficiency can also affectthe developing fetus and it can result in small for gestational age.[7] Growthretardation in the developing fetus is the main cause of neonatal mortality and othercomplications. This growth retardation of the fetus is more in the mothers who havevitamin D deficiency.A study that compared the prevalence of vitamin D deficiency inthe mothers with small for gestational age and appropriate for gestational ageneonates.[8] A total of 40 patients with SGA and AGA were compared and vitaminD deficiency was significantly high in the mothers with small for gestational ageneonates.[8] Vitamin D deficiency was 45% in the patients with SGA, and 20% inthe patients with SGA.[9,10]The high prevalence of vitamin D deficiency associated with small forgestational age neonates is important in the early detection and prevention of fetal growth retardation.[11,12] The aim of this study was to determine the prevalence of vitaminD deficiency in the mothers who have small for age neonates in Pakistanbecause no previous local data is available in this regard. The results of my study may help in deriving recommendations for early diagnosis and treatment of vitaminD deficiency in pregnant women, and hence better health and outcome of thenewborn, reducing neonatal mortality and other complications in later life.

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Methodology

This was a cross-sectional study conducted in the department of Obstetrics and Gynecology, Jinnah Hospital Lahore after permission from concerned authorities and ethical committee. A total of 100 pregnant ladies at a gestational age between 35-42 weeks, having a single small for gestational age fetus on ultrasound, were included in the study. Patients having high blood pressure, raised blood sugar, congenital abnormality baby and patients on Vitamin D supplements were not included in the study. Informal consent was taken before inclusion in the study. All patients were assessed for having small for gestational age fetus ultrasonographically.Patients were assessed by a consultant gynecologist with more than 2 years ofexperience after fellowship, and the mode of delivery was decided according to theindividual patient's condition. The weight of the neonate was recorded after birthand if it does not match with the findings of ultrasound, that patient was excludedfrom the study. The mother's blood was drawn and sent for 25-hydroxy vitamin D levels. All the patients were shifted to the obstetrics ward and they were given standard post-natal care. The serum level of 25-hydroxy vitamin D was recorded and the patient was discharged if deemed so by the attending obstetrician. All data were recorded on the predesigned proforma.

Data were analyzed using SPSS version 22. Mean and standard deviation was calculated for quantitative data like age of the mother, weight, height, BMI, gestational age of the fetus, and 25-hydroxy vitamin D levels. Frequency and percentages were calculated for analysis of qualitative data like economic status and Vitamin D deficiency. Data was stratified for age, gestational age, BMI, and economic status to controleffect modifiers. Post-stratification chi-square test was applied taking p-value ≤ 0.05 as significant.

Results

A total of 100 women were included in this study. All of these 100 women had small for gestational age newborns that were diagnosed by ultrasound studies. The mean age of the women included in the study was 31.72±7.19 years. The mean gestational age of the fetus was 38.35±2.32 weeks. The mean BMI ofthe mothers was 21.39±4.18. Out of 100 women, 35% belonged to lowersocioeconomic class, 32% belonged to middle socioeconomic class, and 33%women were from high socioeconomic class.

Vitamin D deficiency was present in 56% of females included in this study as shown in Figure-I. Data were stratified according to age, BMI, gestational age of the fetus, and socioeconomic class.

The post-stratification chi-square test was applied.

Figure-I: Prevalence of Vitamin D deficiency in mothers of Small for Gestational Age newborns

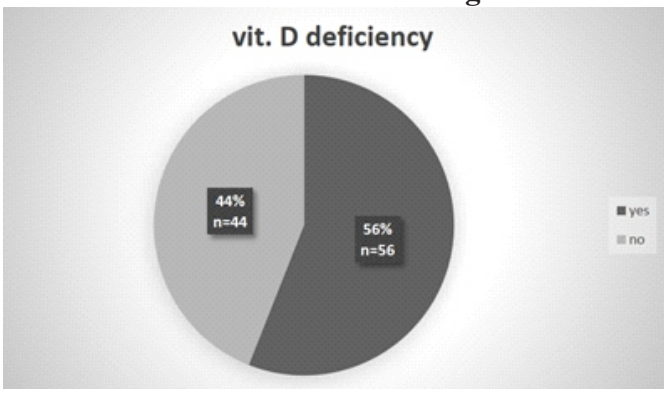

Table-I: Stratification of Vitamin D deficiency with socioeconomic status, age of mother, BMI, and gestational status

Vitamin D Deficiency	Socioeconomic status			P-value
	Lower class	Middle class	Upper class	
No	13	15	16	0.593
Yes	22	17	17	
Total	35	32	33	
Vitamin D Deficiency	**Age of the mother (years)**			**P-value**
	Less than 29	29-37	More than 37	
No	17	15	12	0.803
Yes	22	16	18	
Total	39	31	30	
Vitamin D Deficiency	**BMI**			**P-value**
	Less than 20	20-24	More than 24	
No	19	12	13	0.423
Yes	18	15	23	
Total	37	27	36	
Vitamin D Deficiency	**Gestational age (weeks)**			**P-value**
	=39	>40		
No	28	16		0.765
Yes	34	22		
Total	62	38		

