Section: Obstetrics & Gynaecology

Original Research Article

ROLE OF SERUM BETA HUMAN CHORIONIC GONADOTROPIN AT 12 TO 20 WEEKS GESTATION AS A PREDICTOR OF HYPERTENSIVE DISORDERS OF PREGNANCY

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Abstract

Background: Hypertensive disorders of pregnancy (HDP) afflict seven to ten percent of pregnancies; these illnesses can cause problems for the mother and the unborn child. In poor countries, high-dose polyethene (HDP) is the second leading cause of maternal mortality, and in half of these cases, it may be prevented. Therefore, in order to reduce the rates of maternal and newborn mortality and morbidity, an early HDP projection is required. **Materials and Methods:** Our hospital hosted a prospective observational study with two hundred samples and participants over twenty-four months. An expectant mother who was a patient at our hospital's outpatient obstetrics and gynaecology department participated in the research. The blood levels of beta human chorionic gonadotropin (β HCG) were recorded in every single instance from the 12th to the 20th week of gestation. Additionally, the development of high-dose predisposition (HDP) was meticulously examined throughout this time period. **Result:** Out of 2,000 cases, only 33 moms, or 16.5%, are projected to acquire HDP. Moms in the regular group had an average β HCG of 25787.2 ± 11051.5%, whereas mothers in the HDP group had an average β HCG of 66782.2± 8695.58. Statistical analysis was used to find this out. The highly significant statistical determination of the difference between the means ($P<0.001$) suggests it is essential. **Conclusion:** This discovery resulted from a trial that showed higher serum β HCG levels in people diagnosed with hypertension compared to mothers with normal blood pressure. More research has to be carried out on the use of serum β HCG. In order to determine the therapy's effectiveness and cost-effectiveness, these researchers should conduct large-scale prospective trials.

INTRODUCTION

Preeclampsia, eclampsia, and gestational hypertension are the three conditions that fall under the umbrella of hypertensive disorders of pregnancy (HDP) in some situations. HDP affects seven to ten percent of pregnancies overall.[1] All around the world, it has a major impact on the rates of disease and mortality among mothers and babies. While hemorrhage is the leading cause of maternal mortality in undeveloped countries, high-dose polyethene (HDP) is the second most prevalent cause of maternal death. The disorders that cause hypertension are responsible for around ten percent of all maternal deaths, and fifty percent of these deaths might have been prevented.[2] Bad outcomes for mothers include things like abruptio placentae, diabetic ketoacidosis, DIC, HELLP syndrome, kidney failure, liver failure, pulmonary oedema, cerebrovascular accident, metabolic syndromes and other long-term effects. Low birth weight, premature delivery, respiratory distress syndrome, stillbirth, and admission to the newborn critical care unit have all been seen to be more common in a greater number of newborns. These are all conditions that are associated with premature delivery. Although hypertension disorders do not become apparent until late in pregnancy, the pathophysiological process begins relatively early. As a result, it is necessary to make an early prediction of hypertensive disorders in order to lower the death

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and morbidity rates among mothers and their newborns. Regarding the pathophysiology of HDP, the placenta is the primary trigger and an essential factor in the early stages of the illness. Blood Beta HCG levels, which are increased due to placental trophoblast activity, have been linked to the onset of hypertensive problems during pregnancy. Nobody knows what this connection means. Several studies have shown the existence of this link.

Aims and objective of the study

The primary objective of this research endeavor is to quantitatively evaluate the concentration of β-hydroxybutyrate (β-HCG) in the bloodstream and subsequently analyze the prognostic capability of an elevated serum β-HCG level during the initial half of the second trimester (specifically, between the 12th and 20th weeks of gestation) in relation to the initiation of hypertensive disorders associated with pregnancy.

MATERIALS AND METHODS

Our hospital's outpatient obstetrics and gynaecology department obtained 200 samples from expectant women. This study was a twenty-four-month prospective observational research project at a healthcare facility.

