

A Critical Analysis of Vitamin D and Calcium in Women during Pregnancy

MUHAMMAD ABBAS¹, SHAZIA AZHAR², ASHER FAWWAD³, HINA ABBAS⁴, HUMAIRA JABEEN⁵, FAZZILAT KAMAL⁶, MUHAMMAD SOHAIL⁷

¹Senior Technologist, Patel Hospital Laboratory Karachi

²Assistant Professor & Deputy Director, Baqai Institute of Medical Technology, Baqai Medical University Karachi

³Professor & Head of Biochemistry, Baqai Medical University Karachi

⁴Senior Lecturer, Baqai Institute of Medical Technology, Baqai Medical University Karachi

⁵Vice Principal, National Institute of Physical Therapy & Rehabilitation Karachi

⁶Consultant Consultant, Darul Shifa Medical Center & Maternity Home Karachi

⁷Medical Technologist, DHQ Hospital, Lakki Marwat

Correspondence to: Dr. Shazia Azhar E-mail: shaziahashem@gmail.com Cell 0332-3383315

ABSTRACT

Aim: To find out the frequency of vitamin D and calcium in pregnant women and their effects on fetus as well as mothers.

Study Design: Retrospective study.

Place and Duration of Study: Darul Shifa Clinic & Maternity Home Karachi Pakistan from 1st July 2020 to 31st December 2020.

Methodology: One hundred and twenty patients with proper evidence of pregnancy were enrolled. All patients from age 18 years to age 35 years with no other disease were included and those women who have some other diseases or age outliers were excluded.

Results: There is a significance difference in the vitamin D and calcium during the period of pregnancy. In the group A (18 years to 25 years) the significance difference of vitamin D was (P=0.000) while the calcium was (P=0.200). In the group B (26 years to 30 years) the significance difference of vitamin D was (P=0.000) while the Calcium was (P=0.071) and in the group C (30 years to 35 years) there was no significant change of vitamin D and calcium (P=0.000). The result of group C is different from the results of the above two groups, because in this age majority of the women were living in a congested houses as well as were spending a depressive life due to home problems, husband wife compromise problems, children problems, financial problems etc. and all such problems have a direct impact on their pregnancy

Conclusion: It was statistically found that the Vitamin D and calcium values show significances changes during pregnancy in contrast to the normal women.

Key words: Vitamin D, Calcium, Pregnant women

INTRODUCTION

Pregnancy is a physiological state during which developing fetus totally depends on mother for nutrition. During this period the requirement of nutrients and other supplements like calcium, vitamins, iron and folic acid significantly increase. During the time of pregnancy 30 grams of calcium is transmitted in to fetus. Due to which numerous physiological/biological modifications occur in mother body to provide such amount of calcium like increase intestine absorption of calcium, increase reabsorption from bones and decrease urinary calcium excretion.¹

Calcium and vitamin D are extremely beneficial for both mother and baby during pregnancy span. The insufficient amount of calcium and vitamin D can lead to a number of problems during pregnancy.² Vitamin D is elevated when maternal kidney 1 α hydroxylase enzyme are elevated.³ There is an increased risk of preeclampsia, gestational diabetes mellitus, smallness for gestation infant and pre term birth due to vitamin D deficiency.⁴

Extreme deficiency of Vitamin D in pregnancy may lead to severe illness in both fetus and mother. Decreased weight gain and pelvic deformities that prevent normal vaginal delivery in pregnancy is also a cause of Vitamin D deficiency. Maternal vitamin D deficiency is linked with neonatal problems comprising hypocalcaemia, with or without convulsions rickets and defective tooth enamel.

