

ESTIMATION OF ZINC LEVEL DURING PREGNANCY⁺

Maysoon Sharief *

Jawad K. Mahdi**

Nadham K. Mahdi***

Abstract:

Eighteen women from Basrah Centre, Southern Iraq were studied during 1999 to estimate the zinc level before , during and after pregnancy period Their ages ranged from 17 to 44 years. Parity of the women was 0-5. The mean $\pm$ SD serum zinc level during pre-pregnancy period was $89.11 \pm 13.9 \mu\text{g}/100 \text{ ml}$.Serum zinc level rose slightly during the first trimester to $92.11 \pm 9.4 \mu\text{g}/100 \text{ ml}$. Thereafter, the level fell progressively during the second and third trimesters to $80.44 \pm 11.7 \mu\text{g}/100 \text{ ml}$ and $75.55 \pm 11.6 \mu\text{g}/100 \text{ ml}$ respectively. Thirty days after delivery, zinc levels increased more rapidly to reach the normal values. Pregnancy outcome was also followed up.

المستخلص

شملت الدراسة ١٨ امرأة خلال عام ١٩٩٩ لتقدير مستوى الزنك قبل وخلال وبعد فترة الحمل ترواحت الاعمار من ١٧-٤٤ سنة وكان عدد الولادات لدى النساء من ٠ - ٥ .
كان معدل مستوى الزنك في المصل قليلا خلال الفصل الاول من الحمل الى معدل ٩٢,١١ $\pm$ ١١,٧ ميكرو غرام/١٠٠ مل بعد ذلك انخفض المستوى خلال كلا من الفصل الثاني و الثالث الى ٨٠,٤٤ $\pm$ ١١,٧ ميكرو غرام/١٠٠ مل و ٧٥,٥٥ $\pm$ ١١,٦ ميكرو غرام/١٠٠ مل على التوالي.

أزداد مستوى الزنك بشكل سريع خلال ثلاثين يوما بعد الولادة الى المستوى الطبيعي .تم متابعة نتائج الحمل خلال الدراسة أيضاً.

Introduction:

Little is known about the metabolism of zinc in human pregnancy as the effects of zinc deficiency on the progress and outcome of pregnancy[1]. Several human studies[2-4]. have reported daily intakes of zinc and copper below the recommended dietary allowance[5].. A hypothesis was postulated and based on the reported greater incidence of malformation of the central nervous system among some populations in the Middle East , an area of the world where zinc deficiency related to diet, associated parasitic infections, and geophagia is endemic[6].. and on the teratogenic effect of maternal zinc deficiency in animals[7].

Subsequently, association's between low serum zinc in the first half of gestation and the occurrence of abnormal deliveries, preterm and dysmature infants, and congenital malformations were reported from Sweden[8].. However, there was no difference in either zinc or copper intake between the group who delivered normal babies and the group who delivered growth retarded babies[9-10].

Many of these apparent contradiction's might be explained by maternal physiologic adaptation to pregnancy especially in different race and mixed parity^[11-12]. Furthermore, many of these women had been on mineral and vitamin supplements. Interaction between minerals has been reported[13] and there appears to be some relationship between mineral and vitamin metabolism[14].

⁺ Received on 2000/2/1 , Accepted on 2001/1/27 .

* C.A.B.O.G.,Department of Obstetric and Gynecology,College of Medicine,University of Basrah

** M.Sc.,Department of Pharmacology,Institute of Technology,Basrah-Iraq.

*** M. Sc, Ph.D.,Department of Microbiology,College of Medicine,University of Basrah, Basrah-Iraq

Therefore, it would seem essential to study non-supplemented women as far as zinc status during pregnancy is concerned. The pregnancy outcome that may indirectly reflect zinc status is described for the first time in the country.

Materials and Methods:

Eighteen women from Basrah Centre, Southern Iraq were studied during 1999. Their ages ranged from 17 to 44 years. Parity of the women was 0-5.

They were given a full explanation of the purpose, potential benefits and agreed to be involved. The study was approved by the ethics committee of the College of Medicine, University of Basrah. None of the studied women was diabetic or having coronary heart diseases or other metabolic disorders.

Five ml of venous blood were collected from each women before pregnancy and mid of the first, second and third trimesters as well as 30 days after delivery. Serum was separated by centrifugation at 3000 r.p.m. for 10 min and kept at -20 °C until needed. Zinc level was determined by using an atomic absorption spectrophotometer (Pye-unicam series 2900) by direct aspiration of the sample after being diluted with deionized water (1:10).

