Evaluation of serum calcium level at different stages of pregnancy [+]

دراسة مستوى الكالسيوم في مختلف مراحل الحمل

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Abstract:

Calcium is an essential mineral to life . It is necessary for bone initiation and growth in the developing fetus and throughout life to maintain optimal bone health and structure .

In this study it is conducted to evaluate serum calcium level at different stages of pregnancy (first, second and third trimester) in comparison with non pregnant women.

The result shows that serum calcium in pregnant women is lower than non pregnant women especially in the third trimester , but this variation in small and statistically not significant since calcium is vital mineral and is affine homeostatic control mechanisms to maintain it at constant levels .

المستخلص :

الكالسيوم معدن أساسي للحياة فهو ضروري لبناء العظام ونموها في الجنين ، وللحفاظ على عظام صحية وقوية . لهذا السبب أجريت هذه الدراسة لتقييم مستوى الكلسيوم في الدم في فترات مختلفة من الحمل (المرحلة الأولـــى ، الثانية والثالثة) وقورنت النتائج مع مستوى الكالسيوم في الدم في النساء غير الحوامل وقد وجد أن نسبة الكالسيوم لدى النساء الحوامل أقل من النساء غير الحوامل وبصوره خاصة في المرحلة الثالثة أي الأخيرة من الحمل غيـــر أن هذه النسبة ضئيلة وغير مهمة حسابيا وذلك كون ملح الكالسيوم من الأملاح المهمة في الدم للحفـــاظ عليـــه علـــى مستوى ثابت تقريبا.

Introduction

Most women are a ware of calcium's role in building and maintaining healthy bones. But the mineral becomes even more important during pregnancy , when in addition to forming the baby's bones , it helps to conduct nerve impulses and aids in the proper function of the heart and other muscles .

Although it can be a challenge , it's especially important that expecting mothers get enough calcium in their diets or from supplements . If they don't ,their bodies stores will be depleted , that is the baby will draw essential calcium from it's mother's bones

This , of course can place the mother at higher risk for osteoporosis . [1]

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Calcium is an essential mineral to life . It is the most abundant minerals in our body and is necessary for bone initiation and growth in the developing fetus and throughout life to maintain optimal bone health and structure .[2]

While calcium is often linked to bone health and it's importance to optimal bone health can not be over- emphasized, there are other important function for calcium during a woman's life .Calcium helps the body by aiding muscle contraction and relaxation, blood coagulation and nerve impulse transmission , unfortunately approximately 75% of women do not obtain the recommended amount of calcium in their diet to help maintain healthy bone structure .[2]

No matter what age a woman is when she becomes pregnant , calcium is very important to both the mother and the baby, calcium from the mother's body is used by the developing baby, putting increased demands on the mother's supply . During pregnancy , calcium transfer from mother to developing baby reaches 270mg/day on average , by the third trimester additional calcium may be need for both mother's and baby's health .[2]

Calcium consumption is essential for bone development and maintenance throughout life more than one half of the female population dose not consume the recommended amount of calcium . Calcium intake is especially crucial during pregnancy lactation because of the potential adverse effect on maternal bone health if maternal calcium stores are depleted . There is often transient lowered bone mineral density and increased bone resorption , with the greatest consequence during the third trimester and throughout lactation .Studies indicate that calcium consumption should be encouraged especially during pregnancy and lactation , to replace maternal skeletal calcium stores that are depleted during these periods .[3]

Materials and methods:

This study was done on (100) women ,(75) were pregnant and (25) were used as control. The blood samples of the pregnant women were collected from hospital and from private lab., all blood samples were analyzed .(25) samples collected from women in the first trimester, second trimester and in the third trimester, in equal number, another(25) samples collected from women not pregnant for comparison.

The serum was separated from the blood immediately , minimum venous stasis was employed to prevent haemoconcentration and the blood drawn with very gentle traction on the syringe plunger to avoid heamolysis .

The needle is removed and the blood was transferred to screw-capped glass tubes and allowed to clot at room temperature to separated serum .

The calcium determined by colourimetric method without deproteinization using o-cresolphthalein complex one interference due to magnesium ion eliminated by 8-hyoxyquinoline .

Results and discussion :

Pregnancy is a period of high calcium requirement . The skeleton of newborn baby contains approximately 20-30g of calcium . The bulk of fetal skeletal growth takes place from mid pregnancy on wards . With maximal calcium accretion occurring during the third trimester . The total calcium accretion rate of the fetus increases from approximately 50 mg/day at 20 weeks gestation to 330 mg/day at 35 weeks .[4]

For the third trimester of pregnancy , 200 mg/ day considered the average accretion rate .[5]

In this study serum calcium were measured for 75 pregnant women , 25 in the first trimester, 25 in the second trimester and 25 women in the third trimester .And 25 women not pregnant their serum calcium measured for comparisom .

