

Serum Human Chorionic Gonadotropin Level in Pre-Eclamptic and Normotensive Pregnant Women: A Prospective Study

Balwinder Kaur¹, Chittranjan Vij², Manjit Mohi³

ABSTRACT

Introduction: Pre-eclampsia causes the various fetal and maternal complications. Can cause 8-10% maternal deaths in india and 5-10% in western countries. Human Chorionic Gonadotropin is composed of alfa and beta subunit, beta being specific to HCG. Intact Serum HCG molecule can be detected 7-9 days after LH surge, levels double every 2 days, maximum at 8-10 weeks, Peak levels (100000 mIU/ml) 60th-80th day after last menses, decreases from 10-12 weeks, nadir is reached by 20 weeks which remains unchanged till delivery.

Material and Methods: 70 women enrolled. (1) Study group: 50 pre-eclampsics at 20 or > weeks. (2) Control: 20 Normotensive, same gestation. Data collected, investigations done. Serum HCG Quantitative test, based on ENZYME-Linked Immuno Sorbent Assay (ELISA)

Results: Mean HCG level, Study group (29621.8mIU/ml), Control (11059.3mIU/ml) p value <0.001 (HS). Mean HCG levels were higher in severe (38916.48mIU/ml) than mild (16786.29mIU/ml) preeclampsia, p value <0.001(HS). Difference in Serum HCG was not significant between control (11059.3mIU/ml+) and mild pre-eclampsia (16786.286 mIU/ml+). Significant difference found between Serum HCG in control (11059.3mIU/ml)and Severe Preeclampsia (38916.48 +/-mIU/ml).

Conclusion: Serum HCG significantly increased in preeclampsics than normotensive patients. Difference was larger between severe pre-eclamptic and normotensive pregnants than mild pre-eclamptic and normotensives. HCG is better predictor of severity.

Keywords: ELISA, Gestation, Hypertension, HCG, Placenta, Pregnancy, Pre-eclampsia.

INTRODUCTION

The most common medical disorder in pregnancy is hypertension, affecting 6-8% pregnancies. The national high blood pressure education program (NHBPEP) working group classifies hypertensive diseases in pregnancy into 5 groups.

- Gestational HT.
- Pre-eclampsia.
- Eclampsia.
- Pre-eclampsia superimposed on chronic HT.
- Chronic hypertension.

Pre-eclampsia is one of the most common complications of pregnancy which can lead to IUGR, premature delivery, abruptio placentae and IUD, maternal morbidity and mortality.¹ It can cause 8-10% maternal deaths in India and 5-10% in western countries.² The pre-eclampsia is reported in 2-7% in nulliparous and 0.8-5% in multiparous women.³

HCG, a glycoprotein, is a heterodimer, composed of two non identical, non-covalently bound glycoprotein subunits (a) and beta(b) Amino acid sequence of alfa subunit is similar to LH, TSH and FSH. But beta subunit is specific to HCG. Main source of HCG is placenta. Jones et al (1975) first demonstrated HCG in the culture of chorionic villi. Wide variety of non-placental tissues (normal and abnormal) also produce HCG, like ovary, testes, lungs stomach and adrenals. Intact HCG molecule can be detected in plasma of pregnant women about 7-9 days after mid cycle surge of LH, that precedes ovulation. Blood levels double every 2 days and maximum levels are at 8-10 weeks of gestation. Peak levels reach about 100000 mIU/ml between 60th-80th day after last menses. From 10-12 weeks, maternal HCG start decreasing and by 20 weeks nadir is reached which remains essentially unchanged till delivery.⁴

In 2nd trimester HCG rise may be associated with adverse pregnancy outcome like IUGR, pre- eclampsia. In pre-eclampsia, elevated HCG is due to persistant uteroplacental ischaemia.⁵

HCG production may also be linked to trophoblast response to hypoxia, with the development of hypersecretory state. Exact role of HCG in pre eclampsia is not known. Increased levels of HCG, found in both 2nd and 3rd trimester pregnancy complicated with preeclampsia, implies that it has role in pathogenesis of preeclampsia.

Study aimed to evaluate Serum HCG levels in pre-eclampsia and normotensive pregnant females and to compare Serum HCG of Pre-eclamptic and normotensive pregnant females.

MATERIAL AND METHODS

This study was conducted on 70 pregnant women in the departments of Obstetrics and Gynaecology and Biochemistry, Govt. Medical college, Patiala from 2009 to 2012. after approval from the instutional ethics committee and informed consent of the patients.