The full-term fetal skeleton comprises of round about 30 g of calcium with the majority of accretion happening in the third trimester, whereas feeding women secrete approximately 280-400 mg/day of calcium in breast milk.^{2,5}

Round about five percent of the pregnant females have preeclampsia, defined as hypertension and proteinuria starting in the second half of gestation. Preeclampsia is a primary reason of maternal death throughout the world and is accompanied by substantial perinatal morbidity and mortality.⁶

The deficiency of vitamin D during pregnancy is related with many short and long span problems in neonates, such as multiple sclerosis, rickets in children, recurrent wheezing, type I diabetes, weakness of internal immune system, vitamin D deficiency in infants, and smallness for gestational age (SGA). According to earlier studies, using supplements in pregnancy is essential to increase the serum levels of calcium and vitamin D in mothers and neonates. The results of 13 clinical trials 3-15 and several meta-analyses 16-20 have suggested that calcium supplementation reduces the incidence of preeclampsia.⁷⁻⁹

Vitamin D has a momentous role in the development of skeletal muscles, Immune system; cell differencing having protein like nerves growth factor in the CNS. In recent times the vitamin D has been concerned as a threat

factor for diabetes, IHD¹⁰ and TB in Asians.¹¹ Low maternal vitamin D may adversely affect the developing fetal brain. In addition to the previously known pediatric problems of hypocalcaemic fits, dental enamel hypoplasia, infantile rickets, and congenital cataracts in early life, vitamin D deficiency has been shown to affect postnatal head and linear growth.¹²

In the United Kingdom, the Committee on Medical Aspects of Food Policy (COMA) recommended that all newborns receive 7–8.5 µg (280–340 IU) of vitamin D daily either in a multivitamin preparation or in fortified infant formula milk. It recommends that all pregnant and lactating mothers should receive 10 µg (400 IU) of vitamin D daily¹³ and advises that Asian children should be encouraged to take vitamin D supplements throughout the first five years of life. Several researches consequently reported that infants of mothers with low vitamin D intake during pregnancy had low serum calcium concentrations in cord blood or during the first week of life.^{14,15} Also, it may be possible that maternal vitamin D status affects fetal growth and bone development.^{16,17}

The level of vitamin D is the major key for pregnant female and calcium level of her fetus, low level of vitamin D and calcium is to be consider the primary factor of rickets, osteomalacia, poor development of CNS system etc.^{18,19} This problem is not only restricted to pregnant ladies from Pakistan, however there are reports of a high occurrence of low vitamin D position amongst pregnant women in the Middle East, Pakistan, India and Ethiopia.²⁰

In a population where there is already has a high prevalence of vitamin D insufficiency and poor nutritional calcium intake, the problem is likely to worsen during the period of pregnancy because of the active transplacental transport of calcium to the developing fetus. Hypovitaminosis D in pregnancy has vital consequences for the newborn comprising of fetal hypovitaminosis D, neonatal rickets and tetany and infantile rickets.^{21,22} The inadequate amount of Calcium as well as vitamin D can cause a number of problems in the pregnant women as well as in the fetus like underdeveloped growth, a reduced peak bone density increasing the risk of osteoporosis and some problems of CNS system later in life.²³

During pregnancy the developing baby is totally dependent upon the calcium store in the mother body due to which the mother's bones and teeth are always at risk, and the developing fetus needs a proper amount of calcium for a better survival. 30 g of calcium is required to a normal fetal skeleton by the end of 2nd trimester while 80% of the calcium accretion is occurred during the third trimester in pregnancy. This means that in the third trimester the normal fetal required 250-300 mg of calcium.²⁴

Vitamin D derived from both diet and sunlight. Mainly the vitamin D derives from sunlight and the lack of expose to sunlight is the main cause of vitamin D deficiency.²⁵⁻²⁷ Calcium is the main mineral for both genders, it is especially imperative to the health of females. As the women get older they start losing calcium from bones. So keeping sufficient level during this period is serious to escape major skeletal problem.²⁸ Sun light plays a key role in vitamin D for performing different types of functions in the body. The 25-hydroxylase helps to metabolizes vitamin

D3 in to 25-hydroxy vitamin D3 the activated form of vitamin D.²⁹

MATERIALS AND METHODS

This retrospective study was conducted at Darul Shifa Clinic & Maternity Home Karachi Pakistan from 1st July 2020 to 31st December 2020 and comprised 120 different gestational age women between 18 to 35 years. Patients from any other hospital because of the time insufficiency were excluded. The frequency of vitamin D and calcium were calculated by the SPSS version 20.

