

MATERNAL AND NEONATAL SERUM COPPER LEVEL AT BIRTH*

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ABSTRACT

Total serum copper levels of 70 pregnant women hospitalized for delivery at Misaghieh (private), 90 at Farah (Public) Maternity Hospitals immediately after delivery and 27 non-pregnant women (Control) were measured. The copper level in the blood serum of umbilical cord of the newborn infants were also determined. The copper levels were significantly elevated in both pregnant groups as compared to the non-pregnant group. However, the copper level in the blood serum of the umbilical cord from the private group was significantly higher when compared to those from the public group. A significant correlation was found between the serum copper level of mothers and the cord blood in both, private and public groups.

INTRODUCTION

Copper is important for normal growth and development. It plays a significant role in the development and maintenance of myelin, and also it is integral parts of several critical enzymes and cofactors(1).

Several investigators have demonstrated that serum copper increases during pregnancy. The rise in the serum copper during pregnancy is also regarded as a result of an increased ability of the organism of the pregnant women to meet the high demands of the growing fetus for copper(2-4). However, there is not enough information on the extent of this elevation in pregnant women from different

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socio-economic groups.

Therefore, the purpose of this study is to determine serum copper levels in the two different socio-economic groups of mothers and their newborn infants at the time of birth.

MATERIAL AND METHOD

Serum copper levels of 70 pregnant women hospitalized for delivery at a private (Misaghieh), 90 at a public (Farah), maternity hospitals immediately after delivery, and 27 non-pregnant women (Control) were examined. The copper level in the blood serum of the umbilical cord of the babies was also determined.

The blood was obtained in plastic syringes and poured off into a centrifuge test tube. After coagulation of the blood the serum was separated by means of a centrifugation (15 minutes, 3000 r.p.m.), poured off into a well-cleaned dry glass and kept in a refrigerator at -17°C .

The estimation of the serum copper was further carried out by the colorimetric method(5). In this method the copper was released from its linkage to protein by means of hydrochloric acid, and after adding sodium diethyldithiocarbamate as a color reagent, the yellow-colored complex was read colorimetrically. At first this method was compared with the atomic absorption spectrophotometric method, and no significant difference was observed between these methods. Thus, the colorimetric copper assays of the samples were performed.

RESULTS

Table 1 gives the total serum copper levels of both pregnant and non-pregnant women and Table 2 gives the copper content of the blood serum of the umbilical cord.

The mean concentration of total serum copper in both public and private groups were significantly higher ($P < .01$) and approximately more than twice of the normal non-pregnant adult female values (Table 1).

Although the mean concentration of serum copper in the private group was higher than the public group, the difference was not statistically significant.

The mean concentrations of total copper in fetal serum was about half of the adult non-pregnant and a quarter of the maternal values. Total copper level in fetal serum from the private group was significantly higher ($P < .01$) than those from the public group.

A significant correlation was found between the serum copper

level of the mothers and their newborns in the two groups. The correlation coefficient were $r = 0.917$ ($P = < .01$) and $r = 0.246$, ($P = < .05$) in the private and public groups respectively.

COMMENTS

Several investigators have shown that serum copper and ceruloplasmin levels will rise early in pregnancy with persistence of high levels throughout gestation and into the early postpartum period(6, 3). This increase has been ascribed to increased production of hormones, particularly of the oestrogenic hormones(7), associated with normal pregnancy(8), and its possible influence on the synthesis of ceruloplasmin(9, 1, 2).

This assumption has been strengthened by the observation that administration of oestrogen to non-pregnant women produces an increase in the serum copper content(7).

In the present study the total copper content of the maternal serum in both, private and public groups were significantly higher and approximately more than twice of the normal non-pregnant values. This is in agreement with the reports of others(3, 9). However, a slight, but not statistically significant, increase was also observed in the serum copper levels of the private group when compared with the public group.

The biological value of the increase in serum copper during pregnancy is related to the development of the growing fetus. The increasing of the copper in the maternal serum during pregnancy continuously supplies a sufficient quality of copper to the developing fetus. An increased copper supply is needed by the growing fetus because fetal organs, especially the liver and spleen, show an increased copper content when compared with adult organs(3).

In contrast to the fetal organs, the blood serum of the umbilical cord of the newborn infant contains half the amount of copper when compared with the value in adult normal females(3). In our study the mean serum copper level of the umbilical blood of newborn infants was also about half the amount of the adult non-pregnant female and a quarter of the maternal values. These values are in agreement with the reports of others(10). However, the copper level of the blood serum of the umbilical cord of the newborn infant in the private group was significantly higher than that in the public group. There is no apparent explanation for this difference; it could be simply the result of chance variation or the effects of different socio-economic status between the two groups.

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Table 1
Maternal serum copper levels after delivery

Groups	No.	Serum level ($\mu\text{g}/100 \text{ ml.}$)		Groups	Signifi- cance P
		Mean	\pm S.D.		
I) Non-pregnant	27	108	21	I,II	<.01
Pregnant					
II) Private	70	243	41	I,III	<.01
III) Public	90	230	44	II,III	N.S.

Table 2
Umbilical cord's serum copper levels at birth

Groups	No.	Serum level ($\mu\text{g}/100 \text{ ml.}$)		Significance P
		Mean	\pm S.D.	
Private	68	63	23	<.01
Public	85	48	19	