¹Associate Professor, Department of Obstetrics and Gynae, Medical College, Patiala, ²Associate Professor (ex), Department of Biochemistry, ³Professor, Department of Obstetrics and Gynaecology Government Medical College, Patiala, Punjab, India

Corresponding author: Dr. Balwinder Kaur, H No. 360, North Avenue, Bhadson Road, Patiala 147001, Punjab, India.

How to cite this article: Balwinder Kaur, Chittranjan Vij, Manjit Mohi. Serum human chorionic gonadotropin level in pre-eclamptic and normotensive pregnant women: a prospective study. International Journal of Contemporary Medical Research 2017;4(8):1811-1814.

Inclusion criteria

1. Pregnant women with preeclampsia with gestation of 20 or more weeks without diabetes mellitus or molar pregnancy.
2. Normotensive pregnant women at same gestation for control

Exclusion criteria

1. All cases of essential hypertension or chronic hypertension due to any other cause.
2. Any associated renal, hepatic, neurological disorders, not due to pregnancy induced hypertension.
3. Molar pregnancy.

These pregnant women were divided into 2 groups:

1. Study Group: 50 women with pre-eclampsia at 20 or > weeks of gestation.
2. Control Group: 20 Normotensive pregnant women at same gestation

Maternal data collected on performa. Routine, special and other investigations were done like fundus examination, obstetrical USG and Serum Human Chorionic Gonadotropins Quantitative test based on ENZYME-Linked Immuno Sorbent Assay(ELISA).

STATISTICAL ANALYSIS

Results were expressed in mean +/-, SD. Statistical test t-test was used to determine the *p* value.

RESULTS

Table 1, shows division of study group into 2, depending on severity of disease. 29 had severe pre-eclampsia and 21 mild pre-eclampsia.

Mild pre-eclampsia: Blood pressure ≥ 140 mm Hg systolic and ≥ 90 mm Hg diastolic, on two occasions each 4 hours apart and accompanied by proteinuria at least 1 + on dipstick testing.

Severe preeclampsia:

- Blood pressure $\geq 160/110$ mm Hg
- Proteinuria at least $>= 2+$ on dipstick.
- Serum creatinine >1.2 mg/ml unless previously elevated.
- Platelet count <100000 /mm²
- Liver enzymes elevation,
- Headache, cerebral or visual disturbances, epigastric pain, pulmonary edema and oliguria

Table 2 shows, mean POG in study group was 31.66 weeks and in control group 31 weeks. Statistically, both groups were comparable *P* value >0.05 and is non significant. Table 3 shows that maximum number of women 29 (58%) with pre-eclampsia were between 31-35 wks.

Table 4 shows, both mean systolic and diastolic BP were much higher in severe pre-eclampsia than mild pre-eclampsia. In mild pre- eclampsia mean systolic BP was 142.47 mmHg compared to 165.45 mmHg in severe pre-eclampsia. Mean diastolic BP were 95.81 mmHg and 108.62 mmHg in mild and severe pre-eclampsia respectively.

Table 5 shows, increased HCG levels in women of Pre-Eclampsia. Mean HCG levels in study and control group

were 29621.8 mIU/ml and 11059.3 mIU/ml respectively, *p* value was <0.001 , is highly significant.

Table 6 shows, levels of serum HCG in control group was 11059.3 +/-3478.466 mIU/ml while in mild pre-eclampsia were 16786.286 +/- 5345.113 m IU/ml. Difference in control and mild pre-eclampsia was not large.

Table 7 shows that levels of serum HCG in control group was 11059.3 +/- 3478.466 mIU/ml while in severe pre- eclampsia were 38916.48 +/-8723.344. Difference was significant *p*

	No. of cases	% age
Mild pre-eclampsia	21	42
Severe pre-eclampsia	29	58
Total	50	100

Table-1: Distribution of cases according to severity of disease

	Mean period of gestation (weeks)
Study group	31.66 +/- 3.589
Control Group	31 +/- 4.328

$t=0.655$, $p=0.515$, Not significant

Table-2: Mean period of gestation in study and control group

Period of gestation (weeks)	Study group		Control group	
	No. of cases	% age	No. of cases	%age
20-25	4	8	4	20
16 -30	8	16	4	20
31-35	29	58	9	45
>35	9	18	3	15
Total	50	100	20	100

Table-3: Distribution of subjects according to period of gestation

	Mild pre-eclampsia	Severe pre-eclampsia
Mean systolic BP (mmHg)	142.476 +/- 8.436	165.45 +/- 14.372
Mean Diastolic BP	95.81 +/- 5.895	108.621 +/- 12.457