Inclusion Criteria

Pregnant women with Gestational age 12-20weeks

Exclusion Criteria

- Pregnant women with
- Chronic hypertension
- Heart disease
- Diabetes mellitus
- Renal diseases
- Collagen vascular diseases/ SLE
- Molar Pregnancy
- Anomalous fetus
- Multiple pregnancies

Following the acquisition of written informed permission in the native language, all participants who met the eligibility requirements were successfully recruited and then interviewed in person. They were allowed to walk away from the research and withdraw from participation throughout the interview or assessment. A comprehensive historical account was obtained, encompassing pertinent information regarding the patient's age, gender, socioeconomic standing, previous obstetric experiences, medical background, and familial medical history. There was also information about the patient's family history. In order to determine a woman's gestational age, either her most recent menstrual cycle or an ultrasound scan carried out during the first trimester of her pregnancy were used. Your height, weight, and body mass index were all values that we measured. In order to determine the patient's blood pressure using the auscultatory approach, a mercury sphygmomanometer was used while the patient was sitting. Inspections of the antennas are performed routinely. In order to conduct an examination of serum α-HCG using the CLIA (Chemiluminescent immunoassay) technique, a 2-milliliter sample of venous blood was collected from the patient between the ages of 12 and 20 weeks. The sample was collected in a simple vial, and all necessary aseptic precautions were taken. According to the guidelines, the prenatal clinic monitored the patients until the baby's delivery. Patients who had been diagnosed with HDP were kept under observation more often. During each visit, the patient's blood pressure was measured, and the albumin content of their urine was analyzed, in addition to other pertinent and standard studies.

According to prevailing medical literature, the identification of gestational hypertension, occurring subsequent to the 20th week of pregnancy, is contingent upon the observation of a blood pressure reading surpassing the threshold of 140/90 mmHg on two distinct occasions, with a minimum temporal interval of six hours between measurements.

Prenatal hypertension and proteinuria measured with a dipstick with a level of at least two were diagnostic criteria for preeclampsia. If there was acute kidney injury (AKI), liver failure, hemolysis, thrombocytopenia, intrauterine growth restriction (IUGR), and hypertension more than 140/90 mm Hg, preeclampsia was also diagnosed in the absence of proteinuria. Even in the absence of proteinuria, this remained the situation.

When preeclampsia was shown to be accompanied with generalized tonic-clonic convulsions, eclampsia was identified as the underlying condition.

Six weeks following the birth, participants are monitored for more information. All instances were managed according to the protocol established by the department.

With a particular focus on the development of hypertension, proteinuria, seizures, and other maternal and fetal outcomes, data was gathered with a particular emphasis on these areas. Each piece of information was made a record for later examination and interpretation. According to the different factors, the data were analyzed and interpreted correctly. The continuous variables of the study, encompassing the mean values, were subjected to analysis employing the student's t-test. The discrete variables were quantified as proportions and analyzed utilizing the chi-square ($\chi 2$) statistical test to assess the dataset. The establishment of the HDP threshold for serum β HCG prediction was accomplished through the utilization of the receiver operating characteristic (ROC) curve approach. By using the approach, we were able to accomplish our aim. A statistically significant P-value was defined as 0.05 or less, with a predefined significance threshold of 5%.

RESULTS

Pregnant women who were getting high doses of prenatal treatment as well as routine dosages were included in the study's cohort. The age, parity, and

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systolic and diastolic blood pressure (SBP and DBP, respectively) at the time of prenatal registration were the variables used to compare and evaluate the individuals. With a standard deviation of 3.81 years, the average age of typical moms was found to be 27.08 years. This average age was shown to be greater than the 26.6 ± 3.61 years mean age recorded for parents with HDP. Of the complete sample size, it is important to highlight that 97 people (88.5% of the total) were classified as prime women. It is also important to note that 103 participants—or 51.5% of the total population—were recognized as moms of more than one child. Age, socioeconomic position, and parity did not significantly differ from one another, according to the statistical study that was done (P>0.05)."

