International Journal of Clinical Obstetrics and Gynaecology

ISSN (P): 2522-6614
ISSN (E): 2522-6622

www.gynaecologyjournal.com
2020; 4(4): 219-222
Received: 14-05-2020
Accepted: 18-06-2020

Shivani Singhal
Department of Obstetrics and Gynecology & Biochemistry Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India

Smita Tyagi
Department of Obstetrics and Gynecology & Biochemistry Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India

Bharti Maheshwari
Department of Obstetrics and Gynecology & Biochemistry Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India

Imran Mustafa
Department of Obstetrics and Gynecology & Biochemistry Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India

Corresponding Author:
Shivani Singhal
Department of Obstetrics and Gynecology & Biochemistry Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India

Role of serum beta human chorionic gonadotropin at 13-20 weeks of gestation as a predictor of hypertensive disorders of pregnancy

Shivani Singhal, Smita Tyagi, Bharti Maheshwari and Imran Mustafa

DOI: https://doi.org/10.33545/gynae.2020.v4.i4d.648

Abstract
Background: Hypertensive disorders of pregnancy are a leading cause of maternal and perinatal morbidity and mortality worldwide. The objective of this study was to measure β-hCG during 13-20 weeks of gestation and compare the same between those who develop Hypertensive disorders of pregnancy with those who do not.
Methods: A prospective observational study was carried out on 200 primigravida patients in their second trimester (13-20 weeks) attending the OPD in Muzaffarnagar Medical College. Serum β-hCG levels were estimated in all these patients by CLIA (chemiluminescent immune assay) technique. All pregnancies were followed up till delivery for the development of Hypertensive disorders of pregnancy.
Results: Out of 200 patients, 27(13.5%) cases developed Pregnancy induced hypertension. Of those who developed PIH, 22(70.9%) were having β- hCG levels >2 MOM ($P< 0.05$). Absolute β-hCG levels (Mean ± SD) were also significantly higher (95963.0 ± 42337.64 V/S 40319.74 ± 10659.42; $P< 0.05$) in subjects who later developed PIH. Sensitivity, Specificity, Positive predictive value and Negative predictive value for β-hCG were 85.2%, 92.5%, 81.98% and 94.8% respectively.
Conclusion: Serum β-hCG estimation at mid trimester (13-20 weeks) is a good predictor of PIH and higher levels of β-hCG are associated with increased severity of PIH.

Keywords: Serum beta HCG, pregnancy induced hypertension, prediction of PIH

Introduction
Hypertensive disorders of pregnancy complicate 5 - 10% of pregnancies worldwide and constitute one of the greatest causes of maternal morbidity and mortality and perinatal morbidity and mortality. In developed countries 16% of maternal deaths are attributed to hypertensive disorders [1]. The incidence of pre-eclampsia in India is about 8-10%. Preeclampsia complicates about 4-5% of all pregnancies [2].
Human β-hCG is a glycoprotein with lipid structure that is expressed in trophoblast and various malignant tumors. Chorionic villi are the one that is needed for the development of preeclampsia. Human chorionic gonadotropin is synthesized from syncytiotrophoblast in chorionic villi. The incomplete trophoblastic invasion that is the replacement of vascular endothelial and muscular linings by endovascular trophoblast to enlarge the vessel diameter is incomplete.
In spite of the improvement in maternal and neonatal care, PIH and its sequelae are a dreaded complication of pregnancy. It is indeed a constant endeavor of obstetricians to identify the risk involved in pregnancy and if possible its prediction. If prediction becomes possible, prevention will follow naturally. Several tests have been proposed but none has been accepted widely due to their low predictive value.
In our Indian setup where the follow up is poor, an initial screening test like serum β-hCG level may help in categorizing patients that require more attention.

Aim
The aim of this study was to assess the predictive value of increased beta human chorionic gonadotropin plasma concentration in early second trimester (13-20 weeks) in a population of primigravida female in the occurrence of hypertensive disorders of pregnancy.

Material and Methods

Source of Data: All primigravida patients in their second trimester (13-20 weeks) attending OPD in Muzaffarnagar Medical College, Muzaffarnagar, U.P.

Place of Study: Department of Obstetric and Gynecology, Muzaffarnagar Medical college and Hospital, Muzaffarnagar, U.P.

Duration of Study: The duration of study was of 17 months period i.e. from March 2018-August 2019.

