

## SERUM COPPER LEVEL AS A MARKER OF PLACENTAL FUNNCTION

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### ABSTRACT

**Background:** The foeto-placental transport system leads to higher transport of copper towards the increasing age of gestation. Copper is not only vital micro-nutrient but also notable value during pregnancy either normal or abnormal pregnancy. This study is planned to assess the serum copper levels as a marker of placental sufficiency. **Material and Methods:** Cross sectional study conducted at SRG hospital, Jhalawar medical college during the period of July 2016 to December 2016. 100 Patients of present study were selected from outdoor, antenatal clinic and from ward by simple random sampling. Blood sample for data collection obtained after general physical and systemic examination along with detailed menstrual and obstetric history after taking consent. **Results:** Serum Copper level estimation was done in 100 cases. Out of them 50 were non-pregnant and 50 were pregnant women. Among non-pregnant women average serum copper level was  $121 \pm 4.82 \mu\text{g/dL}$  and in pregnant women it was found to be  $245.08 \pm 32.9 \mu\text{g/dL}$ . This difference was statistically significant ( $P$  value  $< 0.001$ ). The average serum copper levels in I, II and III trimesters were  $183 \pm 4.52$ ,  $251.5 \pm 3.29$ ,  $271.5 \pm 5.68$  and this difference was found to be statistically significant ( $P$  value  $< 0.001$ ). **Conclusions:** We draw the inference that these serum copper values can be implemented as an notable indicator of the condition foeto-placental unit, and should be introduced into the protocol of routine antenatal diagnostics as a simple, easy and accurate method by which we can quickly determine the functional condition of placenta and fetus.

**Key words:** serum copper, placenta, pregnancy.

### INTRODUCTION:

It's been very bizarre for obstetrician and biochemists for long years for reliable and simple methods to aid in the diagnosis of falling placental function. Placental insufficiency can be detected by estimation of ceruloplasmin, pregnandiol, chorionic gonadotropin and urinary and amniotic estriol and determination of serum enzyme of placental origin viz, alkaline

phosphatase cysteine, aminopaptidase, di-amino-oxidase, histaminase.(1)

The rise in serum copper during pregnancy was first described by Krebs as early as 1928. It has been demonstrated that about 95% of this copper is bound to ceruloplasmin an enzyme with an oxidative effect. The ceruloplasmin level may provide a sensitive indicator of normal

pregnancy and placental function but the analysis of these enzymes are however complicated, expensive and requires facilities.(2)

Physiological changes during pregnancy increase serum copper concentration result of increase in ceruloplasmin due to elevated levels of estrogen and enhance its movement across the foetoplacental barrier via passive transfer.(3) Friedman S. et al. found that the oxidizing ability of serum which depends on the presence of the above mentioned enzyme was related to the serum copper. Thus copper serve as an indicator of normal placental function.(4)

In present study, an attempt was made to find out a test which can predict placental function and at the same time comparatively simple in the evaluation of the intrauterine fetal condition.

## MATERIAL AND METHODS

The present study was carried out in SRG hospital, Jhalawar medical college, Jhalawar (Rajasthan) during the period of July 2016 to April 2017. 100 Patients of present study were selected from outdoor, antenatal clinic and from ward by simple random sampling.

All healthy women not suffering from any communicable or non-communicable disease were selected for the study and divided into two groups Normal non-pregnant women having normal menstrual cycle and Pregnant women in different trimesters of pregnancy.

General physical and systemic examination along with detailed menstrual and obstetric history was recorded after taking proper consent. Presence of edema over the independent part was also ruled out. Blood sample for study drowned via venipuncture technique from cases and controls, Serum was auto separated, and serum

copper levels were estimated by method of Eden and Green.(5) The data were analyzed using MS Excel 2010, Epi Info v7 and SPSS v22.

## RESULT

In present study estimation of Serum Copper was done in 100 cases. Out of them 50 were non-pregnant and 50 were pregnant women. Serum Copper Levels during normal pregnancy are given in Table-1.

Table-1: Serum Copper Level among pregnant and non-pregnant women.

S.No.	Groups	No. of cases	Serumcopper level (µg/dL)	P value
1.	Non-pregnant	50	121 ± 4.52	<.001
2.	Pregnant	50	245.08 ± 32.9	

