Serum cholinesterase activity in different types of hypertension during pregnancy

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Abstract: Serum cholinesterase activities were assessed in pregnant women with different types of hypertension. Two samples of blood were taken (during pregnancy and at puerperium) of 20 normal pregnant women (NP), 16 with mild preeclampsia (MPE), 17 with severe preeclampsia (SPE), six with chronic hypertension plus preeclampsia (CHT+PE) and seven with chronic hypertension (CHT). The enzyme activity declined significantly at puerperium as compared with during pregnancy in the CHT and CHT+PE groups ($p < 0.05$). Nevertheless, during pregnancy the activities recorded in the CHT group were significantly higher as compared to NP ($p < 0.01$) and MPE ($p < 0.05$). At puerperium, cholinesterase activities were significantly higher in: (1) SPE as compared to: NP ($p < 0.05$), CHT ($p < 0.001$) and CHT+PE ($p < 0.05$), and (2) MPE as compared to: CHT and CHT+PE ($p < 0.05$). The consequence of the reduction in cholinesterase activity, at puerperium, in the CHT and CHT+PE patients should be established.

Introduction: Pregnancy-induced hypertension (PIH) is a clinical event that occurs during gestation and reverts after giving birth and is one of the main causes of death during pregnancy [1–3]. Some patients with PIH may develop HELLP (haemolysis, increased liver enzymes and low platelet count) which is a syndrome characterised by haemolysis, an increase in hepatic enzymes and thrombocytopenia [1–4]. Patients with chronic hypertension may be complicated with preeclampsia (PE) during pregnancy [1–4]. Liver dysfunction may be observed in patients with preeclampsia [1–4].

Altered serum cholinesterase (EC 3.1.1.8) has been associated with liver disease, cancer and lipoprotein metabolism as well as organophosphates exposure [5]. The significance of cholinesterase in pregnancy is still dubious [6].

The aim of the present study is to assess the significance of serum cholinesterase activity in normal pregnant women and patients with PIH or chronic hypertension during pregnancy and at puerperium.

Patients and methods: The patients studied were among those admitted to the Maternity Hospital (Maternidad Concepción Palacios) of Caracas. The study was accepted by the Ethical Committee of the hospital.

We studied 66 pregnant women, 20 normal (NP), 16 with mild preeclampsia (MPE), 17 with severe preeclampsia (SPE), six with chronic hypertension plus preeclampsia (CHT+PE) and seven with chronic hypertension (CHT). Upon written consent, two samples of blood were taken (one during pregnancy and one, two or three days after delivery). We used the classification of the hypertensive disorders of pregnancy adopted by the American College of Obstetricians and Gynecologists in 1986 [7, 8].

Blood pressures were measured by the first and fifth Kortkoff sounds with patients in the left lateral decubitus position. The blood pressure recordings were ascertained during the admission, before and after starting anti-hypertensive treatment (patients with preeclampsia) and immediately before blood collection.

All patients had more than 20 weeks of pregnancy. Mild preeclampsia was defined for the following: recent hypertension, persistently ≥ 140 mmHg systolic or ≥ 90 mmHg diastolic; mild proteinuria or oedema. Patients with severe preeclampsia had one or more of the following: recent systolic blood pressure persistently ≥ 160 mmHg; diastolic blood pressure persistently ≥ 100 mmHg; proteinuria > 2,000 mg/24 h (or > 3+ in semiquantitative tests), increased serum creatinine levels (> 177 μmol L^{-1}–2 mg dL^{-1}) or oliguria (< 500 mL/24 h), platelet count < 1×10^9 L or evidence of microangiopathic haemolytic anaemia (schistocytes, increase in indirect bilirubin levels, or increase in serum free haemoglobin levels), upper abdominal pain, headache, visual disturbances or other cerebral signs.

Women with chronic hypertension were diagnosed of having essential hypertension before pregnancy. Patients with previous history of chronic hypertension that developed proteinuria, abnormal oedema or any signs of severe preeclampsia were classified as chronic hypertension with superimposed pregnancy-induced hypertension.

We excluded any patient with fever, infection or other chronic diseases (such as diabetes, renal disorders, cardiopathies, *etc.*) and patients in which the syndromes were not clearly defined with the aforementioned criteria. A complete medical record of each patient was kept from the admission to the hospital discharge.

Hypertensive patients were treated with α methyldopa, hydralazine or nifedipine, alone or in combination. The doses varied depending on the response.

Cholinesterase activity was measured using a kit purchased from Sigma Chemical Company (St Louis, MO, USA) according to the method of Rappaport *et al.* [9]. A standard curve using acetic acid was used to calculate the units (Rappaport units/mL) of cholinesterase detected in the samples.

The results obtained were compared using: Student's paired *t*-test, and ANOVA analysis.

Results: Table 1 shows the general characteristic of the population studied. Patients with chronic hypertension (CHT and CHT+PE) were older ($p < 0.05$) as compared with other groups. Significantly higher values of blood pressure and uric acid were observed in the different groups

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Table 1: Characteristics of the groups studied, including laboratory parameters as well as the weeks of gestation in which the samples were taken (means ± SEM).

