

SERUM COPPER LEVELS IN FIRST HALF OF NORMAL AND DISTURBED PREGNANCY AND ITS RELATION TO OUTCOME OF THREATENED ABORTION

by

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SUMMARY

A study of serum copper levels, of selected patients—10 non-pregnant women, 26 normal pregnancy and 28 threatened abortion cases of same gestational age (from 4 weeks to 16 weeks) was done which shows that serum copper level increases in pregnancy progressively with gestational age in normal pregnancy cases. In a threatened abortion case when serum copper level is above the mean value for the gestational age in normal pregnancy, continues to term. In others abortion occurs. However, the lower limit of serum copper level compatible with continuation of normal pregnancy needs to be determined.

Introduction

Copper is a trace element forming integral part of several enzymes and co-factors and is widely distributed in all organs and tissues of the body. Blood contains 70-117 $\mu\text{gm}\%$ of copper distributed in red cells and serum, concentration of serum copper is 83-143 $\mu\text{gm}\%$. Serum copper occurs in 2 forms:

(a) a small fraction loosely bound to albumin molecule concerned in the transfer of copper from gastro-intestinal tract to tissues. This reacts directly with copper calorimetric reagent diethyl-dithio-carbamate.

(b) Copper tightly bound to enzyme ceruloplasmin which does not directly

react with carbamate. This makes about 93% of serum copper.

Placenta contains large amount of ceruloplasmin concentration of ceruloplasmin as well as copper in blood is found to increase in pregnancy as early as 4-6 weeks. Estimation of copper as compared to that of enzyme ceruloplasmin is fairly simple and inexpensive and its serum level may serve as an index of placental function and help in management or for knowing the outcome of threatened abortion.

Aims and Objects

The present study was done to find out serum copper levels in the first half of normal and disturbed pregnancy and to see whether serum copper levels have

From: Dr. V. M. Medical College, Solapur.
Accepted for publication on 12-12-83.

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any relation with outcome of threatened abortion.

found to be 114.2 $\mu\text{g}/100\text{ ml}$ (range 90-140 $\mu\text{gms}\%$).

Material and Methods

Serum copper levels were estimated in (a) 10 non-pregnant healthy women in reproductive age group.

(b) 26 cases of normal pregnancy in women who had no history of Abortion previously or were primigravidas with gestation of 4 to 16 weeks.

(c) In 28 cases of threatened abortion of gestation age 4 to 16 weeks. Patients in whom obvious cause like incompetent os, uterine malformation, retroversion, venereal disease, Rh incompatibility etc. was present were excluded from the study.

The serum copper estimation was done by method of Eden and Green (1940).

All cases of normal pregnancy and threatened abortion were followed till they had delivery or aborted.

Observations

Table I shows distribution of cases of normal and disturbed pregnancy included in the series. The mean serum copper value in 10 non-pregnant women was

TABLE I
Distribution of Cases

Order of pregnancy	No. of cases of normal pregnancy	No. of cases of threatened abortion
Primigravida	7	7
2nd gravida	7	5
3rd gravida	8	11
4th and more gravida	4	5
Total	54	28

The serum copper level in both normal pregnancy and threatened abortion cases was more than the mean for non-pregnant women.

Mean serum copper values in normal pregnancy cases show a progressive rise with gestational age. A sharp rise was noticed after 14 weeks.

It is seen that mean serum copper values in cases of threatened abortion is lower as compared to mean value in normal pregnancy cases in each gestational age group.

TABLE II
Serum Copper Level in $\mu\text{gm}/100\text{ ml}$ in Cases of Normal Pregnancy and Threatened Abortion of Same Gestational Age

Weeks of gestation	Normal Pregnancy			Threatened abortion cases		
	No. of cases	Range of serum copper in $\mu\text{gm}/100\text{ ml}$.	Mean value	No. of cases	Range of serum copper in $\mu\text{gm}/100\text{ ml}$.	Mean value
4 weeks	4	150-190	168	3	121-182	149
6 weeks	4	180-200	190	7	122-196	154.7
8 weeks	5	193-230	203.4	3	138-204	172.6
10 weeks	3	200-240	224	4	144-248	206.7
12 weeks	3	205-243	226.3	3	159-239	205
14 weeks	4	204-260	227.7	6	147-293	185.1
16 weeks	3	241-294	269	2	174-192	183
Total	26			28		

Out of the 28 cases of threatened abortion included in the study, 20 aborted. In 18 abortion occurred within 10 days of admission, in 1 case it occurred between 2 to 3-weeks of admission and in 1 case evacuation was done for missed abortion after 5 weeks of admission.