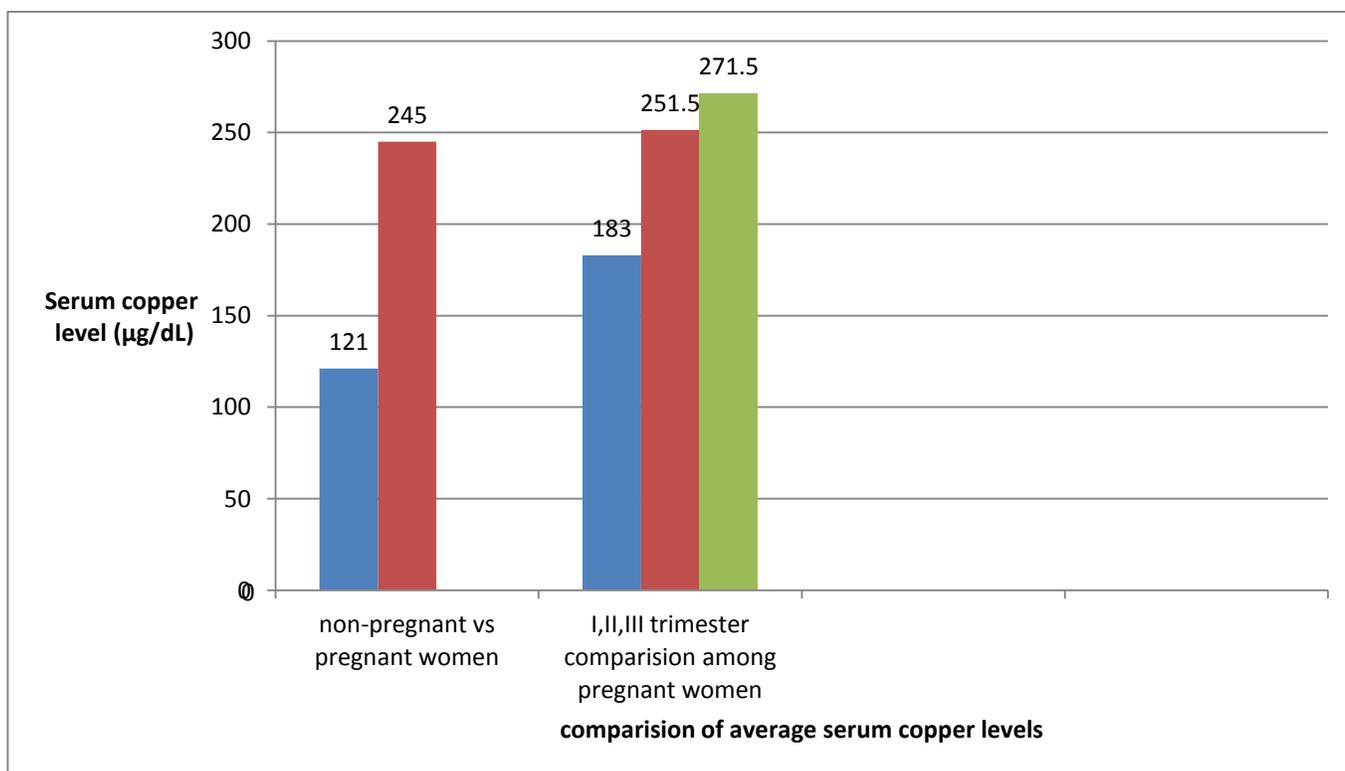
In non-pregnant woman Serum Copper (mean ± S.D.) was 121 ± 4.82 µg/dL and in different trimester of pregnancy (1st, 2nd and 3rd trimester) it was found to be (mean ± S.D)245.08 ± 32.9µg/dL. A significant correlation was found among non-pregnant (group- 1) and pregnant women when these groups were compared (P value < 0.001).(Table-1)

Elevations in Serum Copper Level in normal pregnancy respective to period of gestation were given in Table-2. It was significantly increases in group 1,2, and 3 same groups of pregnant women but in different trimesters of pregnancy (I-trimester, I-trimester, III- trimester) p value < 0.001.

**Table-2: Serum Copper Level among pregnant (different trimesters).**

S.No.	Groups	No. of cases	Serum copper level (µg/dL)	P value
1.	I Trimester	10	183 ± 4.52	<.001
2.	II Trimester	20	251.5± 3.29	<.001
3.	III Trimester	20	271.5± 5.68	<.001

**Fig 1: comparison of average serum copper levels among study groups**



**DISCUSSION**

Copper is an integral part of each cell. Its biological value is comparable with hormones, vitamins and ferments. About 96% of plasma copper is circulates bound to ceruloplasmin. Copper is not only vital micro-nutrient but also

notable value during pregnancy either normal or abnormal pregnancy. The foeto-placental transport system leads to higher transport of copper towards the increasing age of gestation than that of earlier pregnancy. In present study we determined level of Serum Copper in normal non-pregnant women and pregnant women. In

our study Serum Copper Level in non-pregnant woman was found to be  $121.02 \pm 4.52$   $\mu\text{g/dL}$  (mean  $\pm$  S.D.) which is nearly similar to the findings reported about level of Copper in Serum by Vukelic et al 2012,  $116-225.8$   $\mu\text{g/L}$ . (6)

In present study the average Serum Copper Level in pregnant women was found to be  $245.08 \pm 32.9$   $\mu\text{g/dL}$  (mean  $\pm$  S.D.) which is similar to the study done by Izzeldin et al 2015, they reported the serum copper level of  $251.2$   $\mu\text{g/dL}$  (mean). (7) similar results also found in study done by Kapoor et al (8) in contrary to results obtain in study done by R. Janghorban et al 2006 which shows low copper levels but due to anaemic state. (9) AG ma et al 2004 also reported the low levels of serum copper levels in anaemic pregnant women may be attributed to the fact that iron deficiency state result in decrease of Copper levels in the maternal serum (10), however Vashchenko G et al 2013 demonstrated that Copper Oxidase which is believed to fulfill the function of hephaestin in placenta is regulated by Copper and Iron. (11)

present study shows significantly rise in serum copper levels as gestation age increases from I trimester to III trimester, similar results found in study done by versieck J et al and shown higher serum levels. (12)

## CONCLUSION

This study reveals a constant trend of increase of mean serum copper values during normal pregnancy compared to mean serum copper values in healthy non-pregnant women and this difference was found statistically significant. We draw the inference that these serum copper values can be implemented as an notable indicator of the condition foeto-placental unit, and should be introduced into the protocol of routine antenatal diagnostics as a simple, easy and accurate method by which we can quickly

determine the functional condition of placenta and fetus.

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