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BETA HCG in Mid Trimester as a Predictor of Pregnancy Induced Hypertension

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Abstract: ***Background: Pregnancy-induced hypertension (PIH) is the development of hypertension in a pregnant woman after 20 weeks of gestation. Women with high serum beta-HCG levels in early pregnancy are at higher risk of developing PIH. Aim: The present study aims to find the relationship between serum Beta-HCG levels at mid trimester (13-20 weeks) and development of pregnancy induced hypertension. Material and Methods: Serum beta-HCG estimation was done by CLIA method in 500 women between 13 to 20 weeks of gestation, selected randomly for this study from April 2013 to September 2014. Multiple of median (MOM) was calculated from charts of norms available for that weeks of pregnancy. Cases were followed till delivery for the development of PIH and results analysed statistically with Chi-square test. Result: Out of 500 cases, 447 (89.4 %) were finally evaluated in which 387 cases (86.57%), had Beta-HCG levels, <2MOM, whereas 60 cases (13.48%), had values >2 MOM. Out of 387 cases with Beta-HCG levels < 2 MOM, only 6 cases (1.56%) developed pregnancy induced hypertension. The remaining cases, 381 (98.44%), were normotensive and out of 60 cases with Beta-HCG values >2MOM, 49 cases (81.67%) developed pregnancy induced hypertension, and only 11 cases (18.33%) were normotensive. The p value for this parameter when calculated for the development of pregnancy induced hypertension, came out to be <.001, which is highly significant. Conclusion: The study concluded that the serum beta HCG estimation at mid trimester (13–20 weeks) is a good predictor of PIH and higher levels of beta HCG are associated with increased severity of PIH.***

Keywords: Pregnancy Induced Hypertension (PIH), Human Chorionic Gonadotrophin (HCG), Preclampsia

1. Introduction

Pregnancy-induced hypertension (PIH) includes both gestational hypertension and preeclampsia. It is considered as common pregnancy complication for which the pathogenesis remains unclear. Pregnancy induced hypertension is considered one of the main public health issues worldwide and major cause of mortality both in mother and foetus[1],[2], [3]. It is a unique disease characterised by high blood pressure during pregnancy. The American College of Obstetricians and Gynaecologists (ACOG) has classified pregnancy induced hypertension (PIH) into four groups of disorders: gestational hypertension, where resting BP is 140/90 mmHg or higher after the 20th week of gestation; Chronic hypertension, that exists before pregnancy or begins in the first 20 weeks of gestation; preeclampsia (raised BP and edema or proteinuria)/Eclampsia (preeclampsia and seizures); and preeclampsia superimposed on chronic hypertension [4],[5]. PIH may be followed by acute renal failure, maternal death, premature delivery, intra-uterine growth restriction etc. It is seen only in pregnancy, affecting 12–15 % of all pregnant women. In spite of improvement and development in maternal and neonatal care, PIH is still considering as a dreaded complication of pregnancy. Several tests have been proposed but none has been accepted widely due to their low predictive value. The abnormal placentation has been considered as one of the initial event in the disease process. It is hypothesized that during mid trimester, immunological changes occur in the trophoblast, resulting in secretory response, which is seen as a rise in the beta HCG levels [6]. In this study we have tried to find out whether beta HCG can predict the development of PIH.

2. Materials and Method

This present study was conducted in Department of Obstetrics and Gynaecology; Lalla Ded Hospital associated Hospital of Government Medical College Srinagar from April 2013 to September 2014. The present observational prospective study was done on 500 pregnant, normotensive, non-proteinuric women selected randomly between the gestational age of 13–20 weeks and the cases were followed till delivery for the development of PIH. A structured interviewer administered questionnaire was filled for all the patients to obtain information on age, educational status, parity, occupation, ethnic group, gestational age, body mass index (BMI) and cell phone number. Women with multiple pregnancy, congenital malformation, extreme hypertension, diabetes mellitus and history of Down syndrome were excluded from the study. Gestational age was calculated from the reliable menstrual history dates and early ultrasonographical measurement of fetal crown-rump length. Urinalysis for protein and glucose was done at subsequent visits when blood pressure was found to be elevated, i.e., 140/80 mmHg .Blood pressure was done by Richter's mercury sphygmomanometer, the gold standard for measuring blood pressure with a properly sized cuff and the patient in a seated position. Hypertension disorder of pregnancy was identified in case of systolic blood pressure ≥140 mm Hg or diastolic blood pressure ≥90 mm Hg on two occasions at least six hours apart. The Korotkov phase V which is the fading of the blood flow murmur is recognized as the diastolic blood pressure.

The beta- HCG estimation in maternal serum was done by chemiluminescent immunometric assay (CLIA) method. The

multiple of median (MOM) was calculated from the median of the diagnostic test employed for the current study (Diagnostic Products Corporation, U.S, Immulite 2000-HCG), having the central 95% values accuracy. Results were evaluated and analyzed statistically. Chi-square test was applied.

3. Result

Five hundred women were enrolled but only 447 (89.4 %) women were completely followed till term. The 53 cases that were left out were due to Missed abortion (8), Spontaneous abortion (33), and congenital malformations (12) as shown in (TABLE 1). Out of the 447 cases taken up for final evaluation, 246 were between age group 20-24, 165 between 25-29, 28 among 30-34 and 8 cases were >35 age group. It concludes that the age parameter is non significant for the occurrence of pregnancy induced hypertension. The incidence of pregnancy induced hypertension was more in primipara (p=0.002) as compared to multipara and it was statistically significant as P-value<0.05. Out of 447 cases which were final evaluated, 387 cases (86.57%) had Beta-HCG levels <2MOM, whereas 60 cases (13.48%) had values >2 MOM. Out of 387 cases with Beta-HCG levels < 2 MOM, only 6 cases (1.56%) developed pregnancy induced hypertension. The remaining cases, 381 (98.44%), were normotensive. And out of 60 cases with Beta-HCG values >2MOM, 49 cases (81.67%) developed pregnancy induced hypertension, and only 11 cases (18.33%) were normotensive. The p value for this parameter when calculated for the development of pregnancy induced hypertension, came out to be <.001, which is highly significant (TABLE 2).

