

## A Study of $\beta$ -Human Chorionic Gonadotropin Level in Preeclamptic and Normotensive Pregnant Women

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**Abstract:** Preeclampsia remains a major cause of prenatal morbidity and mortality worldwide. Cause of preeclampsia is still ill defined and there is no appropriate test for predicting occurrence of the disorder. This study aimed to assess association between preeclampsia and serum level of  $\beta$ -human chorionic gonadotropin ( $\beta$ -hCG). The study had cross-sectional design and carried out on 75 pregnant women admitted to Asalian hospital (Khorramabad/Iran) during 2004-2005. Subjects divided into 3 groups: Normotensive pregnancies, mild preeclampsia and severe preeclampsia. Then level of  $\beta$ -hCG was measured using Enzyme-linked Immunosorbent Assay (ELISA) method. The mean level of  $\beta$ -hCG was significantly higher ( $p < 0.001$ ) in severe preeclampsia ( $59220 \pm 4634$  mIU mL<sup>-1</sup>) than normotensive and mild preeclamptic groups ( $18572 \pm 2123$  mIU mL<sup>-1</sup> and  $23968 \pm 6558$ , respectively). However, there was no significant difference between normotensive and mild preeclamptic groups regarding mean level of  $\beta$ -hCG ( $p > 0.05$ ). Our results showed that  $\beta$ -hCG may be a good indicator for severe preeclampsia but it is not suitable for early diagnosis of the disease. Performing more studies in this field is recommended to confirm this hypothesis.

**Key words:** Preeclampsia,  $\beta$ -hCG, pregnancy, prediction, ELISA

### INTRODUCTION

Preeclampsia is the 3rd leading etiology of maternal mortality and can complicate 3-14% of all pregnancies (Irminger-Finger *et al.*, 2008; Wagner, 2004). Although, its pathogenesis is not clearly determined, it seems that placenta plays the main role in pathophysiology of preeclampsia (Carty *et al.*, 2008). Several evidences such as definite treatment of preeclampsia by delivery of placenta and occurrence of preeclampsia in the absence of viable fetus confirm this hypothesis (Carty *et al.*, 2008). In spite of reduction in morbidity and mortality of preeclampsia by improvement in maternal and obstetric cares, no significant changes occurred in prediction of preeclampsia (Carty *et al.*, 2008).

Association between  $\beta$ -human chorionic gonadotropin ( $\beta$ -hCG), the placenta's main hormone secreted from syncytiotrophoblast cells and preeclampsia has been investigated in several studies (Dugoff *et al.*, 2004; Ong *et al.*, 2000; Tul *et al.*, 2003). However, the results are mixed and ability of  $\beta$ -hCG in predicting preeclampsia is still not well defined (Canini *et al.*, 2008). Thus, this study was designed to evaluate the relationship between level of  $\beta$ -hCG and preeclampsia.

### MATERIALS AND METHODS

The study had cross-sectional design and carried out at Asalian Hospital in Khorramabad from April 2004 to February 2005. The study subjects were 75 pregnant women who were classified in three equal groups as normotensive, mild preeclampsia and severe preeclampsia. An effort was made to match the participants regarding age, parity and gestational age in 3 groups. The inclusion criteria were all 18-30 years old pregnant women with gravids of I or II as well as gestational age from 28-38 weeks. The exclusion criteria were multiple pregnancy, diabetes mellitus, chronic hypertension and internal diseases. Group 1 included normotensive pregnant women, who had been referred to the hospital due to labor Pain or Premature Rupture of Membranes (PROM). Group 2 comprised mild preeclamptic pregnant women with blood pressures  $> 140/90$  mm Hg, proteinuria less than +2 on dipstick test without clinical feature of severe preeclampsia. Group 3 consisted of pregnant women with severe preeclampsia i.e., mild preeclampsia symptoms accompanied with one or more of the following items, which needed prompt delivery:

- Blood pressure  $\geq$  160/110 mm Hg
- Headache, dizziness, visual blurring, heartburn,
- Renal disorders (proteinuria  $>+2$  on dipstick test), oliguria (urine output  $<400$  cc/24 h)
- Rising in liver enzymes
- Convulsion
- Pulmonary edema
- Intrauterine Growth Retardation (IUGR)
- Thrombocytopenia
- Coagulation disorder

A questionnaire was completed for all patients, included demographics, gestational age, parity, live births, stillbirth, abortion, hypertension, urine albumin, platelet counts, edema, headache, dizziness, visual blurring, heartburn, liver enzymes, BUN and Cr. For measurement of  $\beta$ -hCG, clotted blood was centrifuged and its serum was separated and froze.

Then  $\beta$ -hCG level was determined by the Enzyme-linked Immunosorbent Assay (ELISA) method. In this study, all quantitative variables were presented as mean $\pm$ SD. Statistical analysis was carried out by the SPSS software using Analysis of Variance (ANOVA),  $\chi^2$ , as well as Kruskal-Wallis. The  $p < 0.05$  was considered statistically significant.

### RESULTS

Totally, 75 samples were collected (25 samples from each group). The mean age of the subjects and mean gestational age were  $25.46 \pm 3.5$  years and  $37.08 \pm 2.16$  weeks successively. The mean systolic and diastolic blood pressures were  $139.6 \pm 26$  and  $104.4 \pm 13.2$  mm Hg, respectively. Statistical analysis showed significant differences regarding both mean systolic and diastolic blood pressures between all three groups ( $p < 0.05$ ). Details have been summarized in Table 1.

