Comparative study of vitamin (D) Status in Full Term and Preterm Infants and Their Respective Mothers

Gamal samyAli, \*Mohamed Ashraf Abd Elwahed,\*Rania Ibrahim Hossni Ismail , Shaimaa Mohamed Hassan Ali

Pediatric Department of medical studies for children, Institute of Postgraduate childhood studies and Pediatric Department ,Faculty of Medicine, Ain Shams University, cairo, Egypt.

 Abstract

Background: Vitamin D is important for maintenance of calcium and phosphorus homeostasis and bone mineralization. Vitamin D deficiency in the mothers has possible adverse effects on the fetus and contributes to low vitamin D in infancy. Objectives: to assess vitamin D status, calcium , phosphorus and alkaline phosphate in preterm infants and their mothers. Patients & Methods: A cross sectional study was conducted on 46 neonates, and their mothers. The study was conducted between July and December 2013. The following had been done for all patients:Full medical history and Clinical examination for mothers and their neonates, Laboratory investigation: Maternal blood and Cord blood samples were collected at Delivery to measure vitamin D (vit D), calcium (Ca), phosphorus (P) and alkaline phosphates (ALP). Results: Maternal hypovitaminosis D (vitamin D (25(OH)D) < 10 ng\mL was found in 89 % of pregnant women at the time of delivery and neonatal hypovitaminosis D (vitamin D < 10 ng\mL) was found in 93.5% of studied neonates. Maternal vit D did not correlate to maternal dietary vit D, but it correlated to cord blood vit D. Maternal vit D was correlated to cord blood vit D but not cord blood Ca, Phosphorus ,or alkaline phosphatas. Conclusion: Vitamin D levels in Egyptian mothers at delivery is deficient and it correlates well to cord blood Vitamin D levels.

Key words: vitamin D (25(OH)D) deficiency, neonatal hypovitaminosis D ,cord blood Ca, Phosphorus and alkaline phosphatas.

مقدمـــة البحـــــث:

 ينظم فيتامين (د) تركيز الكالسيوم والفوسفات في الدم، وتعزيز النمو الصحي وإعادة تشكيل العظام، ولقد ثبت أيضا بعض الدراسات أن فيتامين (د) يلعب دورا هام في المناعة والمناعة الذاتية الفطرية قد تلعب دورا في أمراض العظام الأيضية، والتي تعتبر مشكلة اكثر شيوعا في الخدج الرضع في البلدان المتقدمة والبلدان النامية والتي يمكن أن تؤدي إلى ضعف النمو الخطي على المدى الطويل. تشيرالبيانات الحديثة إلى أن وضع فيتامين (د) لدي الأمهات يؤثر على حالة العظام في مرحلة الطفولة. وأخيرا، نظرا لارتفاع معدل انتشار نقص فيتامين (د) في الأمهات عند الولادة وآثارها السلبية المحتملة على الجنين والمساهمة في انخفاض فيتامين (د) في مرحلة الطفولة، من المهم اعطاء نسب كافية للأمهات من مكملات فيتامين (د) أثناء الحمل كجزء من الاستراتيجيات للحفاظ على صحة الام والطفل.

اهداف البحث:

1- دراسة وضع فيتامين (د) لدي الأمهات والاطفال حديثي الولادة.

2- تقييم عوامل الخطرالمرتبطة بنقص فيتامين (د) فى الاطفال حديثى الولادة.

المنهجية:

تصميم الدراســـــــــــــة: دراسة مقطعية

 تمت هذه الدراسة بغرف عمليات الولادة- مستشفي النساء والولادة0

 واشتملت أطفال حديثى الولادة كاملى وناقصي العمر الرحمى.

كل الأطفال حديثى الولادة خضعوا الى:

تاريخ مرضى تفصيلى.

 تقييم العمر الرحمى بإستخدام مقياس بالارد.

 الكشف الإكلينيكى الشامل.