Stool samples were collected and examined by direct smear method for detection of parasitic infections.

Results:

The mean $\pm$ SD serum zinc level during pre-pregnancy period was 89.11 ± 13.9 $\mu\text{g}/100$ ml (Table 1 , Fig 1). Serum zinc level rose slightly during the first trimester to 92.11 ± 9.4 $\mu\text{g}/100$ ml. Thereafter, the level fell progressively during the second and third trimesters to 80.44 ± 11.7 $\mu\text{g}/100$ ml and 75.55 ± 11.6 $\mu\text{g}/100$ ml respectively (Table 1). Thirty days after delivery, zinc levels increased more rapidly to reach the normal values.

Only 4 cases of women were found to be infected by parasites (Table 2).

Pregnancy outcome was also followed up (Table 3). There were one baby with anencephaly, 2 cases with intra-uterine growth retardation and 3 women with gestational hypertension.

Table –1- Zinc level of pre, during and after pregnancy period among 18 women.

Time	Mean $\pm$ SD (mg/100ml)
Pregnancy:	
First trimester	92.11 ± 9.4
Second trimester	80.44 ± 11.7
Third trimester	75.55 ± 11.6
Total	82.70 ± 8.5
<u>After delivery</u>	86.83 ± 9.9
Pre-pregnancy	89.11 ± 13.9

Table –2-The diagnosed parasitic infections among 18 pregnant women.

Parasitic	Pregnancy			After delivery	Non pregnant
	1 st	2 nd	3 rd		
<i>Blastoeyctis hominis</i>	2	0	0	0	0
<i>Giardia lamblia</i>	0	1	0	0	0
<i>Histolytica</i>	0	0	1	0	0

Total	2	1	1	0	0
--------------	----------	----------	----------	----------	----------

Table –3-Pregnancy outcome.

Birth weight	3.35 ± 0.25 kg
Complications	No.
Congenital malformation (anencephaly)	1
Intra-uterine growth retardation	2
Gestational hypertension	3

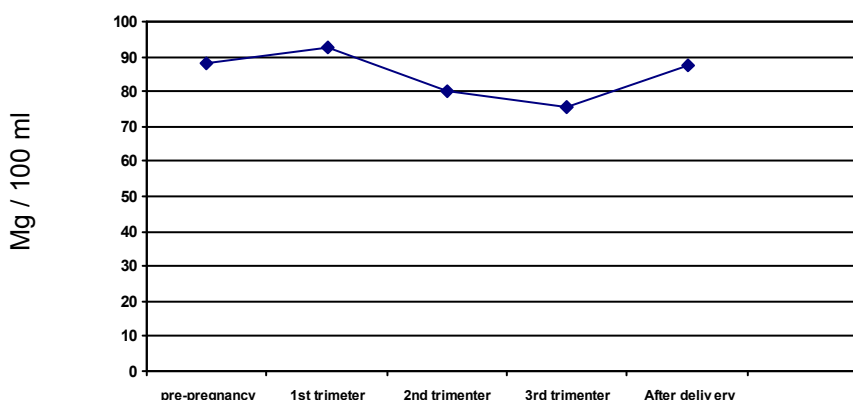


Fig-1-Serum zinc concentrations of pre , during and after pregnancy period.

Discussion:

Serum zinc concentrations fall during pregnancy as proved in this study. The physiological basis of this phenomenon has not been clearly explained , it may be an oestrogen effect and it does not necessarily signify a fall in the amount of zinc inoculating in the plasma pool[15]. Plasma volume expansion and hypoalbuminemia have been cited frequently as possible causes of the fall in plasma zinc concentration in pregnancy. Plasma volume increased by 30% and plasma zinc decreased by 14% between 14 and 35 weeks gestation[16].

Plasma volume is related to body size and the increase in plasma volume in pregnancy is related to birth weight of the baby[17] However, there was no association between intra vascular mass of zinc and percentile birth weight distribution[16].. This variability in plasma volume response to pregnancy makes interpretation of plasma nutrient concentrations very difficult.

Zinc is 60-85% bound to albumin and low levels of serum zinc have been reported to occur when serum albumin is lowered in certain diseases[18-19].. Serum albumin concentration also falls in pregnancy.