Mean value of  $\beta$ -hCG was  $33920 \pm 3443$  mIU mL<sup>-1</sup>, while mean level of  $\beta$ -hCG was  $18572 \pm 2123$  mIU mL<sup>-1</sup> in normotensive women,  $23968 \pm 6558$  mIU mL<sup>-1</sup> in mild preeclamptic women and  $59220 \pm 4634$  mIU mL<sup>-1</sup> in severe

preeclamptic ones. Regarding the  $\beta$ -hCG level, the difference between the 3rd group and 2 other ones was statistically significant ( $p < 0.001$ ). However, it was not the same regarding normotensive and mild preeclamptic groups ( $p > 0.05$ ) (Table 1).

### DISCUSSION

Our findings showed that mean level of  $\beta$ -hCG tends to be significantly higher in severe preeclamptic pregnancies than normotensive and mild preeclamptic situations. Our results are in concordance with most of the previous reports (Basirat *et al.*, 2006; Feng *et al.*, 2000; Li *et al.*, 1998; Ong *et al.*, 2000) however, it is in contrast with some other studies (Dugoff *et al.*, 2004; Tul *et al.*, 2003).

In a study, conducted in China, the levels of Human Placental Lactogen (HPL) and hCG were measured in 142 normotensive and 43 preeclamptic women. The results suggested a direct relationship between the HCG level and severity of preeclampsia ( $r = 0.677$ ,  $p < 0.05$ ). However, there was not an association between the HPL level and severity of preeclampsia ( $r = -0.3$ ,  $p > 0.05$ ). Finally, the authors concluded that the  $\beta$ -hCG level might reflect the disorder degree of the activity of placental trophoblast in Pregnancy Induced Hypertension (PIH) and could be utilized as a marker in determining PIH (Feng *et al.*, 2000). Also, in another study, the relationship between Endothelin (ET) and hCG with preeclampsia was studied. The study compared 32 women with PIH and 17 normotensive pregnant women and concluded ET and hCG were definitely higher in women with PIH rather than normotensive subjects. Therefore, their increase suggest a functional disorder in placental cells, which may resulted from damage to the endothelial cells (Li *et al.*, 1998). In Sweden, in 1998, a case control study was conducted for measuring the Urinary Gonadotropin Peptide (UGP) which, is the urinary metabolite of the hCG. The mentioned study was carried out on 18 preeclamptic women and 20 normotensive pregnant in the third trimester of their pregnancy. It was concluded that the considerable increase of the UGP level in preeclamptic patients was more evident than that in normotensive ones. These results suggest some placental hypoperfusion as a preeclamptic etiology (Williams *et al.*, 1998). A study conducted in Istanbul, in 2004, compared  $\beta$ -hCG levels in 80 women suffering from mild preeclampsia, severe preeclampsia, superimposed hypertension and chronic hypertension with 25 normotensive pregnant women. The  $\beta$ -hCG level was

Table 1: Blood pressure and  $\beta$ -hCG mean level in normotensive, mild preeclamptic and severe preeclamptic women

| Group                                 | Normotensive<br>(n = 25) | Mild<br>preeclamptic<br>(n = 25) | Severe<br>preeclamptic<br>(n = 25) | p-value  |
|---------------------------------------|--------------------------|----------------------------------|------------------------------------|----------|
| Mean gestational age (weeks)          | 37.76                    | 37.16                            | 36.32                              | $>0.050$ |
| Mean maternal age (years)             | 21.56                    | 24.88                            | 21.44                              | $>0.050$ |
| Mean systolic blood Pressure (mm Hg)  | 106.80                   | 144.80                           | 167.200                            | $<0.050$ |
| Mean diastolic blood Pressure (mm Hg) | 71.600                   | 92.00                            | 149.600                            | $<0.050$ |
| $\beta$ -hCG level                    | 185720                   | 23968                            | 592200                             | $<0.001$ |

reported to be 17000 mIU mL<sup>-1</sup> in mild preeclamptic women, 49000 mIU mL<sup>-1</sup> in severe preeclamptic women, about 41000 mIU mL<sup>-1</sup> in women with superimposed hypertension, 12558 mIU mL<sup>-1</sup> in women with chronic hypertension and 9647 mIU mL<sup>-1</sup> in normotensive women. The results indicated that the  $\beta$ -hCG level in women with severe preeclampsia was significantly more than those in other groups ( $p < 0.001$ ) (Gurbuz *et al.*, 2004).

In our study, the  $\beta$ -hCG levels were measured and examined in the 3 groups of normotensive, mild preeclamptic and severe preeclamptic pregnant women during the 3rd trimester of their pregnancy. The results showed that there was a significant difference between the  $\beta$ -hCG level in the severe preeclamptic group with the other 2 ones ( $p < 0.001$ ). However, there was not a statistically significant difference between the normotensive group and the mild preeclamptic ones in spite of higher level of  $\beta$ -hCG level in mild preeclamptic group.

It seems that the  $\beta$ -hCG level in case of severe diseases in which there are placental perfusion disorder and severe damaging to trophoblastic cells, tends to increase due to disorder in the activity of placental cells. Therefore, measuring the  $\beta$ -hCG level may not be an early sign for the early diagnosis of the disease. However, it may prove to be a indicator of the severity of the disease.

## CONCLUSION

Our results showed that  $\beta$ -hCG may be a good indicator for severe preeclampsia but it is not suitable for early diagnosis of the disease. However, performing more studies in this field is recommended to confirm this hypothesis.

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