Blood pressure measurements were taken at the time of booking for both the typical mothers and the HDP women. As of the booking, healthy mothers' average diastolic blood pressure (DBP) was 71.4± 5.4 mm/Hg. In contrast, the average systolic blood pressure (SBP) of women with hypertension (HDP) was 109.9±7.6 mm/Hg. Mothers without HDP had a mean diastolic blood pressure (DBP) of 109.1 ±3.3 mm/Hg, but those with HDP had an average sBP of 109.9±7.6 mm/Hg. Their mean systolic and diastolic blood pressures were not appreciably different at the time they booked the reservation. The situation for these two measurements was as follows.

Between the time of booking and delivery, the HDP women's increases in systolic and diastolic blood pressure were observed. Their mean blood pressure (SBP) was 109.9 ± 7.6 mm/Hg at the time of booking; following delivery, it rose to 152.1 ± 7.9 mm/Hg. During booking, their mean diastolic blood pressure was 71.6 ± 3.9 mm/Hg; during delivery, it increased to 96.4 ± 6.4 mm/Hg. Statistically, there was a substantial rise in both the deep and small blood pressures (P<0.001).

The results of a research that compared the ST elevation and diastolic blood pressure of women in the HDP to those of normal mothers are presented in [Table 1]. In the Normal and HDP groups, there was a significant difference (P<0.001) in the average rise in both systolic and diastolic blood pressure. This difference was observed between the mothers in both groups. The statistical study provided further evidence that underscored the significance of this disparity.

The amount of urine albumin that was present at the time of booking and delivery was documented for both groups. It was demonstrated that 13.1% of the HDP had albumin in their urine, despite the fact that normal newborns did not have albumin in their urine. Upon doing a statistical study, it was determined that the phenomena exhibited a strikingly significant (P<0.001) level of occurrence.

"The findings presented in [Table 2] demonstrate a statistically significant difference (P<0.001) in the mean β HCG levels between regular mothers and high-risk pregnant women. It was shown that there was a statistically significant difference."

moms who gave birth normally made up 38.5% of the population, whereas moms who gave birth with LSCS made up 61.5%. This is what happened when the delivery method was looked into. Low birth weight suffocation (LSCS) was shown to occur more frequently in high-risk pregnant women (also known as HDP mothers) and normal mothers (also known as regular moms), with 26 (78.8%) and 97 (58.1%) instances, respectively. There was seen to be a statistically significant difference (P<0.05) in the kind of delivery that took place between women who had the HDP and those who had normal deliveries.

When the gestational age at birth was considered, there was a statistically significant difference (P<0.001) in the number of preterm and term infants born to HDP and normal mothers. It was demonstrated that these infant groups differed from one another.

The study found that in comparison to children born to mothers with normal births, those born to women with high birth pressure (HDP) had significantly different abnormal and normal perinatal outcomes (P<0.001). [Table 4] displays this data.

[Table 5] presents the results, which indicate a statistically significant difference (P<0.001) between the outcomes of normal and HDP moms and difficult and normal moms.

Table 1: Comparison of Increased SBP and DBP between HDP and normal mothers

Blood Pressure	HDP		Normal		Differ b/w mean	"t"	df	P value
	Mean	SD	Mean	SD	Mean			
SBP	42.2	10.1	7.2	7.2	35	9.375	198	P<0.001
DBP	24.8	6.9	4.7	4.8	20.1	7.767	198	P<0.001"

Table 2: Comparison of β HCG between the HDP and normal mothers

Variable	HDP		Normal		Difference between mean	"t"	Df	P value
	Mean	SD	Mean	SD				
β HCG	66782.2	8695.58	25787.2	11051.5	40995	9.223	198	P<0.001"