 وزن الطفل ومقارنته بالمعدلات الطبيعية لمثل هذا العمر الرحمى.

1. تاريخ مرضي للام.
2. فحوصات معملية للطفل والام (نسبة فيتامين د, الكالسيوم, الفوسفور, الكالين فوسفاتيز).

وقد تم اخذ موافقة كتابية من الوالدين لإجراء البحث.تم وضع البيانات فى الجدول وتحلل إحصائيا بالبرنامج الإحصائى القياسىSPSS .

النتائج: قد وجد في هذه الدراسة ان:

- 89% من الامهات و 93% من الاطفال الخدج يعانون من نقص نسبة فيتامين د في الدم.

- ان نسبة كبيرة جدا من الامهات لا يتناولن فيتامين د قبل او اثناء فترة الحمل.

- عدم وجودعلاقة بين نسبة فيتامين د عند الامهات ونسبة الكالسيوم و الفوسفور والالكلين فوسفاتيز في الحبل السري عند الاطفا ل.

 - وجود علاقة طردية بين نسبة فيتامين د في الامهات ونسبة فيتامين د في الحبل السري للاطفال.

- وجود علاقة طردية بين نسبة الكالسيوم في الامهات ونسبة الكالسيوم في الحبل السري للاطفال.

- وجود علاقة طردية بين نسبة الالكلين فوسفاتيز في الحبل السري للاطفال ونسبة الالكلين فوسفاتيزو الكالسيوم والفوسفور في الامهات.

INTRODUCTION:

 Vitamin D is one of fat-soluble vitamins and it is responsible for intestinal absorption of calcium and phosphate.(1)Humans obtain vitamin D via synthesis from sun exposure and a small contribution from certain foods. The major determinants of vitamin D status are the characteristics of the skin and ultraviolet action over keratinocytes. Over the years, there is an increase in the prevalence of hypovitaminosis D.(2)

 Vitamin D deficiency is recognized as a pandemic. The major cause of vitamin D deficiency is the lack of appreciation that sun exposure in moderation is the major source of vitamin D for most humans. Very few foods naturally contain vitamin D, and foods that are fortified with vitamin D are often inadequate to satisfy either a child’s or an adult’s vitamin D requirement. Vitamin D deficiency causes rickets in children and will precipitate and exacerbate osteopenia, osteoporosis, and fractures in adults.(3)

 Maternal vitamin D status is responsible for fetal and newborn vitamin D status because a fetus receives all vitamin D support from the mother. Maternal 25(OH)D readily crosses the placenta and as early as 24 weeks’ gestation is metabolized to 1,25(OH)2D by the fetal kidneys for endocrine action and by other tissues for paracrine action .(4)

Objective:

 The aim of the present study is to assess Vitamin D status, calcium , phosphorus and alkaline phosphate in preterm infants and their mothers.

SUBJECTS AND METHODS

Design of the study : A cross sectional study

Subjects:

The study was conducted on 46 neonates, and their mothers. The study was conducted between July and December 2013, consecutive deliveries was attended at the delivery room of EL Sahel Teaching Hospital.

Included neonates were further sub classified as follows:-

Group A: less than 32 weeks and their mothers, Group B : 32 -36 weeks and their mothers, Group C :≥ 37 weeks and their mothers.

Exclusion criteria:

 Pregnant women with pre-existing parathyroid conditions, who required chronic diuretic or cardiac medication therapy including calcium channel blocker, or history of medications affecting metabolism of vitamin D and calcium. Congenital malformation, HIE.

Methods: for all neonates the following were done : (1) Full medical history and Clinical examination for mothers and their neonates. (2)Laboratory investigation: Maternal blood and Cord blood samples were collected at Delivery to measure vitamin D, calcium (Ca), phosphorus (P) and alkaline phosphates (ALP).

Ethical consideration: Deliveries were attended and included after having a consent from the mothers at the delivery room.