The result in the study shows that serum calcium in pregnant women is less than non pregnant women especially the third trimester were the mean serum calcium in the first trimester is 9.5mg/100ml with standard deviation ±0.74 , in the second trimester the mean serum calcium was 9.3 ± 0.61 while in the third trimester the mean serum calcium in the lowest 8.8 mg/100ml with standard deviation 0.64 , in comparison with non pregnant women the mean serum calcium is higher 9.8 ± 0.78 as shown in the table below :-

Serum calcium level at different stages of pregnancy

NO	Stage of pregnancy	Mean SD± Serum calcium
1	Non - pregnancy	9.8 ± 0.78
2	First trimester	9.5 ± 0.64
3	Second trimester	9.3 ± 0.61
4	Third trimester	8.8 ± 0.64

It was found from the above results that mean serum calcium in pregnant women is a little bit lower than non pregnant women especially in the third trimester because fetal growth demand increases with advancing pregnancy , in addition adequate in take of calcium during pregnancy is low .

On the other hand it was found that these results are statistically of no significant because all human biological processes require calcium, thus finely tuned homeostatic control mechanisms to maintain constant blood levels extra cellular of calcium have evolved , as have complex cellular mechanisms to control the movement of intracellular calcium .

When calcium levels falls , are rapidly returned to normal by the PTH secretion from the parathyroid gland ensuring the increased intestinal ,renal tubular and bone resorption . Elevated levels of extra cellular calcium inhibit the secretion of PTH and the production calcitriol (vitamin D metabolite) and stimulate the secretion of calcitonin by the thyroid gland, thus determining a decrease in calcium absorption increase of urinary calcium excretion and decrease of bone resorption . Adequate dietary intake of calcium is crucial to replace the calcium lost from the extra cellular fluid, both in the from of losses in urine . faeces and sweat and due to incorporation into bone and soft tissues .

Approximately 99% of body calcium is contained in bone . The calcium needed for skeletal growth comes only from dietary intake and there are no extra-skeletal reservoirs , therefore it is likely that decreased calcium intake can result in a reduction of calcium concentration in the extra cellular fluid impairing normal bone growth and metabolism .[6]

The potential negative consequences of a deficiency in calcium intake during pregnancy may effect bone metabolism, may cause hypertensive disorders or effect the fetal growth .

The alterations in serum calcium and bone metabolism during pregnancy are accompanied

By an increased concentration of the calciotropic hormone 1- 25 dihydroxy vitamin D (calcitriol) but with little alteration in parathyroid or calcitonin hormone concentration .[7] ,[8] ,[9]

In fact ,recent data show that pregnancy are accompanied by physiological changes in calcium and bone metabolism that are sufficient to make calcium available for fetal growth without a need to increase maternal calcium intake. [10]

Physiological hyper absorption of calcium occurs in pregnancy , preceding the demands of the fetus for calcium .[10]

During the last two trimesters of pregnancy and during breast feeding , the baby absorbs more calcium from food , the baby needs this extra calcium to build healthy teeth and bones .

If the women do not get enough calcium in her diet during pregnancy , the calcium the baby needs will be taken from her bones .

Unfortunately , many women do not get enough calcium . The average women gets only about 700 mg every day . A part from not eating enough calcium rich foods , many women rely too much on vitamin supplements .

Supplements often contain less than one third of the recommended daily amount of calcium. [11]

References

1. Mary silva , M.S.,R.D. reviewed by Margorie Green field , M.D.“ calcium in pregnancy ” 2005 . from internet .
2. Baron , J.A. , et al.“calcium supplements for the prevention of colorectal Adenomas ”N *Engl J Med*. 340 :101 -7 1999 .
3- Thomas , Michael MD a;Wesisman . steven “calcium supplementation during pregnancy and lactation” *American journal of obstetrics and Gynecology* , April 194(4): 937- 945 ,2006 4-IOM(Institute of Medicine) ., Dietary reference intake for calcium ,
4-phosphorus ,Magnesium , Vitamin D, and fluoride . Areport of the panel on calcium and related Nutrients and the standing committee on the secientific evaluation of dietary reference intakes. *Food and Nutrition* Board.,National Academy Press. Washington, DC. 1997 .
5- Prentice A.“ Maternanl calcium metabolism and bone mineral status ” . *Am J Clin. Nutr.* May 71 (5suppl) :1312s-6s [free full text] ,2000 .
6- Weaver, CM. Ch.26 calcium. *In:PRESENT Knowledge and Nutrition* 8th Ed. Bowman, BA and Russel RM .Eds .ILSI Press ,Washington , DC.PP. 273-280 ,2001 .
7- prentice A.“ calcium in pregnancy and lactation,” *Annu Rev Nutr* ,20:249-72,2000
8- prentice A, Jarjou LM , Stirling DM Buffenstein R, Fairweather –Tait S. “Biochemical marker of calcium and bone metabolism during 18 months of lactation in Gambian women accustomed to low calcium intake and in those consuming a calcium supplement” . *J Clin Endocrinol Metab*.April, 83(4):1059-66 [free full text] ,1998 .
9-Ritchie LD, Fung EB, Halloran Bp , Turnlund JR, Van Load MD , Cann CE , King JC.A longitudinal “ study of calcium homeostasis during human pregnancy and lactation and after resumption of menses”. *Am J Clin Nutr.* Apr. ,67 (4) :693-701.
[free full text] , 1998 .
10- Allen LH. “Women's dietary calcium requirements are not increased by pregnancy or lactation ” . *Am J Clin Nutr.* Apr.67(4): hormone concentration . [7] ,[8] ,[9]
591-2 .[free full text], 1998 .
11- pregnancy and newborn (Health education center) March , 2007 . from internet .