Table 3: Comparison of gestational age at delivery between the HDP and normal mothers

Gestational age at delivery	HDP		Normal		Total		Chi sq., df & p-value
	Frequency	%	Frequency	%	Frequency	%	
Preterm	15	45.5%	11	6.6%	26	13.0%	$\chi 2$=36.805 df=1 and p<0.001"
Term	18	54.5%	156	93.4%	174	87.0%	
Total	33	100%	167	100.0%	200	100.0%	

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Table 4: Comparison of Perinatal outcome between the HDP and normal mothers

Perinatal outcome	HDP		Normal		Total		Chi sq., df and p-value
	Frequency	%	Frequency	%	Frequency	%	
Abnormal	13	39.4%	11	6.6%	24	12.0%	$\chi 2=28.084$ df=1 and p<0.001"
Normal	20	60.6%	156	93.4%	176	88.0%	
Total	33	100%	167	100.0%	200	100.0%	

Table 5: Comparison of Maternal outcome between the HDP and normal mothers

Maternal outcome	HDP		Normal		Total		Chi sq., df and p-value
	Frequency	%	Frequency	%	Frequency	%	
Complicated	11	33.3%	1	0.6%	12	6.0%	$\chi 2=52.352$ df=1 and p<0.001"
Not Complicated	22	66.7%	166	99.4%	188	94.0%	
Total	33	100%	167	100.0%	200	100.0%	

DISCUSSION

A statistically significant difference (P<0.001) was observed between the two groups, indicating that the quantity of serum β HCG that was found to be significantly greater than that of mothers who were expecting was found to be significantly higher. This conclusion appears to be appropriate in light of the findings of the investigation that Yaron and his companions carried out,[3] and Ellis p et al.[4] Serum β HCG was shown to have a strong positive predictive value, which led the researchers to the conclusion that it may be able to detect high-dose premenstrual syndrome (HDP). A significant positive predictive value was also demonstrated by the researchers. The research that was carried out by Dayal M. and her colleagues.[5] Preeclampsia was discovered in twenty percent of the fifty women who were examined for the condition. With a p-value of less than 0.001, the mean blood β HCG level in preeclamptic individuals was found to be considerably increased, measuring 16130.2 MIU/ml. This level was considered to be over 2.5 MoM. This was found to be pretty comparable to the findings that we obtained from our research, which revealed that out of 200 patients, 33 (16.5%) had HDP. Furthermore, it was observed that there was a significant difference of 40995 MIU/ml in the average blood β HCG level between women who reported having HDP and those who did not have it.
The study by Basirat Z et al,[6] and Vidayabati RK et al,[7] demonstrates that the mean blood beta-HCG level was greater in persons with moderate and severe preeclampsia than it was in normal instances, which is consistent with the findings of our study. In accordance with our findings, it has been found that greater levels of beta HCG are linked with the severity of PIH (P value <0.01). In the research conducted by Kaur G. and colleagues, the sensitivity ranged from 90.91 to 97.44 percent. On the other hand, the specificity ranged anywhere from 96.44 percent to 83.33 percent.[8]

CONCLUSION

According to the results of this study, individuals who ultimately developed preeclampsia had higher serum β HCG levels than those who remained normotensive during their pregnancy. Contrarily, this study's significant impacts pale compared to the natural fluctuation. Moreover, it should be mentioned that serum β HCG does not have enough sensitivity or positive predictive value to be used as a vital marker for mass screening. Serum β HCG should also be paired with other serum indicators and ultrasound factors, such as a Doppler evaluation of the uterine arteries, for optimal results. This will enhance the functionality of the screening tool. To determine whether women are at risk of having preeclampsia, we need further research that employs large-scale prospective trials to determine how cost-efficient and effective it is to use uterine artery dopplers, alpha-fetoprotein, fetal DNA in maternal blood, serum beta HCG, or maybe a combination of these.

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