RESULTS

The vitamin D was significantly deficient while the ratio of the calcium was normal in majority of the cases during pregnancy. In group one, 18-25 years showed vitamin D mean value gain was 11.6±10.939 and P=0.000. Whereas in calcium the mean value was 7.463±0.200 and P=0.200. In the second age group from 26-30 years vitamin D, the mean was 13.3±7.667 and P=0.000 while in calcium, the mean was 7.902±0.980 and P=0.071. In third age group from 31-35 years vitamin D, mean was 20.3±15.790 and P=0.000 whereas in calcium, the mean was 8.47±0.919 and P=0.000. These results shows significant deficiency of vitamin D in all three groups but the ratio of calcium was not deficient because of taking calcium supplements during this span. The results of group third was different from the results of the above two groups which shows both vitamin D as well as Calcium also deficient between 31-35 years (Table 1).

Table 1: Comparison of age according to vitamin D and calcium

Age (years)	Vitamin D	Calcium	P value
18-25	11.6±10.93	7.46±1.0	0.000
26-30	13.3±7.66	7.90±0.98	0.071
31-35	20.3±15.79	8.47±0.19	0.00

DISCUSSION

The vitamin D and calcium are the essential parameters in the period of pregnancy. Nobody can deny this truth that human body is the combination of different systems (digestive, urinary, reproductive, Respiratory, muscular etc) having their own specific role for a healthy survival, but unfortunately nowadays there is a catastrophic lack of the balance diet due to which human life is facing serious problems in their routine life, in which calcium and vitamin D is on the peak.³⁰

According to a research conducted in Iran in 2007 stated that vitamin D and calcium are the vital parameters for a better survival in general and playing a key role in the women during pregnancy. This showed that vitamin D concentration of pregnant women is lower than the normal women and a stress is also given to the use of sufficient amount of calcium and vitamin D supplements intake during pregnancy is important.³¹

The concentration of vitamin D and calcium was significant greater than the women seen as non-pregnant. Some other studies also mentioned that women who attained the vitamin D during pregnancy had a greater head circumference as compared to those who did not receive vitamin D, and the deficiency of vitamin D may have sever variations in pregnancy outcomes.³²

The mean score of vitamin D was 11.6 ± 10.939 and mean score of calcium was 7.463 ± 1.102 and $P=0.200$. There is a significant lack of vitamin D in the first group having ages from 18 to 25 years. Whereas there is no significant lack of calcium was found in this group. In the current study a great correlation was found with the previous studies. Maghbooli et al³¹ reported that vitamin D is continuously lower in the first three to eight months of pregnancy in the age of 19-30 years. Kazemi et al³³ also observed a high prevalence of physiologically significant hypovitaminosis D among pregnant women in Iranian population. This study showed that the mean score of vitamin D was 13.3 ± 7.667 and the mean score of calcium was 7.902 ± 0.980 ($P=0.071$) in second age group. So this interpretation clearly demonstrates that there is a significant lack of vitamin D in the 2nd group having ages from 26 to 30 years. Whereas there is no significant lack of calcium was found in this group. Because normally both vitamin D and calcium is deficient during pregnancy but here the researcher achieved normal result of calcium just due to the taking of calcium supplement and proper care of the subject during this span.

Karim et al³⁴ conducted a study in a tertiary-care center Karachi, Pakistan reported that vitamin D deficiency is high among pregnant urban Pakistani women and their newborns. According to the current study, the age between 31-35 years, the mean score of vitamin D was 20.3 ± 15.790 and mean score of calcium was 8.47 ± 0.919 and the value of significance was 0.000. So this analysis clearly proves that there is a significant lack of vitamin D and calcium in the 3rd group having ages from 31 to 35 years.

CONCLUSION

Vitamin D and calcium are the key standards that need proper care and attention during pregnancy and there is a significant lack of vitamin D especially in women whereas for eliminating the deficiency of calcium, majority of them are taking supplements for better outcomes. The proper care, attention, balanced diet and peaceful environment should be provided to the women during pregnancy so that they spend their life in peace not in piece.

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