	NP	MPE	SPE	CHT+PE	CHT
n	20	16	17	6	7
Age (years)	26 ± 6	22 ± 7	23 ± 6	34 ± 3*	31 ± 8*
Systolic pressure	120 ± 5	138 ± 11**	164 ± 14***	176 ± 28***	157 ± 15***
Diastolic pressure	72 ± 7	92 ± 6***	111 ± 5***	118 ± 20***	101 ± 12***
Uric acid	3.2 ± 0.6	5.0 ± 1.6**	5.9 ± 2.7****	6.0 ± 2.4***	5.2 ± 1.2*
Total bilirubin (mg dL^{-1})	0.4 ± 0.2	0.45 ± 0.25	0.49 ± 0.38	0.5 ± 0.23	0.6 ± 0.19
ALT U L^{-1}	17.3 ± 9	10.5 ± 2.6	22 ± 15	26.1 ± 23	21.2 ± 12
AST	27.3 ± 4	20 ± 4.4	38 ± 27	86.8 ± 119	27.3 ± 3
Creatinine (mg/%)	0.6 ± 0.2	0.66 ± 0.13	0.81 ± 0.19***	0.83 ± 0.12**	0.73 ± 0.1
Platelet (mm^3)	242.000 ± 60.000	256.000 ± 79.140	232.000 ± 88.640	200.000 ± 53.398	290.000 ± 67.509
Weeks of gestation					
1st sample	38 ± 3	37 ± 2	36 ± 3	31 ± 5	33 ± 2
2nd sample	39 ± 1	38 ± 1	36 ± 3	32 ± 4	38 ± 2

*As compared with the different groups with NP. *p < 0.05; **p < 0.01; ***p < 0.005; ****p < 0.0001.*

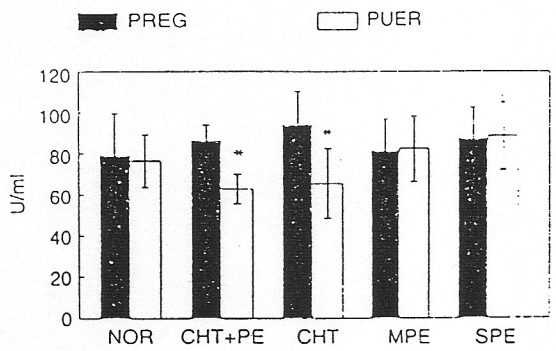

*Figure 1. Serum cholinesterase activity during pregnancy and at puerperium in the different groups studied: normal pregnancy (NP), mild preeclampsia (MPE), severe preeclampsia (SPE), chronic hypertension (CHT) and chronic hypertension plus preeclampsia (CHT+PE). *As compared with PREG. p < 0.05 (Student's t-test).*

(MPE, SPE, CHT and CHT+PE) as compared to NP. An increase in creatinine levels, increase in serum transaminase, or a decrease in platelet count was observed generally in the patients with SPE and SPE and CHT+PE. HELLP syndrome was not observed in these patients.

Figure 1 illustrates the levels of cholinesterase during pregnancy and at puerperium. There was no correlation between the age of the patients or the weeks of gestation with serum cholinesterase activity. Even though the values are within the normal range of the population [9–11], there were significant differences within and between groups. The significant decreases ($p < 0.05$) in enzyme activity observed at puerperium as compared to during pregnancy in the CHT and CHT+PE patients are depicted.

ANOVA analysis of the different groups revealed significant differences during pregnancy ($p < 0.05$) and at puerperium ($p < 0.005$). During pregnancy, the patients of the CHT group presented higher values of cholinesterase activity as compared to NP ($p < 0.01$) and MPE patients ($p < 0.05$). At puerperium, activities were significantly higher in: (1) SPE as compared to: NP ($p < 0.05$), CHT ($p < 0.001$) and CHT+PE ($p < 0.05$), and (2) MPE as compared to: CHT and CHT+PE ($p < 0.05$).

Discussion: Cholinesterase has been widely implicated in different hepatic disturbances. However, its importance in pregnancy, hypertension and pregnancy-induced hypertension is dubious [6, 10–11]. Several genetic variants as well as population variability of the levels of cholinesterase has made it difficult to ascertain the role of this enzyme in different pathologies.

In the present report, we observed a marked decline in cholinesterase activity at puerperium as compared to during pregnancy in patients with CHT and CHT+PE. This decrease was not observed in the other groups, suggesting that important metabolic modifications may occur during pregnancy or at puerperium in these patients.

On the other hand, serum cholinesterase activity during pregnancy seemed not to be modified in patients with preeclampsia. No difference was observed between treated and not treated patients or the number of anti-hypertensive drugs used (results not shown). Since none of the patients included in this study developed HELLP, it is possible that alterations in the cholinesterase activity will be observed only in this condition. Further analysis should be performed to ascertain the role of these enzyme in severe liver dysfunction during pregnancy.

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