

SERUM MALONALDEHYDE AND CERULOPLASMIN LEVELS IN TOXAEMIA OF PREGNANCY

By

SHEELA M. KODLIWADMATH, M. V. KODLIWADMATH AND B. SADASIVUDU

SUMMARY

Levels of serum Ceruloplasmin (CER) and Malonaldehyde (MDA) which is a product of lipid peroxidation, were estimated in normal non-pregnant, normal pregnant and in pregnant toxæmic patients. A significant increase in both MDA and CER levels was observed in pregnant women when compared to the control non-pregnant. A marked significant elevation in the level of serum MDA along with a marginal but significant rise in serum CER was observed in toxæmic pregnant patients in comparison to the same in normal pregnant females.

These results were discussed in the light of the role played by CER as an acute phase protein and as an antioxidant. MDA elevation in normal pregnancy is attributed to a rise in prostaglandin production. The rise in the level of MDA in toxæmia of pregnancy is ascribed to increased lipid peroxidation, as a result of tissue ischemia followed by hyperemia. Rise in CER in normal pregnancy may be due to increased oestrogen levels, while in toxæmia, the increase is probably caused by tissue damage and as part of acute phase reaction.

Introduction

It is fairly established that the serum levels of Ceruloplasmin (CER) a copper transporting protein are elevated in normal pregnancy. It is a protein synthesized in liver under the influence of estrogen. Besides its well known function in the utilization of iron in hemoglobin synthesis, it is recognized as one of the acute phase reactant proteins. An important feature of the functions of CER is its antioxidant activity in the

prevention of damage caused by oxygen free radicals. Increased formation Malon aldehyde (MDA) is taken as an index of increased lipid peroxidative damage of the tissues, although MDA is also known to be formed as a bye product in prostaglandin synthesis. Since eclampsia is associated with hypoeestrogenism and characterised by vasculospasm, it was thought that a simultaneous study of serum levels of CER and MDA would throw light on the severity of the toxæmic state. In this paper, we report the serum CER & MDA levels in twenty five normal pregnant and in twenty five preg-

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Serum Malonaldehyde (MDA) and Ceruloplasmin (CER) Levels in Normal Women, Normal Pregnancy and Toxaemia of Pregnancy

	Control group non-pregnant women	Normal pregnancy women	% change over non-pregnant women	Toxaemia of pregnancy	% change over normal pregnant
MDA (Nano moles per 100 ml)	216.8 ± 43.3 (20)	254.13 ± 43 (25)	+ 17.22	317.21 ± 44.95 (25)	+ 24.82 P < 0.001
Ceruloplasmin (Milligrams per 100 ml)	34.44 ± 1.06 (20)	44.14 ± 5.38 (25)	+ 28.16 P < 0.001	49.12 ± 8.3 (25)	+ 11.28 P < 0.05

Each value is mean ± standard deviation. Figures in parenthesis indicate the number of subjects. Statistical analysis is done employing students 't' test.

nant women with toxæmia (pre-eclampsia and eclampsia) together with serum CER & MDA levels in twenty control non pregnant women.

Patients and Methods

Twenty normal healthy non pregnant females in the age group of 20-40 yrs, mostly belonging to the nursing staff and medical students served as control subjects in the study, for the group of normal pregnant females. Twenty five healthy pregnant females during third trimester served as controls for twenty five pregnant women suffering from toxæmia of pregnancy (pre-eclampsia and eclampsia). These patients are from the wards of the department of obstetrics and gynecology.

Serum CER levels and MDA levels in the above groups were estimated in fasting blood samples or on admission before any treatment was instituted.

Serum CER was estimated as per the method of Ravin (1961) and is expressed in mg%, by multiplying O.D. with Holmberg-Lamell factor, 87.5.

Serum MDA levels were estimated by a modified procedure of Wilbur *et al* (1943) as described by Valipasha and Sadasivudu (1984). Nadigar *et al* (1987) and Mahfouz *et al* (1986), MDA is expressed as nonomoles per 100 ml of serum.

Results

It is evident from the results that there is a significant increase in the serum CER levels in normal pregnant woman and it is in agreement with observations made by other workers (Reiss and Raymond, 1956). A significant increase (17.2%) in the content of MDA is observed in normal pregnant women.

A marked increase in content of MDA in serum of patients suffering from toxemia is observed. A marginal, but significant increase (11.2%) in serum CER when compared to the same in normal pregnant women is observed.

Discussion

A number of hormone binding proteins such as thyroxin binding globulin (TBG), cortisol binding protein (transcortin) and metal binding proteins, such as transferrin and CER are found to be elevated in serum during pregnancy (Pritcher *et al*, 1985). Although elevation in serum CER levels may help in enhanced utilisation of iron during pregnancy, it may also help in defence against oxidative damage by free radical mechanism.

CER has been shown to prevent the formation of oxygen free radicals (Altimimi and Dormandy, 1977) and also in the disposal of superoxide radicals by virtue of its mild superoxide dismutase activity (Goldstein *et al*, 1979).

Hence CER may be having a protective role in pregnancy. The increased serum MDA levels in normal pregnant women may be due to enhanced synthesis of prostaglandins (PG) by vascular endothelial cells. Such an increase in the synthesis of PGE₂. Is supposed to play a role in the known refractoriness of the vasculature in the tissues to the action of angiotensin II in normal pregnancy (Pritcher *et al*, 1985).

It is intriguing to note that serum CER levels showed a marginal and significant increase in toxemic patients in spite of a state of hypoestrogenism. Eclamptic toxemia is characterised by vasculospasm and ischemic state of tissues fol-

lowed by vascular dilatation giving rise to more oxygen supply. Under these conditions damage to the tissues by oxygen free radicals may ensue (Seiszo, 1978). This would lead to increased production of MDA as a result of lipid peroxidation.

The observed increase in serum MDA levels in toxemia may explain such a contention. Furthermore, tissue damage may invoke an acute inflammatory reaction and cause the production of more CER through the Interleukin-I. (Carl-Bartil-Laurell, 1985), in spite of low estrogen levels. However the rise in serum CER may not be enough to prevent the lipid peroxidative damage. It is possible that the elevation in serum MDA levels in toxemia may be mostly due to peroxidative damage of the tissues. Routine administration of high amounts of antioxidants such as vitamin E and ascorbic acid may be beneficial. The increased production and elevated serum MDA levels may be responsible for some of the toxic effects as MDA is known to form cross links with proteins and is also found to be cytotoxic and mutagenic to certain tissues in culture (Le Baron, 1982).

References

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