Table-4: Comparison of Mean Systolic and diastolic BP in mild and severe pre-eclampsia

	Mean Serum HCG (mIU/ml)
Study Group	29621.8 +/- 13299
Control group	11059.3 +/- 3478.46

$t=6.134$, p value $=<0.001$, H S

Table-5: Comparison of mean Serum Human chorionic Gonadotropin levels in study and control group

	Mild pre-eclampsia	Control group
Serum HCG (mIU/ ml)	16786.286 +/- 5345.113	11059.3 +/- 3478.466

$t=4.043$, p value = 0.23, NS

Table-6: Comparison of serum HCG levels of mild pre-eclampsia with control

value = < 0.001

Table 8 shows, that mean HCG levels were higher in patients of severe pre-eclampsia (38916.48 mIU/ml) than mild preeclampsia (16786.29mIU/ml), *p* value < 0.001 which is highly significant.

DISCUSSION

Pre-eclampsia is the most common and major complication causing premature delivery, fetal growth retardation, abruptio placentae, fetal death and maternal mortality and morbidity Pre-eclampsia is a complex condition, which can not be attributed to any single

cause. Present study was conducted to compare serum HCG in normal pregnancy and pregnancy complicated with pre-eclampsia. Study was conducted on 70 pregnant females. Out of which 50 women (group 1) were pre-eclamptic at gestation of 20 weeks or more and other 20 pregnant females (group 2) were normotensive at the same gestation.

- Depending on severity of disease, 21 women were of mild pre-eclampsia. and 29 had severe pre-eclampsia (Table 1).
- In the present study mean gestational age of two groups was comparable. The mean period of gestation of the study group was 31.66 +/- 3.589 weeks and of control group was 31.0+/- 4.328 weeks (Table 2).
- The maximum number of patients in study group 29 (58%) were between 31-35 weeks gestation (Table 3)
- Both mean systolic and diastolic BP were much higher in severe pre-eclampsia (165.45/108.62 mmHg) than mild pre-eclampsia. (142.47/ 95.81 mmHg) (Table 4)
- Mean HCG levels were increased in Pre-Eclampsia as compared to control. Mean HCG level in study and

control group were 29621.8 mIU/ml and 11059.3 mIU/ml respectively, *p* value <0.001, highly significant. (Table 5). Kharfi A et al⁶ also showed significant increase in HCG levels in preeclamptics as compared to normotensive pregnant women, *p* value < 0.001. Kalinderis M et al⁷ study showed same results with *p* value <0.001

- Difference in levels of serum HCG in control (11059.3 +/- 3478.466 mIU/ml) and severe pre-eclampsia (38916.48 +/-8723.344). was significant, *p* value =< 0.001 (Table 7)

Table 9: Ezimokhai M et al⁸ studied that there was sustained elevation of maternal serum HCG levels in pre-eclampsia and found levels (32,300+/-5600 mIU/ml) in patients of pre eclampsia, suggesting that HCG may be involved in the pathophysiology of pre-eclampsia. Steier JA et al⁹ showed levels of 31,710 +/- 3825 mIU/ml in patients of preeclampsia. Casart YC et al¹⁰ studied HCG levels in patients of pre eclampsia and found levels of 28,524+/- 4916 mIU/ml in patients of pre-eclampsia. In present study, the HCG levels were 29621.8+/- 13299 mIU/ml (Table 5)

Table 10: Hsu et al¹¹ found levels of 46538+/-15001 mIU/ml in severe pre eclampsia and 11203 +/-2346 mIU/ml in mild preeclampsia. Gurbuz A et al¹² in his study found a mean of 49817.59 m IU/ml in severe pre -eclampsia and 17361.31 mIU/ml in mild preeclampsia.

Present study showed (Table 8), significantly higher HCG levels in severe pre- eclampsia 38916.48+/- 8723.344 mIU/ml than mild pre eclampsia (16786.29 +/- 5345.113 mIU/ml), showing increasing HCG levels with increase in severity of disease. In present study most of pre- eclamptic womens were having high levels of serum HCG.

