

# Serum $\beta$ -hCG Levels between 13-20 Weeks Gestation can Predict Development of Pregnancy Induced Hypertension

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**Aims:** To find out predictive value of serum  $\beta$  human chorionic gonadotropin ( $\beta$  HCG) levels between 13-20 weeks of gestation in predicting the development of pregnancy induced hypertension (PIH) or pre-eclampsia, eclampsia.

**Methods:** Serum  $\beta$  HCG level was estimated in 200 normotensive patients between 13-20 weeks of gestation. The median value of Serum  $\beta$  HCG was calculated and patients were divided into two groups as per two times multiple of median (2MOM) values of Serum  $\beta$  HCG i.e. those above and below the 2MOM values. The patients were followed up to delivery and were evaluated for the development of PIH, pre-eclampsia and eclampsia.

**Results:** As per the median score of Serum  $\beta$  HCG in studied patients, the determined value of 2MOM was 30845 mIU/ml. Out of 200 patients, 23 (11.5%) patients were found to have values of Serum  $\beta$  HCG  $\geq$  2MOM. Twelve (52%) patients in Serum  $\beta$  HCG  $\geq$  2MOM group developed hypertension on follow up as compared to 13 (7.3%) patients in  $<$  2MOM group ( $p < 0.0001$ ). Also patients in the  $\geq$  2MOM group had higher prevalence of maternal and fetal complications.

**Conclusions:** Serum  $\beta$  HCG levels between 13-20 weeks of gestation can predict development of PIH in pregnant females

**Keywords:**  $\beta$  HCG; maternal complications; pregnancy-induced hypertension.

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## INTRODUCTION

Gestational hypertension is one of the most common medical complication of pregnancy. It can lead to complications like preeclampsia, eclampsia, antepartum hemorrhage and is one of the common causes of maternal and fetal mortality and morbidity. How pregnancy incites or aggravates hypertension remains an unanswered question despite huge amount of research in this area.<sup>1</sup>

Placenta is central to the pathogenesis of gestational hypertension. Women with pregnancy induced hypertension (PIH) have hyperplacentalosis. Early placental vascular damage in preeclampsia leads to placental hypoxia and increased production of  $\beta$  human chorionic gonadotropin ( $\beta$  hCG) by syncytiotrophoblastic cells.<sup>2</sup> Patients with twin pregnancies and molar pregnancies have increased  $\beta$  hCG levels and carry increased risk of PIH. Thus increased levels of  $\beta$  hCG in late first and

early second trimester may be used as a marker of impending PIH.<sup>3-5</sup> We conducted this study to find out the predictive value of raised  $\beta$  hCG levels in predicting the development PIH, preeclampsia, or eclampsia.

## METHODS

Two hundred patients with a gestational age of 13-24 weeks according to last menstrual period or according to ultrasonography (USG) were enrolled. A single serum  $\beta$  hCG level estimation was done between 13-20 weeks of gestation. Patients with history of hypertension, renal disease, diabetes, heart disease, thyroid disorders, multiple pregnancy, polyhydramnios, or patients with USG documented congenitally malformed fetus were excluded from the study. After detailed history and clinical examination baseline investigations including complete blood count (CBC), renal and hepatic function tests, routine urine examination, fasting blood glucose, ABO and Rh grouping was done. Quantitative estimation serum  $\beta$  hCG level estimation was done by immunoenzymatic colorimetry method. Serum  $\beta$  hCG level of two times multiple of median (2MOM) for a given population of pregnant females is known to be associated with adverse pregnancy outcomes.

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Therefore, the patients were dicotomised as per 2MOM criteria into two groups as high  $\beta$  hCG group i.e. Serum  $\beta$  hCG values  $\geq 2$ MOM ( $\geq 30,845$  mIU/ml) and low  $\beta$  hCG group i.e. Serum  $\beta$  hCG values  $< 2$ MOM ( $< 30,845$  mIU/ml). PIH was defined as a blood pressure reading of  $\geq 140/90$  mmHg.

Patients were followed in the outpatient department and were evaluated for development of PIH and associated symptoms of edema, puffiness of face, headache, decreased urine output. At the time of delivery maternal complications like eclampsia, abruption placenta, preterm labor, postpartum hemorrhage and fetal complications such as intrauterine growth retardation, prematurity, intrauterine death or stillbirth were noted. All patients provided informed consent. The study was approved by the Institutional Ethics Committee.