Study Design: Prospective Observational Study.
Sample Size: 200 subjects

Inclusion Criteria

1. Above 18 years and below 30 years of age.
2. Primigravida with gestational age 13-20 weeks as determined by last
3. menstrual period and/or Ist trimester ultrasound scan.
4. Singleton pregnancy.
5. Previously normotensive and nonproteinuric
6. Booked for delivery.

Exclusion Criteria

1. Gestational age <13 weeks and >20 weeks.
2. Twins or multiple pregnancy.
3. Multiparity.
4. Preexisting hypertension, Diabetes mellitus, Heart disease, Severe anemia, Thyroid dysfunctions, COPD and other medical conditions
5. Molar pregnancy.
6. Germ cell tumors
7. Pregnancies with fetal chromosomal or structural abnormalities.

Method of collection of data (including sampling procedure)

All patients were informed about the study and informed written consent was taken before they were enrolled in the study. At the time of enrollment, demographic details were noted, detailed obstetric and medical history was taken. Gestational age was calculated from reliable menstrual history dates and/or Ist trimester ultrasonographical measurement of fetal crown rump length. All patients underwent thorough clinical and routine obstetrical examination. Baseline blood pressure (average of 3 readings) using a sphygmomanometer was recorded using the auscultatory method. Routine antenatal tests were performed as required and indicated.

A 2ml of venous blood sample was obtained from the patient and was collected in plain vial with all aseptic precautions for analysis of serum levels of Beta human chorionic gonadotropin using CLIA(Chemiluminescent immuno assay) method. Obtained serum β-hCG levels of all patients were recorded. All pregnancies were followed up till delivery.

Data collection form /Patient proforma

A structured format was prepared for collecting the demographic details, personal, obstetric and medical history, data related to all ANC visits, outcomes of serum β-hCG assessment, perinatal events and outcomes.

Statistical methods

The data was analysed using SPSS (Statistical Package for Social Sciences) software. Chi square tests and t tests were used.

Results

Table-1 shows the distribution of patients on the basis of their age in PIH and normotensive group and the majority of patients were of age group 23-27 years in both the groups and the association was found to be statistically insignificant (p>0.05).

Table 1: Comparison of age Profile of women in two groups

		PIH (N=27)	Normotensive (N=173)	p-value
Age (years)	18 - 22	6 (22.2%)	56 (32.4%)	0.568
	23 - 27	18 (66.7%)	101 (58.4%)	
	28 - 30	3 (11.1)	16 (9.2%)	

Table-2 shows the relationship between β−hCG (absolute) levels and PIH and the association between mean β−hCG level of PIH patients and Normotensives was statistically significant (*p*< 0.05) and as the level of β−HCG increases the PIH also increases.

Table 2: Relationship between beta hCG (absolute) levels and gestational hypertension

hCG level	PIH (N=27)	Normotensive (N=173)	P-Value*
<30,000	0(0.0%)	17(9.8%)	
30,000-40,000	1(3.7%)	70(40.4%)	
40,001-50,000	3(11.1%)	67(38.7%)	
50,001-60,000	1(3.7%)	14(8.1%)	
60,001-70,000	2(7.4%)	4(2.3%)	
70,001-80,000	0(0.0%)	1(0.5%)	
80,001-90,000	7(25.9%)	0(0.0%)	
90,001-1,00,000	5(18.5%)	0(0.0%)	
>1,00,000	8(29.6%)	0(0.0%)	
Mean±SD	95963.0±42337.64	40319.74±10659.42	<0.001

Table-3 shows the β-hCG values (absolute) and severity of PIH and the association was found to be statistically significant (*p*< 0.05) where the patients with mild hypertension were 33.3% while with severe hypertension (66.7%).

Table 3: Beta hCG values (absolute) and severity of PIH

Beta hCG level (mIU/ml)	Mild(n=9)	Severe(n=18)	Total(n=27)	P-Value*
≤80000	6 (66.7%)	1 (5.6%)	7(25.9%)	<0.001
>80000	3 (33.3%)	17 (94.4%)	20 (74.1%)	

Table-4 shows the value of β-hCG (MOM) as a predictor of PIH and the association was found to be statistically significant (*p*< 0.05).

