Role of Serum Alphafeto Protein & Beta Human Chorionic Gonadotropin in Patients with Pre-Eclampsia

Vandana Yadav¹, G G Kaushik², Nagraj Soni³

Abstract: Background: 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 levels of β-human chorionic gonadotropin (β-hCG) and alphafeto-protein (AFP). Method: The study had cross-sectional design and carried out on 500 pregnant women admitted to R.N.T. Medical college, Udaipur. Subjects were divided into 3 groups normotensive pregnancies, mild preeclampsia and severe pre-eclampsia. The level of β-hCG and AFP were measured using Enzyme-linked Immunosorbent Assay (ELISA) method and results were analyzed statistically using SPSS version 17. Results: Out of 500 pregnant women 250 were controlled and 250 were preeclamptic women. Out of 250 preeclampsia women 200 were mild preeclampsia and 50 were severe pre-eclampsia. Maternal serum of β-hCG and AFP were markedly raised in pre-eclampsia in comparison to controlled and paralleled with the severity of preeclampsia. Conclusion: A significant positive correlation between second trimester serum markers and development of pre-eclampsia was observed. β-hCG and AFP may be good indicator for severe pre-eclampsia but it is not suitable for early diagnosis of the disease. Performing more studies in this field is recommended to confirm this hypothesis.

Keywords: Alphafeto-protein, β-human chorionic gonadotropin, pre-eclampsia

1. Introduction

Pre-eclampsia is a multisystem disorder of unknown etiology with hypertension, proteinuria and/or edema which predisposes to potentially lethal complications such as eclampsia, abruptio-placenta, acute renal failure, cerebral hemorrhage and circulatory collapse. Approximately 7 to 10% of all pregnancies are complicated by hypertensive disease, 70% of which is gestational hypertension pre-eclampsia related and 30% are due to chronic hypertension (Sibai, 2010). Pre-eclampsia is defined as a systolic blood pressure ≥ 140 mm Hg or diastolic blood pressure ≥ 90 mm Hg on 2 occasions at least 4 hrs apart after 20 weeks gestation in women with a previously normal blood pressure or ≥ 160 mm Hg systolic or ≥ 110 mm Hg diastolic, confirmed with in a short interval (minutes) to facilitate timely anti-hypertensive therapy and proteinuria ≥ 300 mg / 24 hrs or a protein / creatinine ratio ≥ 0.3 mg/dl or a dipstick reading of ≥ 1+. In the absence of proteinuria, pre-eclampsia is diagnosed as new onset hypertension with the new onset of any the following : thrombocytopenia, renal insufficiency, or cerebral or visual systoms. (ACOG, 2013) Pre-eclampsia was considered as defined by American college of Obstetrics and Gynecologists (ACOG, 2013) the combination of hypertension and proteinuria, thrombocytopenia, renal failure, or cerebral or visual symptoms. This combination of signs and symptoms is called pre-eclampsia.

Blood samples were collected with all aseptic precautions. Levels in maternal serum were done by ELISA technique.

2. Material and Methods

The present study was conducted at the Department of obstetrics and gynecology, R.N.T. Medical College, Udaipur, after taking approval from ethical committee from 2011 to March 2013. The prospective randomized study was conducted on 500 pregnant women of gestational age between 12-24 weeks with singleton pregnancy. Patients with chronic hypertension, twin pregnancy, molar pregnancy, chromosomally abnormal fetus, diabetes, chronic renal diseases, autoimmune disorders, cardiovascular diseases were excluded from the study. A part from routine hematological investigations, estimation of AFP and β-hCG levels in maternal serum were done by ELISA technique.

The study had cross-sectional design and carried out on 500 pregnant women admitted to R.N.T. Medical college, Udaipur. Subjects were divided into 3 groups normotensive pregnancies, mild preeclampsia and severe pre-eclampsia. The level of β-hCG and AFP were measured using Enzyme-linked Immunosorbent Assay (ELISA) method and results were analyzed statistically using SPSS version 17.
difference of pregnancy outcome comes among the control, mild pre-eclampsia, and severe pre-eclampsia groups were carried out with ANOVA, student’s t-test. P value < 0.05 was considered statistically significant.

3. Result

Table 1: Distribution of various groups of subjects according to severity:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Group studies</th>
<th>Number of subjects (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Healthy pregnant women (controls)</td>
<td>250</td>
</tr>
<tr>
<td>2</td>
<td>Pre-eclamptic primigravidas (Mild)</td>
<td>200</td>
</tr>
<tr>
<td>3</td>
<td>Pre-eclamptic primigravidas (Severe)</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>500</td>
</tr>
</tbody>
</table>

