

# Predictive Value of Maternal Beta Human Chorionic Gonadotropin for Risk Assessment of Hypertensive Disorders of Pregnancy

SHAKILA YASMIN<sup>1</sup>, SARA REZA<sup>2</sup>, AISHA JAVED<sup>3</sup>, AMNA ANUM<sup>4</sup>, SHAHNAZ NOOR<sup>5</sup>, IRUM NOOR<sup>6</sup>

<sup>1</sup>Associate Professor Gynae/Obst Unit 2 Bahawal Victoria Hospital, Bahawalpur

<sup>2</sup>Assistant Professor, Pathology Department Quaid-e-Azam Medical College, Bahawalpur

<sup>3</sup>Senior Registrar, Gynae/Obst Unit 2 Bahawal Victoria Hospital, Bahawalpur

<sup>4</sup>Women Medical Officer (WMO), Gynae/Obst Unit 2 Bahawal Victoria Hospital, Bahawalpur

<sup>5</sup>Assistant Professor, Pathology Department Quaid-e-Azam Medical College, Bahawalpur

<sup>6</sup>Associate Professor, Pathology Department Quaid-e-Azam Medical College, Bahawalpur

Correspondence to: Sara Reza, Email: [sara.qmc@gmail.com](mailto:sara.qmc@gmail.com), Cell: 03334603388

## ABSTRACT

**Objective:** This study was conducted to find out if measuring levels of beta HCG in early 2<sup>nd</sup> trimester can accurately predict HDP occurrence.

**Methods:** This was a prospective observational study was conducted from August 2020 to September 2021 at OPD/IPD of Gynae Unit-II of Bahawal Victoria Hospital, Bahawalpur. The tests were done at Pathology Department, Quaid-e-Azam Medical College, Bahawalpur. Beta HCG levels of total 180 pregnant females who were in their second trimester (14-20) were assessed.

**Results:** Out of 180 study subjects, 157 cases remained normotensive and 23 patients got hypertensive disorders of pregnancy. Out of these 23 patients, twelve patients had mild hypertensive disease while eleven patients had severe disease. We noticed a significantly raised serum  $\beta$  hCG levels in females with htn disorder of pregnancy as compared to normotensive pregnant females.

**Conclusion:** The study indicated that pregnant women with raised beta HCG levels in early pregnancy are at an increased risk of adopting gestational hypertension and related disorders so beta HCG in second trimester can be used as a good predictive test for HDPs.

**Keywords:** Pregnancy, Beta HCG, Hypertensive pregnancy disorders, trimester, hypertension

## INTRODUCTION

Hypertensive disorders of pregnancy (HDP) are very common disorders occurring in pregnant women. They have a major contribution in morbidity and mortality of mothers and fetuses globally.<sup>1-4</sup> HDP can lead to complications in 5-10% of total pregnancies.<sup>5</sup> In developing countries, approximately 10-15% of pregnant women deaths are due to these hypertensive disorders.<sup>6</sup> The HDPs can vary from mildly raised BP with little signs and symptoms to severe hypertension with multi-organ dysfunction. The complications associated with HDPs are preterm delivery, low birth weight, intrauterine growth retardation and perinatal death. Maternal issues include cardiac diseases, CVA, cirrhosis, renal failure, placental abruption, DIC and HELLP syndrome.

According to the recommendations of National High Blood Pressure Education Program (2000) functioning Group on raised Blood Pressure in Pregnancy<sup>7</sup>, the hypertensive disorders in pregnant women are classified as follows: transient hypertension of pregnancy, pre-eclampsia & eclampsia, pre-eclampsia superimposed on chronic hypertension and chronic HTN

The human chorionic gonadotropin is a hormone yielded in pregnancy first by the growing embryo and onward mainly by the syncytiotrophoblast of the placenta. In this glycoprotein  $\alpha$  and  $\beta$  subunits<sup>8</sup> are linked noncovalent. Plasma half-life of beta HCG is 36 hours. Placenta plays a major triggering role in pathogenesis of gestational hypertension/ pre-eclampsia. The mechanism of raised BP in pre-eclampsia is narrowing of blood vessels and inebriated angiogenesis which tends the trophoblastic cells to be hyperplastic and hypoxic. This results in an increased yield of placental hormone resulting in raised level of circulating  $\beta$ -hCG.<sup>9-13</sup> Another evidence comes from disease conditions like molar or twin pregnancies which are associated with high hCG levels and pose a greater danger of HDPs.

Hypertensive disorders of pregnancy lead to an increased incidence of HDP associated morbidity and mortality in mothers and fetuses. There is a need of an accurate predictive test that can help in early diagnosis of pregnant women who are at the risk of gestational hypertension/pre-eclampsia. This study was conducted to establish the role of beta hCG in predicting HDP. The raised level of beta HCG in early pregnancy can help in early diagnosis and timely management to avoid complications.

## MATERIALS AND METHODS

This was a prospective observational study conducted at Gynae Unit II of Bahawal Victoria Hospital, Bahawalpur. A total of 180 pregnant females were included in the study after taking informed consent from the study subjects and approval from ethical committee of our institute. Gravid females in their second trimester (14 - 20 weeks) age 18-40 years having singleton pregnancy which was confirmed by ultrasonography. Normotensive previously with no history of proteinuria were included in this study. Women with twin or multiple pregnancy, known hypertensive, history of gestational trophoblastic diseases in previous or present pregnancy, any congenital abnormalities i.e Down syndrome or germ cell tumors were excluded from the study.