Table 4: Value of beta hCG (MOM) as a predictor of PIH

Hypertension	hCG >2 MOM (51521.50 mIU/ml)	hCG ≤2 MOM (51521.50 mIU/ml)	Total (n=200)	P-Value*
Yes	22 (70.9)	5 (2.9)	27 (13.5)	<0.001
No	9 (29.1)	164 (97.1)	173 (86.5)	
Total	31 (100.0)	169 (100.0)	200 (100.0)	

Table 5: Case Processing Summary

Hypertension	Valid N (listwise)
Present	27 (13.5%)
Absent	173 (86.5%)

Table 6: Sensitivity, specificity, PPV, NPV, accuracy of ROC curve

Parameters	hCG
Cutoff value	51521.50mIU/ml
Sensitivity	85.2%
Specificity	92.5%
Positive Predictive Value	81.98%
Negative Predictive Value	94.8%
Accuracy	94.0%

Table-7 shows the mode of delivery of the studied patients where cesarean was in majority of the cases (77.8%) where as in normotensive patients cesarean was in 52.0% and the association was found to be statistically significant between hypertensive and normotensive patients ($p< 0.05$).

Table 7: Mode of Delivery

Mode of Delivery	PIH (N=27)	Normotensive (N=173)	P-Value*
Vaginal	6 (22.2)	83 (47.9)	0.012
Cesarean (LSCS)	21 (77.8)	90 (52.1)	

Discussion

In present study, total 200 primigravida patients were recruited to assess the predictive value of increased Beta Human Chorionic Gonadotropin plasma concentration in early second trimester (13-20 weeks) in the occurrence of Hypertensive disorders of pregnancy. Mazhari F [3], Soundararanjan P *et al.* [4], Muthulakshmi D *et al.* [5], & Munirah M *et al.* [6] have opted the similar methodology as in the present study.

Like in present study, Mazhari F [3], Soundararanjan P *et al.* [4] Muthulakshmi D *et al.* [5], Kulkarni N *et al.* [7] and Rajesh A *et al.* [8] also use hCG production level as a measurement tool for the prediction of pregnancy induced hypertension.

In the present study the prevalence of PIH was observed to be in 13.5% (27 patients out of 200) which was comparable to the studies performed by:

Studies	Prevalence (%)
Mazhari F [3]	13.33
rajesh A *et al.* [8]	14.8
Pawar P *et al.* [9]	11.53
Victor SR *et al.* [10]	14.14

In present study, we observed that the higher absolute levels of β-hCG strongly correlate with occurrence of PIH(Table-2). Out of 200 primigravida patients, 27 patients who developed PIH were having higher absolute levels of β-hCG as compared to 173 primigravida patients who did not (Mean ± SD; 95963.0 ± 42337.64 V/S 40319.74 ± 10659.42; $P< 0.001$). Chowdhary H *et al.* [11] also reported that the maternal serum β-hCG levels in patients of pre eclampsia (54907 ± 29509) was higher than in the normotensive group (41095 ± 19103; $P< 0.001$).

In the present study, the association between the Beta hCG values (absolute) and severity of PIH was found to be statistically significant ($p< 0.05$) where the patients with mild hypertension were 33.3% while with severe hypertension (66.7%). We observed that when beta hCG levels are more than 80,000 mIU/ml, not only the chances for occurrence of PIH increase but the severity as well. Our study is in accordance to the study performed by Chowdhary H *et al.* [11] who reported 60.0% with severe hypertension and 40.0% with mild hypertension.

In present study, out of total 200 cases evaluated, 169 cases (84.5%) had β-hCG levels ≤2MOM, whereas 31 cases (15.5%) had β-hCG values >2MOM (Table-4). Out of 169 cases with β-hCG levels ≤2MOM, only 5 cases (2.9%) developed PIH. And out of 31 cases with β-hCG values >2 MOM, 22 cases (70.9%) developed PIH ($P< 0.001$). Sharma V *et al.* [12] in their study observed that out of 387 cases with β-hCG levels <2MOM, only 6 cases (1.56%) developed PIH and out of 60 cases with β-hCG values >2MOM, 49 cases (81.67%) developed PIH ($P< 0.001$). Soundararajan P *et al.* [4] had also reported similar findings.

In present study, we observed the sensitivity, specificity, positive predictive value and negative predictive value for β-hCG levels for >2MOM were 85.2%, 92.5%, 81.98% and 94.8% respectively. Chowdhary H *et al.* [11], Pawar P *et al.* [9], Revankar V M [13], Soundararajan P *et al.* [4], Kulkarni N *et al.* [7], Mazhari F[3] had reported similar findings.