Table 1: Outcome of pregnancy after Recruitment

Total no. of cases	Missed abortion	Spontaneous abortion	Congenital malformations	No. Of cases followed till delivery
500	8 (1.6%)	33 (6.6%)	12 (2.4%)	447 (89.4%)

Table 2: Distribution of Cases According to Hypertensive Status and Beta-HCG

HCG levels (MOM)	Number of cases	Normotensive	PIH	
			Mild PIH	Severe PIH
≤2	387 (86.57%)	381 (98.44%)	6 (1.56%)	0
>2	60 (13.43%)	11 (18.33%)	17 (28.33%)	32 (53.33%)
TOTAL	447	392	23	32
Chi-square=309		d.f.=1	P-value<0.001 (Sig.)	

4. Discussion

This study was undertaken to examine the possibility of using Beta-HCG to predict pregnancy induced hypertension. Color Doppler is a sensitive technology for early prediction of pregnancy induced hypertension but its accessibility in day to day practice is limited. It is therefore necessary to find methods of predicting pregnancy induced hypertension, which are relatively easy to access and reasonably accurate in prediction [7]. Our study focussed on the role of maternal mid trimester Beta-HCG levels as a marker of subsequent pregnancy induced hypertension development. In this study, 500 cases were initially enrolled. However, only 447 cases (89.4%) could be evaluated for the final results. The 53 cases that were left out were due to missed abortion (8), spontaneous abortion (33), and congenital malformation (12) and 10 were lost to follow up. The mid trimester period (13-20 weeks.) was chosen for the current study, as a time for estimation of the Beta-HCG levels, with a mean age of 15.45 weeks. A study conducted by Jaiswar et al , a similar gestational age group was studied [8], as was in another study by Hsu et al, who justify it by quoting that during mid trimester, immunological changes occur in the trophoblast, resulting in secretory response, which is seen as a rise in the Beta-HCG levels[6].

The mean age of the cases for the present study was 24.66 yrs. But, there was no statistically significant correlation found between the age and the occurrence of pregnancy induced hypertension which was in concordant with the results of study conducted by Aysel Kabuku et al, who observed that there was no statistically significant difference between study and control groups with respect to the maternal age [9].

In our study, the parity status of the mother was significantly associated with the occurrence of pregnancy induced hypertension; the incidence was more in the primigravidas as compared to the multiparas. In a study conducted by Aysel kabuku et al, no significant correlation was found between parity and pregnancy induced hypertension [9].

In our study, a total 447 cases final evaluated, 387 cases (86.57%), had Beta-HCG levels, < 2MOM. Whereas 60 cases (13.43%), had values >2 MOM. The multiple of median was calculated and Beta-HCG values for that particular gestational age group. Out of 387 cases with Beta-HCG levels < 2 MOM, only 6 cases (1.5%) developed pregnancy induced hypertension. The remaining cases, 381 (98.5%), were normotensive. And out of 60 cases with Beta-HCG values >2MOM, 49 cases (81.66%) developed pregnancy induced hypertension, and only 11 cases (18.33%) were normotensive. The p value for this parameter when calculated for the development of pregnancy induced hypertension, came out to be <.001, which is highly significant. A study by Pankaj Desai et al, 62 cases out of 90 (68.9%) with values of Beta-HCG >2MOM developed pregnancy induced hypertension against 21 cases out of 130 (16.15%), having a Beta-HCG value <2 MOM. The difference was statistically significant (p value <.001) [10]. In another study by Ashour et al, in the overall population the Beta-HCG levels >2 MOM, during second trimester were significantly associated with development of pregnancy induced hypertension. They concluded that with the use of Beta-HCG value of 2 MOM as a cut off, its sensitivity as a screening test for pregnancy induced hypertension was 15.6%, the specificity was 90%, and the positive predictive value was 12.8% [11]. In the present study, the increasing Beta-HCG levels (in mIU/ml) showed a direct association with the severity of pregnancy induced hypertension. While 3 case out of 21, i.e 14.28% with a Beta-HCG value <80,000mIU/ml, group had severe pregnancy induced hypertension, the similar figure for

>80,000 mIU/ml group was 29 out of 34 i.e 85.29%, giving a p value of <.01, which is statistically significant. So, it was concluded that as the Beta-HCG levels rise, the probability of developing severe pregnancy induced hypertension also increases with a positive association between these parameters. Similar results have been shown by Zhonghua et al, in which the author concluded that there was a positive correlation between the absolute Beta-HCG levels and the severity of pregnancy induced hypertension , (p value <.05). The serum level of Beta-HCG in the mild pregnancy induced hypertension group was 25,330±17,800 and in severe pregnancy induced hypertension group it was 42,190±17,720, that was significantly higher than the normotensive pregnant group, 12,330±720, giving a highly significant p value<.001[12].

5. Conclusion

The study concluded that measuring second trimester serum Beta- HCG levels is a good predictor of pregnancy induced hypertension and helps in risk stratification of women destined to develop pregnancy induced hypertension in the same pregnancy. Thus these women can be followed up in a tertiary care centre for further management of beta HCG which is associated with severity of PIH.

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