## RESULTS

The mean age of the patients was  $25.8 \pm 4.7$  years (range = 17-38). Eighty seven patients (43%) were nulliparous and 46 (23%) had a history of one or more abortions in the past. Twenty three patients (11.5%) had Serum  $\beta$ -hCG values  $\geq 2$ MOM [Table-1]. Patients in as high  $\beta$ -hCG group were found to have significantly more chances of developing PIH (52% vs. 7%) on the follow up. High  $\beta$ -hCG group patients were also significantly more likely to get maternal complications like eclampsia, abruption placenta, preterm labor, postpartum hemorrhage as compared to low  $\beta$ -hCG group (39% vs. 7.9%). Fetal complications like IUGR, prematurity, IUD were also seen significantly more in High  $\beta$ -hCG group (30% vs. 7.9%) [Table-2].

**Table-1: Baseline characteristics of the patients (N=200)**

Characteristics	Value
Age	25.8 $\pm$ 4.7 (17-38) years
Parity	
Nullipara	87 (43%)
Para 1	63 (31%)
Para 2	29(14%)
Para 3 or more	21(10%)
History of Abortions	46 (23%)
Patients with Serum $\beta$ hCG values $\geq 2$ MOM*	23 (11.5%)

\* $\beta$  hCG values  $\geq 2$ MOM:  $\beta$  human chorionic gonadotropin values  $\geq$  two times multiple of median

**Table-2: Comparison of patients between high and low serum  $\beta$ -hCG values**

Characteristics	High $\beta$ -hCG group (n=23)	Low $\beta$ -hCG group (n=177)
PIH	12 (52%)	13 (7.9%)*
Maternal complications	9 (39%)	14 (7.9%)**
Fetal complications	7 (30%)	14 (7.9%)***

PIH: Pregnancy Induced Hypertension \* $p < 0.0001$ , \*\* $p < 0.0005$ , \*\*\* $p < 0.005$  by Fisher's Exact test

## DISCUSSION

Gestational hypertension is one of the most common complication of pregnancy and it has an adverse impact on the maternal as well as the fetal outcome.<sup>6,7</sup>

The exact cause of gestational hypertension is still not known. At present the termination of pregnancy is the only definitive treatment available to control the gestational hypertension.<sup>8</sup> Though the gestational hypertension manifests in the third trimester the underlying mechanisms start operating early in the pregnancy. It is with this information in background that researchers are trying to look for early markers of gestational hypertension so that patients can be picked up early and given special care.

Studies have shown that serum  $\beta$ -hCG levels are increased in patients with preeclampsia and eclampsia. There appears to be a positive correlation between raised serum  $\beta$ -hCG levels and preeclampsia and eclampsia with severe forms of disease having higher levels of serum  $\beta$ -hCG levels.<sup>3,4,5,9</sup> We decided to look for the serum  $\beta$ -hCG levels at 13-20 weeks of gestation as early pick up of the patients who are likely to get gestational hypertension gives more time to the physician to institute therapy.

In our study, we found out that patients with higher levels of serum  $\beta$ -hCG had significantly higher likelihood of developing gestational hypertension on follow up. This has been seen in previous studies also.<sup>4,5,9</sup> The origin of gestational hypertension lies in the placenta and occurs because of ischemia secondary defective trophoblastic invasion of spiral arteries. The ischemic placenta releases the substances which in turn act on the endothelium leading to gestational hypertension.<sup>10,11</sup> At present only calcium supplements and low dose aspirin have been shown to have preventive effect in gestational hypertension.<sup>12,13</sup>

In our study we also looked for the maternal and fetal outcome in patients. We found that patients with

higher levels of serum  $\beta$ -hCG levels had significantly more maternal and fetal complications as compared to patients who had low levels of serum  $\beta$ -hCG levels. This, however, could be related to the fact that patients with higher levels of serum  $\beta$ -hCG levels were more likely to be having PIH.

## CONCLUSIONS

Thus, in our study we found out that higher levels of serum  $\beta$ -hCG levels estimation at 13-20 weeks of gestation was a good predictor of subsequent development of gestational hypertension and can be used in the outpatient setting to identify such patients and give them special care.

**Conflict of interest:** None

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