In present study, the PIH patients cesarean was done in majority of the cases (77.8%) where as in normotensive patients cesarean was done in 52.0 % and the association was found to be statistically significant between hypertensive and normotensive patients ($p< 0.05$). Our findings were in accordance with Dawle SS *et al.* [14] reported the difference in mode of delivery in both the groups was statistically significant (p = 0.0001).

Conclusion

The study showed that measuring second trimester β-hCG levels is useful in clinical practice to identify women who will develop PIH in the same pregnancy. Also higher levels of β-hCG are associated with increase severity of PIH. The sample size for this study being small, necessitate the need of further large scale studies considering the importance of β-hCG in PIH prediction.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee.

References

1. Cunningham FG, Leveno KJ, Bloom SL, Hauth JC. Hypertensive disorders of pregnancy. In: Cunningham F, Williams G III, J eds. Williams Obstetrics. 25thed, 2018, 706-709
2. Choudhury KM, Das M, Ghosh S, Bhattacharya D, Ghosh TK. Value of Serum β-hCG in Pathogenesis of Pre-Eclampsia. J Clin Gynecol Obstetrics. 2012; 1:71-5.
3. Mazhari F, Varun N. Prediction of hypertensive disorders in pregnancy by estimation of maternal serum beta hCG levels in the mid-trimester (13-20 weeks) of pregnancy. International Journal of Biomedical Research. 2018; 09(10):354-357.
4. Soundararajan P, Muthuramu P, Veerapandi M, Mariyappan R. Serum beta human chorionic gonadotropin and lipid profile in early second trimester (14-20 weeks) is a predictor of pregnancy-induced hypertension. Int J Reprod Contracept Obstet Gynecol. 2016; 5:3011-6
5. Muthulakshmi D, Sasirekha R, Medha R. Serum β-hCG levels between 12 to 20 weeks of gestation in prediction of hypertensive disordrers of pregnancy. Int J Reprod Contracept Obstet Gynecol. 2017; 6:3347-51
6. Munirah M, Khalidah MB, Dian Nasriana N, Hanita O, NorAzlin MI. Early Second Trimester hCG of Maternal Serum as Predictor Marker for Pregnancy Induced Hypertension. Med & Health. 2018; 13(1):143-152.
7. Kulkarni N, Bansal R, Pawar P. Serum Beta hCG and uterine artery Doppler studies in second trimester to predict preeclampsia and eclampsia. Int J Reprod Contracept Obstet

Gynecol. 2018; 7:1924-8.
8. Rajesh A, Muralidharan V. Serum beta hCG in early second trimester as a predictor of gestational hypertension. Int J Reprod Contracept Obstet Gynecol. 2018; 7:2355-9.
9. Pawar P, Goyal R, Kaur H, Singal N. Study of significance of elevated maternal serum β-human chorionic gonadotropin (β-hCG) level in 16 to 20 weeks pregnant women as predictor of hypertensive disorder of pregnancy. Int J Reprod Contracept Obstet Gynecol. 2018; 7:4721-30.
10. Victor SR, Jayalakshmi D. Serum β hCG as a predictor and potent marker for pregnancy induced hypertension. IAIM. 2019; 6(3):38-43.
11. Chowdhary H, Khurshid R, Parveen S, Yousuf S, Tali SH, Shah ZA. Utility of second trimester beta hCG levels in prediction of gestational hypertension: a prospective cohort study. Int J Reprod Contracept Obstet Gynecol. 2017; 6:1040-4.
12. Sharma V, Sharma P, Firdous N. Beta hCG in mid trimester as a predictor of pregnancy induced hypertension. Int J Sci Res. 2016; 5:303-5.
13. Revankar VM *et al*. Assessment of serum β-HCG and lipid profile in early second trimester as predictors of hypertensive disorders of pregnancy. Int J Gynaecol obstet. 2017/138/3
14. Dawle SS, Bhalerao AV. Prediction of Pregnancy-induced Hypertension by Maternal Serum Beta Human Chorionic Gonadotropin Levels in Early Second Trimester of Pregnancy. J South Asian Feder Obst Gynae. 2018; 10(2):104-109.