CONCLUSION

It is concluded that pre-eclamptic women had a significant increase in serum HCG levels as compared to normotensive patients. This suggests involvement of serum HCG in development and pathogenesis of pre- eclampsia. Our study, showed that levels of HCG were increased in pre-eclampsia

	Severe pre-eclampsia	Control
Serum HCG (mIU / ml)	38916.48 +/-8723.344	11059.3 +/- 3478.466
t= 13.523, <i>p</i> value =< 0.001, HS		
Table-7: Comparison of serum HCG levels of severe pre-ec-lampsia with control group		

	Mild pre-eclampsia	Severe pre-eclampsia	T	P value	Significance
Mean Serum HCG (mIU/ml)	16786.29+/-5345.113	38916.48 +/-8723.344	10.294	< 0.001	HS
Table-8: Comparison of serum HCG levels according to severity of disease					

Studies	Serum HCG (mIU/ml)
Ezimokhai M et al ⁸	32,300 +/- 5600
Steier JA et al ⁹	31,710+/- 3825
Casart YC et al ¹⁰	28,524 +/- 4916
Present study (2011)	29,621.8 +/- 13299
Table-9: Serum Human Chorionic Gonadotropin levels in patients of pre-eclampsia in various studies.	

Studies	Serum HCG (mIU/ml)	
	Mild pre-eclampsia	Severe pre-eclampsia
Hsu et al ¹¹	11203+/- 2346	46538+/-15001
Gurbuz A et al ¹²	17361.31	49817.59
Present study (2011)	16786.29+/-5345.113	38916.48+/- 8723.344
Table-10: Erum HCG levels in patients of mild and severe pre-eclampsia in various studies		

than normotensive, but difference of severe pre-eclamptic and normotensive pregnant was much more than that between mild pre-eclamptic and normotensive pregnant. So HCG can be used to better assess the severity of disease. As a part of screening of pre eclampsia, early estimation of serum HCG should be done to prevent complications 13

REFERENCES

1. Zhang J, zeisler J, Hatch MC, Berkowitz G. Epidemiology of pregnancy- induced hypertension. *Epidemiol Rev.* 1997;19:218.
2. Varughese B, Dhingra M, Kumar R, Dhingra R. Preeclampsia and associated risk factors. *Journal of Post Graduate Medical Education* 2009;4:21.
3. Bailis A, Witter R F. Hypertensive Disorders of Pregnancy In: *The John Hopkins Manual of Gynaecology and Obstetrics.* Fortner B K, Wallach E E, Szymanski M L, Fox E H eds. 3rd edn. Lippincott Williams and Wilkins; 2008:180-91.
4. Cunningham F G, Leveno K J, Bllom S, Hauth J C, Rouse J D, Spong C. Pregnancy Hypertension In: *Williams Obstetrics* eds 23rd edn. McGraw hill: 2009.706-56.
5. Basirat Z, Barat S, Hajiahmadi M. Serum Beta Human Chorionic Gonadotopin levels and preeclampsia. *Saudi Med J.* 2006;27:1001-4.
6. Kharfi A, Gigue'rec Y, Grandpre'c PD, Moutquina JM, Fores JC. Human chorionic gonadotropin (hcg) may be a marker of systemic oxidative stress in normotensive and preeclamptic term pregnancies. *Clinical Biochemistry.* 2005;38:717-21.
7. Kalinderis M, Papanikolaou A, Kalinderi K, Ioannidou E, Giannoulis C, Karagiannis V, Tarlatzis BC. Elevated Serum Levels of Interleukin-6, Interleukin-1b and Human Chorionic gonadotropin in Preeclampsia. *Am J Reprod Immunol* 2011;66:468-75.
8. Ezimokhai M, Brown M, Agarwal M, Rizk DE, Thomas L. Renal handling of endogenous human chorionic gonadotrophin in preeclampsia. *Hypertension in pregnancy.* 1999;18:129-37.
9. Steier J A, Ulstein M and Myking O L. Human chorionic gonadotropin and testosterone in Normal and preeclaptic pregnancies in relation to Fetal sex. *Obstet Gynecol.* 2002;100:552-6.
10. Casart Y C, Tarrazzi k and Camejo M I. Serum levels of interleukin-6, interleukin-1b and human chorionic gonadotropin in pre-eclamptic and normal pregnancy. *Gynecological Endocrinology.* May 2007;23:300-3.
11. Hsu CD, Chan DW, Iriye B, Johnson TR, Hong SF, Repke JT. Elevated serum human chorionic gonadotropins as evidence of secretory response in severe pre elampsia. *AM J Obstet Gynecol.* 1994;170:1135-8.
12. Gurbuz A, Karateke A, Mengulluoglu M, Gedikbasi A, Ozturkmen M, Kabaca C and Sahinoglu Z. Can Serum HCG Values Be Used in the Differential Diagnosis of pregnancy Complicated by Hypertension? *Hypertension In Pregnancy.* 2004;23:1-12.

Source of Support: Nil; **Conflict of Interest:** None

Submitted: 07-08-2017; **Accepted:** 29-08-2017; **Published:** 17-09-2017