Assessment of Serum Reproductive Hormone Concentrations in Normal Pregnancy

Shahid A Mujawar¹, Vinayak W Patil², Rekha Daver³

ABSTRACT

Background and objectives: Gestation is associated with profound hormonal and metabolic changes in the mother. These alterations facilitate the placenta to take over the dominant role of steroid production. The present study was designed to assess the concentrations of estrogen, progesterone, and total testosterone in normal pregnancy.

Materials and methods: Fifty normotensive normal pregnant subjects with mean age 26.4 ± 4.48 years with no history of hypertension, vomiting, fever, cough, and cold were taken. Their mean ± SD gestational age at the time of study was 23.8 ± 10.2 weeks who attended to the gynecology OPD were included in the study. Age-matched 50 nonpregnant subjects, not having any acute illness, thyroid, liver, and renal diseases, were taken as control. Serum estrogen, progesterone, and total testosterone were estimated by chemiluminescent method on Immulite 1000.

Results: The alterations of serum reproductive hormone levels in normotensive pregnant subjects were found when compared to those of non-pregnant control group. Study group showed a significant (p value < 0.001) increase in serum estrogen, progesterone, and total testosterone levels due to production of prostaglandin before labor, subsequent conversion of cholesterol to progesterone in the placenta, and defect in newborn growth and size, respectively. When compared to nonpregnant control group.

Conclusion: Reproductive hormones such as estrogen, progesterone, and total testosterone in normal pregnancy are of paramount importance during pregnancy. This study suggests that levels of abovementioned parameters were altering in normal physiological changes during pregnancy.

Keywords: Estrogen, Pregnancy, Progesterone.

Materials and Methods
This study was carried out at Department of Biochemistry, Grant Medical College and Sir JJ Group of Government Hospitals, Mumbai, over the period of October 2007–June 2010. All participants completed a medical history form and provided informed consent. Fifty normotensive pregnant subjects with mean age 26.4 ± 4.48 years who had no history of hypertension, vomiting, fever, cough, and cold were taken. Their mean ± SD gestational age at time of study was 23.8 ± 10.2 weeks who attended to the gynecology OPD were included in the study. Age-matched 50 nonpregnant subjects, not having any acute illness, thyroid, liver, renal diseases, and not used oral contraceptives were taken as control. Serum estrogen, progesterone, and total testosterone were estimated by chemiluminescent method on Immulite 1000.

Conflict of interest: None


Source of support: Nil

Corresponding Author: Shahid A Mujawar, Department of Biochemistry, Grant Govt. Medical College and Sir JJ Group of Government Hospitals, Byculla, Mumbai, Maharashtra, India, Phone: +91 9897407891, e-mail: akbarson4@gmail.com

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Biochemical Analysis
Serum estradiol measured by solid-phase, competitive, chemiluminescent enzyme immunoassay. Serum progesterone measured by sequential, competitive, chemiluminescent immunoassay. Serum total testosterone measured by solid-phase, competitive, chemiluminescent enzyme immunoassay. We used fully automated enzyme-amplified chemiluminescent immunoassay-based Immulite 1000 analyzer. Measurement of these blood parameters was done using commercial kits from Siemens Medical Solutions Diagnostics, Los Angeles, CA, USA.

Statistical Analysis
Numerical variables were reported in terms of mean and standard deviation. Statistical analysis of results was done by normal distribution ‘z’ test. In this analysis, variables showing p value less than 0.05 and 0.001 were considered to be statistically significant and highly significant respectively.

RESULTS
Demographic data of pregnant subjects such as age and hemoglobin (Hb) were significantly changed (p value < 0.05), whereas body mass index (BMI), systolic blood pressure (SBP), and diastolic blood pressure (DBP) were statistically insignificant when compared to those of non-pregnant control group (Table 1).

