BLOOD GLUTATHIONE PEROXIDASE AND SELENIUM IN ABORTION

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ABSTRACT

This study was carried out to estimate the levels of glutathione peroxidase and selenium in blood of abortion cases. Glutathione peroxidase and selenium were determined in 52 abortion cases (22 in 1st trimester, 30 in second trimester), 45 normal pregnant cases and 25 non-pregnant control cases. The selenium concentration in whole blood and plasma in abortion cases was almost the same as in normal pregnant women but significantly low when compared with the control non-pregnant group. The glutathione levels was higher in abortion cases when compared with normal pregnant and non-pregnant control groups. Red cell and plasma glutathione peroxidase activities of women who had abortion were significantly lower compared with both non-pregnant control group and normal pregnancies.

INTRODUCTION

The enzyme glutathione peroxidase contains selenium that is an integral part of it. The glutathione peroxidase activity in red cells and plasma as well as selenium concentration in whole blood are significantly lower in women during delivery as compared to non-pregnant women (1). There is a clear decline in these parameters from first trimester to the delivery. Smith and Piciano(2) have demonstrated that selenium requirement is increased due to its transport to the foetus during pregnancy. It is observed that deficiency of selenium in humans may lead to some complications including abortions.

METHODS

Studies were carried out in 52 abortion cases, 45 normal pregnant cases and 25 non-pregnant controls. All the cases of abortion were spontaneous in nature and they were all part of the patients admitted to the V.S.S. Medical College Hospital, Burla. The normal pregnant cases were also part of the group attending the same hospital for delivery. The non-pregnant controls were among the attendants of patients attending the same hospital and also hospital staffs. All the subjects studied were aged 18 – 35 yrs. Among the abortion cases, 22 were in first trimester and 30 were in second trimester.

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Blood samples were collected in heparinised tubes. Part of blood was centrifuged, plasma was separated, and washing of red cells were done with normal saline. The selenium concentration in whole blood and plasma were measured fluorimetrically with 2-3 diaminonaphthalene. The glutathione peroxidase activity in red cells and plasma were measured spectrophotometrically by the method of Paglia and Valentine(3) with t-butyl hydroperoxide as a substrate. The results were compared with 25 control and 45 normal pregnant cases.

RESULTS

The values of glutathione peroxidase, GSH level and selenium level in blood of 25 non-pregnant control women, 45 normal pregnant women and 52 abortion cases were observed and tabulated as below.

From the above table it is seen that the patients with abortion and normal pregnancy, the selenium levels in whole blood and plasma did not differ much but when compared with non pregnant control cases, the selenium levels in whole blood and plasma were significantly lower ($p < 0.001$).

In women with abortion the glutathione concentration is higher when compared with the other two groups. In contrast the red cell as well as plasma glutathione peroxidase activities were the same in pregnant women and non-pregnant control groups but were significantly lower in women with abortions.

DISCUSSION

TABLE 1

Glutathione Peroxidase, GSH and Selenium in blood of abortion cases, normal pregnant cases and non- pregnant controls.
Values are Mean $\pm$ S.D.

Groups	Glutathione peroxidase		GSH level mmol/L	Selenium level (ng/ml)	
	U/gm. Hb	U/L plasma		Whole blood	Plasma
Control (n = 25)	18.2(3.16)	230(54)	2.38(0.26)	90.7(11.3)	66.2(13)
Normal pregnancy. (n=45)	18.1 (5.9)	229 (101)	2.32 (0.24)	74 (11.5)	54.5 (11)
Abortion (n=52)	15.1 (2.95)	168 (30.6)	2.59 (0.31)	74.7 (9.6)	56.1 (8.75)

Selenium in blood components are generally related to diet(4). It is usually accepted that normal selenium concentration in serum / plasma is 100ng/ml. In our study the mean serum selenium concentration in plasma was found to be 66.2 ng/ml. Rayman and Abou Shakra (5) have shown that in serum of pregnant women the median selenium level was only 48.9 ng/ml, which did not differ from the level of aborted women 56.1 ng/ml but were significantly lower compared with non pregnant control 66.2 ng/ml.

Nazarglu *et al* (6) have shown that vitamin E, selenium, copper, manganese are significantly lower in plasma of aborted ewes compared with non aborted animals. The administration of selenium before mating and throughout the pregnancy increased selenium levels and the activity of glutathione peroxidase. In human the problem with reproductive performance is not so evident. Iwanier and Zuchara (7) supplemented a group of subfertile men with selenium and have shown that the selenium levels and glutathione peroxidase activities in their blood increased but the quality of spermatozoal activity did not change. Barington and Taylor (8) have shown in their study the mean selenium values to be $(54.7 \pm 16.7 \text{ ng/ml})$ which is almost at par with our study 54.5. The serum selenium value of non-pregnant control cases was higher $(81.1 \pm 16 \text{ ng/ml})$. Barington and Taylor (8) have shown that in women with repeated abortions serum selenium concentration is also significantly lower compared with non-pregnant control.

In the present study the selenium concentration in whole blood and plasma did not differ between

aborted women from that of pregnant women. However glutathione peroxidase activities both in red cell and plasma were significantly lower in abortions compared to normal pregnancy and control groups.

Oxygen is essential for all aerobic organisms whose metabolism leads to the formation of harmful free radicals and other reactive oxygen species (ROS). The trace elements function as prosthetic groups of various enzymes(9). Selenium is incorporated into the active site of glutathione peroxidase(10). Copper, zinc and manganese are constituents of superoxide dismutase(11), which plays a major role in catalyzing transformation of superoxide radical anion to less harmful H_2O_2 . Glutathione peroxidase catalyses the reduction of H_2O_2 and organic hydroperoxides thereby preventing peroxidation of cell membranes and act as a free radical scavenger. Lipid peroxidation is a major manifestation of oxidative stress. Oxidative stress is aetiologically involved in a variety of clinical conditions including pregnancy and abortions.

The decreased levels of glutathione peroxidase was the observed result due to abortion. The decreased activities of red cell and plasma glutathione peroxidase may play an important role in the aetiology of spontaneous abortion. Whether decreased levels of glutathione peroxidase cause abortion require further studies. Glutathione peroxidase reduces almost every hydroperoxide. Conflicting results were available on blood glutathione peroxidase activity of pregnant women. Red cell glutathione peroxidase and plasma lipoperoxides in women with habitual abortions,

were not significantly different from those of controls(12). Further they found that glutathione and lipid peroxide levels in plasma of aborted women were significantly higher than healthy controls while other small antioxidants like vitamin A, vitamin E betacarotene and bilirubin were significantly lower in habitual abortions.

In the present study in the aborted women there is increased concentration of glutathione, which participates in elimination of free radicals probably due to lower glutathione peroxidase activity(13). Glutathione is the most important non enzymatic thiol of cells and function as an essential redox compound. The hydroxyl radicals which are considered as a major source of free radical damage are neutralized by glutathione peroxidase. This also plays an important role in various detoxification processes.

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