Pregnancy continued beyond viability in 8 cases. There was 1 premature birth. One patient had L.S.C.S. for placenta previa—Type III at 38 weeks. Baby was healthy. Six patients had full term normal delivery. All babies were born alive, were healthy and had no congenital anomaly.

From Table III it is observed that serum copper levels and the outcome of threatened abortion in the 28 cases. Pregnancy continued in those cases where serum copper level was more than the mean value for the period of gestation, while in the 20 cases who aborted, the serum copper levels were below the mean value for the period of gestation.

It was further noticed that the serum copper value in individual cases was less than the lower limit, in the range, for the particular age of normal gestation in 18 out of 20 cases.

Discussion

The mean serum copper level in non-pregnant healthy women was found to be 114.2 $\mu\text{gm}/100\text{ ml}$ in present series which is comparable to that reported by Kapoor *et al* (1977) i.e. 110 $\mu\text{gm}/100\text{ ml}$. In the present series the mean levels at 4 weeks gestation age in normal pregnancy and threatened abortion cases were 160 $\mu\text{gm}/100\text{ ml}$ and 149 $\mu\text{gm}/100\text{ ml}$ respectively which are significantly higher than the mean non-pregnant level (114.2 $\mu\text{gm}/100\text{ ml}$ and range of 90-140 $\mu\text{gm}/100\text{ ml}$).

The mean serum copper value for gestational age 4 to 12 weeks in present

TABLE III
Serum Copper Values in Cases of Threatened Abortion in Relation to Mean Value in Normal Pregnancy for Same Gestational and Outcome of Threatened Abortion

Weeks of gestation	Total No. of cases of threatened abortion	No. with serum copper level more than mean values in normal pregnancy	Outcome of threatened abortion		No. with serum copper levels less than mean value in normal pregnancy	Outcome of threatened abortion	
			Aborted	Full term delivery		Aborted	FTND
4 Weeks	3	1	—	1	2	2	—
6 Weeks	7	2	—	2	5	5	—
8 Weeks	3	1	—	1	2	2	—
10 Weeks	4	2	—	2	2	2	—
12 Weeks	3	1	—	1	2	2	—
14 Weeks	6	1	—	1	5	5	—
16 Weeks	2	Nil	—	—	2	2	—
Total	28	8	—	8	20	20	—

series was 200 $\mu\text{gm}/100\text{ ml}$. Hegduk and De Jorge (1965) have quoted 150 $\mu\text{gm}\%$ and 68 $\mu\text{gm}\%$ respectively for the first trimester. Our figure is a little higher.

In the present series, all cases of threatened abortion who has serum copper levels above the mean value for the gestational age in normal pregnancy cases, continued pregnancy beyond viability and delivered living normal babies, while those with values lower than the mean, aborted.

The mean values for various gestational ages in normal pregnancy roughly serve as an upper limit of a critical range above which pregnancy continues in absence of other causes as incompetent os, uterine anomalies, etc.

All the same, as seen in the group of normal pregnancy cases, patients with serum copper values below the mean value did continue to term.

The lower limit of the critical range below which abortion will occur needs to be determined.

In the present series, 90% or 18 out of 20 cases who aborted had serum copper levels below the lower limit in the range for the period of gestation of normal pregnancy cases. A critical range can be defined as below:

Values below	Lowest value of serum Cu in normal preg. cases for the gestational age	Values in between	Mean Sr. Cu. Value in normal preg. for the gestational age	Values above
Abortior		No definite opinion		Preg. continues

A Study of large number of normal cases may help, but the number of cases that can be studied in a general hospital has limitations as below:

(a) The exact date of L.M.P. is given by few patients attending general hospital because of illiteracy.

(b) Many patients have their Hb levels very low to include them in the study.

(c) Patients may have low grade infections.

(d) Undernutrition and malnutrition (known to cause IUGR) can affect the growth of the fetus and placenta from early pregnancy though abortion may not occur.

All these factors may contribute to wide variations in the results.

Acknowledgement

We are thankful to the Dean, Dr. V. M. Medical College and General Hospital, Solapur, for allowing us to use the data and publish the paper.

We are thankful to the staff of the Biochemistry department for the kind co-operation.

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