Table 1: Demographic data in non-pregnant controls and pregnant subjects

<table>
<thead>
<tr>
<th>S. no.</th>
<th>Biochemical parameters</th>
<th>Non-pregnant (n = 50)</th>
<th>Normotensive pregnant (n = 50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Age (years)</td>
<td>25.4 ± 4.96</td>
<td>26.4 ± 4.48*</td>
</tr>
<tr>
<td>2.</td>
<td>Gestation age (wks)</td>
<td>00 ± 00</td>
<td>23.8 ± 10.2*</td>
</tr>
<tr>
<td>3.</td>
<td>BMI (kg/m²)</td>
<td>20.8 ± 3.38</td>
<td>21.9 ± 4.78**</td>
</tr>
<tr>
<td>4.</td>
<td>SBP (mm of Hg)</td>
<td>120 ± 6.46</td>
<td>122 ± 6.45**</td>
</tr>
<tr>
<td>5.</td>
<td>DBP (mm of Hg)</td>
<td>79.7 ± 4.23</td>
<td>81.8 ± 4.78**</td>
</tr>
<tr>
<td>6.</td>
<td>Hb (g/dL)</td>
<td>11.3 ± 1.10</td>
<td>10.2 ± 1.09*</td>
</tr>
</tbody>
</table>

The results were compared between control group and study group of pregnant subjects. The values are presented in mean ± S.D. *p < 0.05

Table 2: Serum reproductive hormones in non-pregnant controls and pregnant subjects

<table>
<thead>
<tr>
<th>S. no.</th>
<th>Biochemical Parameters</th>
<th>Non-pregnant (n = 50)</th>
<th>Normotensive pregnant (n = 50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Estradiol (pg/mL)</td>
<td>54.4 ± 24.5</td>
<td>2486 ± 755**</td>
</tr>
<tr>
<td>2.</td>
<td>Progesterone (ng/mL)</td>
<td>0.98 ± 0.47</td>
<td>82.7 ± 18.5**</td>
</tr>
<tr>
<td>3.</td>
<td>Testosterone (ng/dL)</td>
<td>49.7 ± 16.9</td>
<td>84.2 ± 23.7**</td>
</tr>
</tbody>
</table>

The results were compared between control group and study group of pregnant subjects. The values are presented in mean ± S.D. **p < 0.001

DISCUSSION
Gestation is associated with profound hormonal and metabolic changes in the mother. These alterations facilitate the placenta to take over the dominant role of steroid production. The present study showed highly significant increase (p value < 0.001) in serum estradiol levels in patients with normotensive pregnancy when compared to that of nonpregnant control group. Progressively increased concentration of estradiol was observed during pregnancy. Similar findings of estradiol hormone were reported by Mathur et al. The increased synthesis of estradiol after 30th week of gestation is due to production of prostaglandin before labor. Estrogenic activity is effected via estradiol–receptors complexes that trigger the appropriate response at the nuclear level in target sites (follicle, uterus, breast, vagina, urethra, and hypothalamus).

Serum progesterone concentrations were significantly increased (p value < 0.001) in normotensive pregnant subjects when compared with that of non-pregnant controls. Similar to our results, Khan et al. also observed overall increased serum progesterone levels in normal pregnant women. The concentration of progesterone second trimester of gestation is increased due to maybe placental extraction of maternal cholesterol with subsequent conversion in the placenta to progesterone. In our study cases, majority of patients were in second trimester of pregnancy.

We observed highly significant increase (p value < 0.001) in serum total testosterone levels in normotensive pregnant group when compared to that of nonpregnant control group. Maternal serum testosterone levels might be increased because of defect in newborn growth and size through several potential mechanisms. Maternal testosterone may modify her energy homeostasis and thus decrease nutrient supplies to the placenta and fetus. Carlsen et al. and Hohlagschwandtner et al. showed increment of serum testosterone levels in pregnancy. Our findings in Indian women are in fair agreement with those of Carlsen et al. and Hohlagschwandtner et al.

We can conclude that reproductive hormones, such as estrogen, progesterone, and total testosterone in normal pregnancy, is of paramount importance during pregnancy. This study suggests that levels of abovementioned parameters were altering in normal physiological changes during pregnancy. Our study indicates no major deviation with previous study.