It has been suggested that the apparent hypozincemia and hypoalbuminemia of normal pregnancy are largely due to increasing plasma volume after the first trimester[16]. Also, results might be related to dietary habits. In Iraqi, most population consume a large amount of bread and rice in their meals. Since bread contains phytic acid which forms a complex substance and decreases zinc absorption[20].

Also food grains are minimal source for zinc, while meat considered as a rich source for it. Nevertheless, Iraq is consume less a mount of meat during the economic sanction years[21].

It seems that the parasitic infected low number of pregnant women has no effects on zinc status among the studied group.

However, these observations suggest the need for better definition of the role of zinc in human reproduction.

References:

1. Aggett, PJ. *Trace elements and human pregnancy and lactation* . In: Chandra RK, ed. Trace elements in nutrition of children. New York: Raven Press; 137-55,1985.
2. Cuthrie BE, Robinson MF. *Daily intakes of manganese, copper, zinc and cadmium by New Zealand women*. "Br. J. Nutr", 33,55-63, 1977
3. Lyon TDB, Smith H, Smith LB. *Zinc deficiency in the west of Scotland? A dietary intake study*. "J Nutr", 42, 413-6. ,1979
4. Hunt IF, Murphy NJ, Gomez J, Smith JC. *Dietary zinc intake of low income pregnant women of Mexican descent*. "Am.J Clin Nutr", 32, 1511-8, 1979
5. *Recommended dietary allowances*. Food and nutrition Board, Washington DC: National academy of sciences, 1980.
6. Sandstead HH. *Zinc in human nutrition*. In: Bronner F, Coburn J eds . *Disorders of mineral metabolism*. Vol 1. Trace minerals. New York, N.Y: Academy press,:94-157, 1981.
7. Hurley LS. *Teratogenic aspects of manganese, zinc and copper nutrition*. "Physiol Rev", 61, 249-95, 1981.
8. Jameson S. *Effect of zinc deficiency in human reproduction*. "Acta Med Scand"; 593(suppl.) , 1-89, 1976
9. Armstrong J. *Dietary intake of zinc, copper, calcium and iron in human pregnancy*. Proc Nutr Soc, 41, 147 A ,1982.
10. McMichael AJ, Dreosti IE, Gibson GT, et al. *A prospective study of serial maternal serum zinc levels and pregnancy outcome*. "Early Hum Dev", 7, 59-69, 1982
11. Hutchins CJ. *Plasma volume changes in primigravidae*. "Brit J Obstet Gynec", 87, 586-9, 1980
12. Campbell DM, MacGillivray I. *Maternal physiological responses and birth weight in singleton and twin pregnancies*. "Europe J. Obstet Gynec Reprod Biol", 7,17-26. 1977
13. Crofton RW, Gvozdanovic D, Aggett PJ. *A study of the effect of zinc on iron absorption in man*. Proc. " Nutr Soc", 41, 17. 1982 A
14. Smith JC JR. *The vitamin A zinc connection : A review*. "Ann NY Acad Sci", 355,62-75, 1980
15. Aggett PJ. *Zinc in pregnancy*. "Postgraduate Doctor", 10,10-16. 1987
16. Tuttle S, Aggett PJ, Campbell D, MacGillivray I. *Zinc and copper nutrition in human pregnancy: a longitudinal study in normal primigravidae and in primigravidae at risk of delivering a growth retarded baby*. "Am. J Clin Nut", 41:1032-41, 1985
17. Hytten FE, Leitch I. *The physiology of human pregnancy*. Oxford : Blackwell Scientific Publications 1971.
18. Walker BE, Dawson JB, Kelleher J, Losowsky MS. *Plasma and urinary zinc in patients with malabsorption syndromes as hepatic cirrhosis* . "Gut", 14, 943-8, 1973
19. Schechter PJ, Giroux EL, Schlienger JL, et al . *Distribution of serum zinc between albumin and 2 macroglobulin in patients with decompensated hepatic cirrhosis*. "Eur J Clin Invert", 6, 147-50, 1976
20. Oberlaas D, *Mechanism of zinc haemostatic*. " J. Inorgan Bioch"., 62, 231-41, 1996
21. Mahdi JK. *Levels of trace metals in selected risk groups in Basrah*. M. Sc. Thesis. Uni. Of Basrah, Iraq. 1997.