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Original Researach Article

A study on the role of mid trimester serum beta Human Chorionic Gonadotropin as a predictor of hypertensive disorders of pregnancy

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ABSTRACT

Objective: To determine whether increase in serum beta human chorionic gonadotropin between 12 to 20 weeks of gestation is associated with increase in incidence of gestational hypertension, pre-eclampsia and eclampsia later in pregnancy.
Materials and Method: A prospective observational study was undertaken in the department of O&G, SCB Medical College, Cuttack for a period of one year. One hundred pregnant women were enrolled between 12 to 20 weeks of gestation for the study. Their serum beta human chorionic gonadotropin was measured by enzyme linked fluorescence immuno assay and all were followed up. Those who developed hypertension or pre-eclampsia or eclampsia during follow up were included in the hypertensive disorders of pregnancy group and rest were included in normal group. Both the groups were compared and analyzed.
Results: Out of the one hundred study samples 14% women developed hypertensive disorders later in pregnancy and the rest 86% remained normotensive. The beta human chorionic gonadotropin levels of the women in the hypertensive group was found to significantly higher than women in normal group.
Conclusion: Quantitative estimation of serum beta human chorionic gonadotropin in mid trimester is a very useful screening tool for the prediction of hypertensive disorders of pregnancy. It should be adopted in the routine antenatal care so that there can be a drastic reduction in the maternal mortality and morbidity.

1. Introduction

Hypertensive disorders of pregnancy (HDP) is a major cause of maternal mortality and morbidity world wide.[1] It comprises of gestational hypertension, pre-eclampsia and eclampsia.[2] Affecting 7 to 10 % of all pregnancies it forms a deadly triangle with hemorrhage and sepsis so far as maternal deaths in developing countries is considered.[3] Complications that follows this dangerous condition are many which includes acute problems like abruptio placentae, HELLP syndrome, DIC, renal failure, CVA, hepatic failure, pulmonary edema and long term effects like metabolic syndrome and diabetes mellitus.[4] The peculiarity of this disease is that the pathogenesis starts as early as 12 weeks of pregnancy and the disease progresses silently without any clinical manifestations. By the time diagnosis is made end organ damage and complications are already advanced. Hence the best way to defeat this menace is to develop a good predictive test and take preventive steps before the onset of complications. Although the exact etiology remains unclear despite extensive clinical and basic researches it is quite well known that placenta plays a major role in the pathogenesis.[5] Hence there has been a constant effort to study the relationship between placental products like beta hcg, alpha feto protein (AFP), pregnancy associated plasma protein-A (PAPP-A), and subsequent development of HDP.[6] With this background in mind the present study is an endeavor to know whether there is any relationship between the level of serum beta hcg a major product from placental trophoblastic cells and the future development of hypertensive disorders of pregnancies. Answer to this question will help in deciding whether it can

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be a useful predictive test that can be utilized to catch the disease at an early stage so that interventions will ultimately prevent complications and bring down the mortality and morbidity.

2. Aim and Objective

The aim of our study was to determine whether increase in serum level of beta human chorionic gonadotropin between 12 to 20 weeks of pregnancy is associated with increase in incidence of hypertension, pre-eclampsia and eclampsia later in pregnancy.

Objective was to compare the mid trimester serum beta hcg level of women developing hypertensive disorders of pregnancy with that of normal pregnant women and to estimate whether there is any significant difference.

3. Materials and Methods

The study was a prospective observational study conducted in the department of obstetrics and gynaecology, SCB medical College and Hospital, Cuttack which is a tertiary care center in the state of odisha. The study period was one year from august 2018 to august 2019. Study sample was selected from pregnant women attending antenatal clinic of the OPD. A total of one hundred women were enrolled for the study after considering the inclusion and exclusion criteria.

Inclusion criteria - All pregnant women attending antenatal OPD with gestational age between 12 and 20 weeks as estimated by their last menstrual period or first trimester ultrasound scan.

Exclusion criteria -Women with chronic hypertension, diabetes mellitus, multiple pregnancy, molar pregnancy, anomalous fetus, chronic renal diseases, collagen vascular diseases like SLE.

Proper informed written consent was obtained from all selected samples at the beginning. To start with all enrolled women were subjected to detailed history taking, examination and routine antenatal investigations including obstetric ultrasonography. Blood pressure was measured using mercury spygnomanometer in right arm sitting position taking the appearance and disappearance of korotkoff sounds as systolic and diastolic pressures respectively. 5 ml venous blood was collected for estimation of serum beta hcg by enzyme linked fluorescence immunoassay. Urine was examined for albumin by dipstick method. These were repeated at every antenatal visit and results recorded. All were followed up till delivery and 6 weeks postpartum. Those women who developed gestational hypertension defined as systolic blood pressure greater than or equal to 140 mm of mercury or diastolic pressure of more than or equal to 90 mm mercury or pre-eclampsia defined as hypertension with proteinuria more than 2+ dipstick or eclampsia defined as convulsions associated with hypertension were included in the HDP group (Hypertensive Disorders of Pregnancy group). Rest of the women who did not develop features of HDP till delivery or postpartum were placed in the normal group. The two groups were compared with regard to their initial beta hcg levels and obstetric outcomes. Management of all cases was done as per the protocol of the department. The collected data was analyzed according to the type of variables. Continuous variables were analyzed in terms of mean and interpreted by students test. Discontinuous variables were described in terms of percentage and interpreted by chi-square test. P- values less than equal to 0.05 was considered as statistically significant.