Table 2: Demographic characteristics of normal pregnancy and pre-eclampsia cases

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Parameters</th>
<th>Normal Pregnancy (N = 250)</th>
<th>Mild Pre-eclampsia (N = 200)</th>
<th>Severe Pre-eclampsia (N = 50)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mean gestational age (weeks)</td>
<td>20.20 ± 2.25</td>
<td>22.42 ± 3.25</td>
<td>21.30 ± 2.90</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>2</td>
<td>Mean maternal age (years)</td>
<td>28.58 ± 2.30</td>
<td>23.2 ± 3.10</td>
<td>21.80 ± 2.90</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>3</td>
<td>Mean systolic blood pressure (mm Hg)</td>
<td>114.25 ± 7.42</td>
<td>156.24 ± 7.90</td>
<td>183.86 ± 8.24</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>4</td>
<td>Mean diastolic blood pressure (mm Hg)</td>
<td>76.61 ± 8.67</td>
<td>99.51 ± 4.87</td>
<td>113.06 ± 5.11</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Table 3: Laboratory data of normal pregnancy, mild and severe pre-eclampsia:

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Parameters</th>
<th>Normal Pregnancy (N = 250)</th>
<th>Mild Pre-eclampsia (N = 200)</th>
<th>Severe Pre-eclampsia (N = 50)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Urea (mg/dl)</td>
<td>15.50 ± 2.59</td>
<td>24.52 ± 3.99</td>
<td>35.46 ± 4.94</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>2</td>
<td>Creatinine (mg/dl)</td>
<td>0.74 ± 0.14</td>
<td>0.83 ± 0.07</td>
<td>1.46 ± 0.27</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>3</td>
<td>Uric acid (mg/dl)</td>
<td>4.85 ± 1.31</td>
<td>5.83 ± 1.00</td>
<td>7.60 ± 0.77</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Table 4: Comparison of β-hCG and AFP levels in normal pregnancy, mild and severe pre-eclampsia.

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Parameters</th>
<th>Normal Pregnancy (N = 250)</th>
<th>Mild Pre-eclampsia (N = 200)</th>
<th>Severe Pre-eclampsia (N = 50)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AFP (ng/ml)</td>
<td>52.50 ± 15.52</td>
<td>116.41 ± 7.92</td>
<td>151.04 ± 7.2</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>2</td>
<td>β-hCG (mIU/ml)</td>
<td>8091.44 ± 1493.68</td>
<td>15850.26 ± 17839.53</td>
<td>19791.70 ± 987.02</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Graph 2: Comparison of β-hCG and AFP levels in normal pregnancy, mild and severe pre-eclampsia.

Graph 3: Laboratory data of normal pregnancy, mild and severe pre-eclampsia.

Values are given as mean ± SD, P < 0.05 significant.

4. Discussion

In pre-eclampsia, the rise of blood pressure is due to vasoconstriction and impaired angiogenesis leading to hypoxia and hyperplasia of trophoblastic cells which causes hypersecretion of placental hormone ultimately leading to high level of circulating β-hCG. In this study, we found that serum β-hCG levels were significantly elevated in severe preeclampsia, compared with the controls. This finding indicates that an abnormal secretory function exists in patients with severe preeclampsia. In preeclampsia, placental pathologic examination reveals focal cellular necrosis in the syncytiotrophoblast and increased mitotic activity with cellular proliferation in the cytotrophoblast (Jones CJP 1980). In addition, the proliferating cytotrophoblast in severe pre-eclampsia is rapidly transformed into syncyti-
trophoblast with in 72 hours (Hoshina, 1982). The normal placenta differentiates during pregnancy with the cytotrophoblast dominate in late pregnancy (Enders AC 1965). It is well known that the cytotrophoblast is an undifferentiated stem cell and the syncytiotrophoblast is a differentiated trophoblast transformed from the cytotrophoblast (Kliman HJ, 1987). In 1934, Smith et al talked about increasing hCG levels in severe preeclampsia for the first time. Luckas M (1998), Benn PA (1996) & Ashour AM (1997) indicate that an unexplained elevation of serum hCG significantly correlated with the occurrence of preeclampsia. By contract Poula et al and Aguлина et al demonstrated no relation between levels of serum hCG and severity of pre – eclampsia. Stamilio et al also found no association between severe preeclampsia and elevated second trimester hCG levels. Alpha – fetoprotein (AFP) is produced in the fetal liver and yolk sac, and secreted into the fetal circulation and amniotic fluid, passed into the maternal circulation via the placenta and its concentration is 100 fold increase in the first trimester of pregnancy compared with non pregnant women. In our study, unexplained high levels of MSAFP have been associated with pre – eclampsia. Our findings are consistent with the study by Tikkanen et al (2007), Waller et al (1996) and Willaims et al (1992) about the correlation of pre – eclampsia and MSAFP, while Khoo’s study (1978) showed, in preeclampsia women; significantly lower mean AFP values were obtained. Raly et al also found the AFP values in the severe pre – eclampsia group differed significantly from all other groups. Brazerol et al (1999) reported that the explanation for the association between elevated maternal serum alpha-fetoprotein and adverse pregnancy outcome is not clear, but is probably a marker of placental dysfunction, including partial placental abruption, feto maternal bleeding and abnormal implantation.

5. Conclusion

Pre-eclampsia remains a major cause of perinatal morbidity worldwide. Exact etiology is still not defined. It usually presents clinically toward the end of pregnancy, after the disease process is well established. The new markers provide an opportunity to study the early natural history of disease and possibly to conduct treatment trials. The present study confirmed the elevated levels of AFP and beta–hCG are associated with pre-eclampsia in second trimester.

References