Statistical analysis

The data were coded, entered and processed on computer using Statistical Packaged for Social Science(5). The level P ≤ 0.05 was considered the cut-off value for significance.

RESULTS:

Maternal hypovitaminosis D (vitamin D < 10 ng\mL) was found in 89 % of pregnant women at time of delivery and neonatal hypovitaminosis D (vitamin D < 10ng\mL) was found in 93.5% of neonates. Maternal vit D did not correlate to maternal dietary vit D, but it correlated to cord blood vit D. Maternal vit D was correlated to cord blood vit D but not cord blood Ca, Phosphorus , alkaline phosphatas.

Table (1 ) : Correlation between maternal vit D and other variables

|  |  |  |
| --- | --- | --- |
| Maternal vit D | r | P value |
| GA (w) | -0.100 | 0.510 |
| Birth Wt (kg) | -0.044 | 0.769 |
| antenatal illness | 0.082 | 0.588 |
| Dietary vit D | 0.172 | 0.253 |
| sun exposure | 0.351 | 0.017 |
| vit D supplementation | 0.038 | 0.803 |
| Neonatal vit D | 0.308 | 0.037\* |
| Neonatal Ca | 0.167 | 0.267 |
| Neonatal p | 0.034 | 0.822 |
| Neonatal ALP | -0.038 | 0.801 |

Figure (1) : Positive correlation between Vit.D of mother and their neonates

Table (2) : Correlation of lab findings between mother and their neonates

|  |  |  |
| --- | --- | --- |
|  | R | P value |
| Vit. D (ng/ml) | 0.308 | 0.037\* |
| Ca (mg/ml) | 0.423 | 0.003\*\* |
| Phosphorus (mg/ml) | 0.391 | 0.007\*\* |
| ALP (IU/ml) | 0.433 | 0.003\*\* |

Table (3): Correlation between maternal symptoms of vit D deficiency and weight, GA of neonates and maternal age

|  |  |  |
| --- | --- | --- |
| Symptoms of vit D deficiency | r | P value |
| Birth weight | -0.114 | 0.449 |
| GA | -0.082 | 0.588 |
| Gravidity | 0.023 | 0.878 |
| Parity | 0.263 | 0.078 |
| maternal age | 0.045 | 0.766 |
| sun exposure | -0.274 | 0.066 |
| vit D supp | -0.028 | 0.854 |
| dietary vit.D | -0.088 | 0.559 |

r = Pearson correlation

Table (4): Correlation between neonatal Ca and other Maternal variables

|  |  |  |
| --- | --- | --- |
| Neonatal Ca | r | P value |
| Maternal Ca | 0.423 | 0.003\*\* |
| sun exposure | -0.038 | 0.800 |
| vit D supplementation | 0.056 | 0.711 |
| Dietary vit D | -0.077 | 0.609 |
| Maternal vit D | 0.167 | 0.267 |
| Maternal p | 0.133 | 0.376 |
| Maternal ALP | 0.199 | 0.184 |

DISCUSSION:

In the current study , maternal hypovitaminosis D (vitamin D ≤ 10 (ng\mL( or 25 (nmol\L)) was found in 89 % of pregnant women at time of delivery and neonatal hypovitaminosis D (vitamin D ≤ 10 (ng\mL( or 25 (nmol\L)) was found in 93.5% of neonates.

 This is similar to Studies from Saudi Arabia, Kuwait, United Arab Emirates and Iran reveal that 10 - 60% of mothers and 40-80% of their neonates had undetectable to low vitamin D levels (0-25nmol/L) at delivery(6).

 In the current study, maternal vit D did not correlate to maternal dietary intake of vit D, but it correlated to cord blood vit D.Delvin el al,(7) conducted a vitamin D supplementation trial with 34 French women who received minimal to no vitamin D from dietary sources. The supplement-treated women received 1000 IU/d vitamin D from the sixth month of gestation, whereas the other group served as a control group. Cord samples for the vitamin D-supplemented group demonstrated higher concentrations of both 25(OH)D and 1,25(OH)2D. At day 4 of age, serum 25(OH)D concentrations were higher in the vitamin D-supplemented group, compared with the control group.