4. Results

Our observation revealed that during the follow up period 14 women developed hypertensive disorders of pregnancy and 86 women remained normal till the end of the study.

Table 1 The 14 women who developed HDP had raised beta hcg between 12 to 20 weeks gestation. The mean serum beta hcg of the HDP mothers was 54298 ± 22302 miu/ml compared to normal mothers whose mean level was 27015 ± 11250 miu/ml. The difference was statistically highly significant.

Table 2 The HDP mothers had a significantly higher rise in their systolic and diastolic blood pressures compared to the normal mothers suggesting that when initial beta hcg is high rise in blood pressure later in pregnancy is also high.

Table 3 The above table shows that more than 90 % of HDP mothers who had initial high beta hcg also went on to have positive urine albumin later in pregnancy which is a hallmark of pre-eclampsia.

Table 4 Both the groups were matched with regard to their status at the time of booking. The above table states that the HDP mothers and normal mothers were similar with respect to their mean age at enrollment, socioeconomic status, parity and their blood pressure at the beginning of the study as the calculated differences were not statistically significant.

5. Discussion

It is known that hcg is a glycoprotein secreted by placental trophoblastic cells. The serum concentration of its beta subunit is a reflection of trophoblastic activity. It is postulated that in HDP there is hypoxia induced by impaired angiogenesis and insufficiency of placental spiral arteries and this leads to hyperplasia of trophoblastic cells and hypersecretion of hcg. This relationship has been studied in as early 1992 by Aquilina J and Ellips P et al.[7] They had concluded from their cross sectional study with 200 women that 70% mothers with elevated beta hcg in early second trimester developed hypertension later in pregnancy. The largest study was however by Yaro et al in 1994 who studied

Table 1: Comparison of beta hcg between HDP and normal group.

HDP		Normal		Difference	"t"	Df	P
Mean	SD	Mean	SD				
54298	22302	27015	11250	27283	7.13	96	< 0.005

Table 2: Comparison of increase in blood pressure between HDP and normal mothers

Blood Pressure	HDP		Normal		Diff b/w means	"t"	df	P
	Mean	SD	Mean	SD				
SBP	41	15	5	12	36	10.3	96	< 0.001
DBP	24	8	3	9	21	8.1	96	< 0.001

Table 3: Comparison of urine albumin detection between HDP and normal mothers

Mothers	Urine albumin Present		Urine albumin Absent		X^2	Significance
	No	%	No	%		
HDP	13	92.8	1	7.2	82.9	P < 0.001
Normal	2	2.3	84	97.7		

Table 4: Comparison of HDP and normal mothers at the beginning of the study

Variables	Normal mothers		HDP mothers		X^2 / t	P value
Age (Mean ± SD)	26.2 ± 4.5		26.1 ± 2.3		t = 0.93	P > 0.05
Socioeconomic status	Lower mid	17 (24.6%)	Lower mid	4(28.5%)	X^2= 1.072	P > 0.05
	Lower	69 (75.4%)	Lower	10(71.5%)		
Parity	Primi	44 (51.2%)	Primi	8 (57.1%)	X^2= 0.287	P > 0.05
	Multi	42 (48.8%)	Multi	6 (42.9%)		
Systolic BP	Mean	SD	Mean	SD	t = 1.563	P > 0.05
	112	9.1	107.9	9.7		
Diastolic BP	Mean	SD	Mean	SD	t = 0.618	P > 0.05
	72	7.4	70.0	6.2		

more than 60,000 patients and found a similar result. They concluded that beta hcg can be used as a predictive test for HDP.[8] Several recent Indian studies have also shown similar results as that of our study.[9,10] Nevertheless we agree that our study was not conducted for a long duration with a possibility of including a larger sample. Hence we suggest that more number of larger studies should be done on this subject to make the evidence stronger enough to be accepted by all.

6. Conclusion

From the results of our study and analysis of other similar studies we can firmly conclude that there is a strong relationship between mid trimester beta hcg level and risk of hypertensive disorders of pregnancy. We found that there was a significant rise in the serum beta hcg between 12 to 20 weeks gestation in those women who subsequently developed hypertension, pre-eclampsia and eclampsia. Hence this simple biochemical test can be utilized as a test to predict the occurrence of the most dreadful disease in pregnancy. If the predictive test comes positive effective and timely interventions can be initiated. The outcome will be a prevention of severe complications and reduction of mortality and morbidity . This will go a long way in achieving the WHO sustainable development goal of bringing down the MMR to 70 by 2030.

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8. Conflict of Interest

The authors declare they have no conflict of interest.

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