Discussion

This study assessed vitamin D deficiency among mothers with small for gestational age newborns, and its stratification with maternal age, socioeconomic status, gestational age, and maternal BMI. The age of the women included in the study was 31.72±7.19 years. The mean gestationalage ofthe fetus was 38.35±2.32 weeks. The mean BMI ofthe mothers was 21.39±4.18. Out of 100 women, 35% belonged to lowersocioeconomic class, 32% belonged to middle socioeconomic class, and 33%women were from high socioeconomic class.Vitamin D deficiency was present in 56% of females. According to the results of this study, the prevalence of vitamin D deficiency (<20ng/ml) inmothers of small for gestational age (SGA) newborns was 56%. The results of this study augment the resultsof the study conducted previously, which showed there is an increased prevalence of vitamin D deficiency in mothers of SGA newborns.[8] In that study the prevalence of vitamin D deficiency in SGA newborns was 45% while only 20% of women with AGAnewborns had vitamin D deficiency. The mean age of the patients in the current study was31.72±7.19 years. The mean age of the patients in that study was 26.78±5.26 years. In the current study, the meangestational age of the fetus in this study group was 38.35±2.32 years; while in the previous study,[8]it was 37.32±0.94, which is comparable to my study results.Only mothers of SGA were included in my study while in other study mothers ofSGA and AGA newborns were compared for the prevalence of vitamin D deficiency. The sample size was relatively larger in the currentstudy. Cut off point for vitamin D deficiency (<20ng/ml)and SGA newborns (less than 10th centile for gestational age) was the same in both groups, and SGA newborns were diagnosed ultrasonographically in both groups thematernal age and BMI in the current study showed no relation with vitamin D deficiency in themothers (p value=0. 803 for age, p value= 0.423 for BMI), which was consistentwith the results of other studies.In some previous studies,[12,13] it was found that there is a significant relationship betweenthe non-use of multivitamins and vitamin D deficiency in the mothers, while the relation between vitamin D deficiency in mothers and its deficiency in cord blood samples werestatistically significant. The use of multivitamins and cord blood sample vitaminD levelswere not included in the current study.

In a study, Nasrin K[14] determined the relationship between maternal vitamin D levelsand low birth weight neonates. A total of 102 neonates were divided into twogroups, LBW neonates (< 2500 g) and neonates with birth weights > 2500g. Dataregarding medical history, physical examination, and anthropometric measurementsof neonates were collected. The maternal blood sample was analyzed for vitamin D levelsafter delivery. The results of his study showed that mean maternal vitaminD levels weresignificantly lower in mothers of low birth weight neonates (25.05 ±20.16 ng/ml in LBW group verses 38.13±18.5 in other group, p=0.001). This reveals that 62.3% of mothers ofLBW neonates had vitamin D deficiency which is in accordance with the results of the current study. In that study,[13] relationship between vitamin D deficiency and head circumference of neonates(HC<34) was statistically significant (p value=0,007), while, there was nostatistically significant difference between maternal vitamin D deficiency and height(<48 cm) of neonates (p value= 0.054). There was no statistical difference betweenparity or educational level of the mother and maternal vitamin D deficiency (p = 0.23 and p = 0.43 respectively). Anthropometric measurements and parity of the mother were not included in the current study. Mean maternal age was higher in vitamin D deficiencymothers (p = 0.031), which is contrary to the results of the current study, where no significantrelation was foundbetween the age of the mother and vitamin D deficiency. Cut off value of vitamin D deficiency (<25ng/ml) in that study was different than current study.Another study was done by Yuan-Huachenon the cohort of 3658 mothers andsingleton offspring pairs.[7] Positive correlation between maternal vitamin D levels andneonatal birth weight was found in the study. The mean age, BMI, and gestational ageof the patients were comparable to the current study. Maternal serum 25 (OH) D levelsweredivided into three groups: vitamin D deficiency (<20 ng/mL), vitamin D insufficiency (20–29.9 ng/mL), and vitamin D sufficiency (≥30 ng/mL). Overall 16.01% of neonates wereSGA in the vitamin D deficient group, 5.52% were SGA in the vitamin D insufficient group whichwas significantly higher than 2.80% SGA neonates in the vitamin D sufficient group (p =0.001).[7] Result of that study

showed that there was a threshold value (40 ng/ml) below which vitamin D level is an important predictor of birth weight. It was also found that vitamin Ddeficiency equally affects birth weight in all three trimesters of pregnancy. In thatstudy age, gestational age, parity, and monthly income did not affect vitamin D deficiencyin mothers in accordance with current study results. While contrary to the current study vitamin Dlevels were slightly higher in mothers with BMI > 18.5 compared to mothers withlower BMI. Further, serum vitamin D levels were higher among mothers takingmultivitamin supplements and samples collected in the summer and spring seasons. Vitamin D affects fetal growth by its interaction with Ca2+ homeostasis and parathyroid hormone(2). The results of the current study and other studies suggest that Vitamin D deficiencyis associated with poor fetal outcomes including, LBW neonates, preterm births,increased perinatal morbidity, infectious disease, and sepsis. Vitamin D deficiency iscommon in Pakistani mothers and infants. It is difficult to draw a final conclusion on the need for vitamin D supplementation during pregnancy. However, currently available data indicates that vitamin D supplementation during pregnancy reduces the risk of LBW neonates, preterm births, respiratory infections, and sepsis.

Conclusion

This study found that Vitamin D deficiency was present in more than of women with small of gestational age newborns.

Authors Contribution: SF: Conception of work, Interpretation of data and drafting. **AA:** Design of work, Acquisition and analysis of data and Drafting. **HM:** Conception of work Interpretation of data and revising. **AH:** Acquisition, Analysis of data and revising. **FR:** Design of work and drafting. **RT:** Interptation of data and revising.
All authors critically revised and approve its final version.

Conflict of Interest: Author has declared no conflict of interest.

Sources of Funding: The source of funding was self.

Declaration: None

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