 Results of the present showed that none of mothers were supplemented probably with the recommended doses of vitamin D during pregnancy. Moreover, food fortification with vitamin D is not practiced in Egypt. Under these circumstances, exposure to sunlight becomes crucial for vitamin D acquisition. Although it seems odd that sunlight exposure is limited in this geographic setting, cultural practices including traditional clothing (covered dress) for women and limited access to open space for pregnant and nursing women were found to be the primary reasons for inadequate sunlight exposure ,this may explain our results.

 In this study, maternal vit D was correlated to cord blood vit D but not cord blood Ca, Phosphorus , alkaline phosphatas.

Nicholas et al,(8)found a correlation between maternal and cord blood 25(OH)D. Maternal vitamin D deficiency in pregnancy has been associated with neonatal hypocalcaemia.

 This is agreement with a study that stated that it is generally accepted that maternal vitamin D status during pregnancy reflects the maternal and neonatal calcium homeostasis .(9) Several researches subsequently 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. Also, it may be possible that maternal vitamin D status affects fetal growth and bone development .(10)

In conclusion, hypovitaminosis D is evident problem in Egyptian mothers with associated low levels of cord blood vit D. A better antenatal care and higher vit D supplementation during pregnancy may be needed to improve maternal vit D status and consecutively neonatal status.

REFERENCES

1- Norman AW (2008). "From vitamin D to hormone D: fundamentals of the vitamin D endocrine system essential for good health". Am. J. Clin. Nutr. 88 (2): 491S–499S.

2- Vercruyssen J, Jacquemyn Y and Ajaji M.(2012) "Effect of sun exposure and 25- hydroxyvitamin D status among pregnant women in Antwerp, Belgium". Int J Gynecol Obstet 88: 450-4.

3- Holick MF and Tai C Chen. (2008); "Vitamin D deficiency: a worldwide problem with health consequences". Am J ClinNutr ;87(4):1080S– 6S

4- Wagner CL and Greer FR, American Academy of Pediatrics Section on Breastfeeding, American Academy of Pediatrics Committee on Nutrition.(2008) "Prevention of rickets and vitamin D deficiency in infants, children, and adolescents". Pediatric;122:1142– 52.

5- SPSS. Inc Released (2007): SPSS for Windows, Version 16.0. Chicago, SPSS Inc.

6 - Al-Mohaimeed A and Khan NZ (2012)"Vitamin D Status Among Women in Middle East" Journal of Health Science; 2(6): 49-56 .

7- Delvin EE, Glorieux FH, Marie PJ, et al (1981) "Vitamin D dependency: replacement therapy with calcitriol?" J Pediatr;99:26–34.

8-Nicholas C H , Nicholas J B et al.,(2014) ;"Vitamin D supplementation in pregnancy: A systematic review" Health Technol Assess. 18(45): 1–190.

9- Datta S, Alfaham M, Davies DP, et al., (2002):"Vitamin D deficiency in pregnant women from a non-European ethnic minority population: an interventional study". Br J Obstetr Gynaecol, 109: 905-8.

10-Nozza JM and Rodda CP. (2001).; "Vitamin D deficiency in mothers of infants with rickets". Medical Journal of Australia 175(5): 253–5.

دراسة مقارنة لحالة فيتامين (د) عند الأطفال كاملي النمو والأطفال الخدج والامهات لكل منهما

ا.د/ جمــال سامـــى علــي, ا.د/ محمــد اشــرف عبد الواحـد

ا.م.د/ رانيــا ابراهيـم حسنــي اسماعيل , د/ شيماء محمد حسن علي

قسم الاطفال- قسم الدراسات الطبية -معهد الدراسات العليا للطفولة-جامعة عين شمس