According to revised criteria for diagnosis of pre-eclampsia<sup>14</sup> it is high blood pressure at fourth months of pregnancy with Albuminuria, >3 gm/24 hours on dipstick testing, or hepatorenal diseases (GFR <30 ml/min, ALT > 100 IU/L), CNS complications with or without DIC, decreased platelets and anemia. Triple test for Down syndrome was done on all patients. Baseline investigations were carried out like CBC, random serum glucose, renal function tests, liver function tests, urine complete examination on 24 hours urine and PT, APTT. Ophthalmologist examined eye for any hypertensive changes in fundus.  $\beta$  hCG was estimated for all patients at 20 weeks of gestation. It was considered high when the levels were raised from two multiple of medians. The cut off was calculated by using ROC. The follow up was done three weekly until 28<sup>th</sup> week and two weekly till 37 weeks, then per week levels were assessed upto delivery. At every antenatal visit, blood pressure was monitored. In case of hypertension, the patient was asked to visit frequently. All baseline investigations were done in such high risk patients. Finally the study participants were divided in 2 groups: Group A included those who developed hypertension in pregnancy. Group B included those who did not develop hypertension in pregnancy. Group A was on the basis of features severity divided into two groups Group A1 and Group A2. SPSS was used to analyze results and  $\beta$  hCG levels of these groups were compared. Also second trimester  $\beta$  hCG was compared with severity of hypertension during pregnancy.

**RESULTS**

The mean age of study population was compared showing almost similar age pattern in all groups. There was no significant correlation of hypertension with age.

Table 1: Mean Age of study population

Groups	Mean ± SD	Range	P Value
Normotensive (B)	28.14±4.11	18-34	0.10
Mild HDP (A1)	29.32±3.70	21-36	
Severe HDP (A2)	28.98±4.27	25-38	

Table 2 indicated the level of beta HCG in our study population. P- value is <0.01 indicating a significant difference between the study groups. The level was within the normal range in normotensive women but it was raised from the cutoff value in case of hypertension.

Table 2: Level of beta HCG in study subjects

Level of βhCG (ng/ml)	normotensive (n=157)	Mild HDP (n=12)	Severe HDP (n=11)
Mean±SD.	10.82±0.62	14.10±0.53	24.31±0.51
Range	9.11-11.63	12.42-16.57	18.26-26.17

The severity of HPD and the beta HCG level) showed a positive correlation . by Spearman's Correlation co-efficient (0.6). The more the blood pressure is increased the higher are serum levels of beta HCG is found.

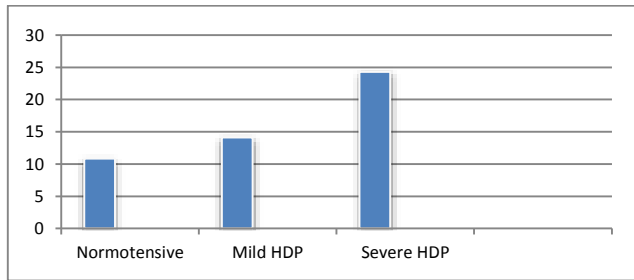


Fig 1: Mean level of beta HCG in study subjects

**DISCUSSION**

Hypertension in pregnancy is a challenge for obstetrician all around the world as the complications can lead to poor maternal and fetal outcome. As discussed earlier the spectrum of this disease can extend from mild to a severe stage. It is better to diagnose it at an early stage so that timely management can prevent the complications.

In our study the age of pregnant females with presence of hypertension. Showed no positive correlation These results are similar to the study conducted by Vishal Sharma et al<sup>15</sup>, who also stated that there is no association of hypertensive diseases of pregnancy with age of the pregnant female. Most of the study subjects in my project were between 21 to 35 which indicates that this condition is more common in young females hence it is more important to diagnose it at its earliest.

In current study, an increasing pattern of β-hCG levels can be observed in the three study groups. It shows a direct association of β-hCG with severity of hypertension in pregnancy. Heena Chaudhary et al<sup>16</sup> conducted an observational study showing that early trimester estimation of beta HCG levels in pregnant females revealed the increased the level of beta HCG the increased the risk of developing hypertension during pregnancy. The results of study by Roiz-Hernández et al<sup>17</sup> are in concordance with our study describing the use of β-hCG measurement at 20 weeks of pregnancy in identification of pre eclampsia in pregnant women. Gur Mandeep Kaur et al<sup>18</sup> also showed same results in their article. According to them the

monitoring of beta HCG can help in diagnosing development of hypertension in pregnancy at an earlier stage. Also it can predict the severity of disease. However, there were few studies found in literature like the ones performed by Morssink et al<sup>19</sup>, Pouta et al<sup>20</sup> and Muthu Lakshmi D et al<sup>21</sup> that contradicted our results. No correlation was found in serum β-hCG and hypertension of pregnancy in their research.

**CONCLUSION**

The study showed that pregnant women in early gestation with raised beta HCG are at an increased risk of developing gestational hypertension and related disorders. So beta HCG in second trimester can be helpful for the prediction of HDPs. The finding of our study will help in early detecting and managing pregnant females with hypertension . hence reducing the risk of associated complications.

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