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ORIGINAL RESEARCH

Maternal Serum human Chorionic Gonadotropin as a predictor of Preeclampsia

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Abstract:

Background: Preeclampsia is a syndrome characterized by the new onset of hypertension with proteinuria, end organ dysfunction or both after 20 weeks of gestation in a previously normotensive woman. Early diagnosis and treatment of this disease may prevent serious sequelae of the disease. Many different tests have been suggested to predict preeclampsia and thus trying to prevent maternal and neonatal morbidity and mortality by earlier diagnosis.

Aim: This study aims at predicting preeclampsia by doing serum Hcg values in second trimester.

Methods and Materials: It was a prospective study conducted on 150 women in a tertiary care centre. women were randomly selected from antenatal outpatient department or ward admissions. Serum HCG estimation was done by sandwich Chemiluminescence immunoassay method and calculated MOM. Women with known LMP and gestational age between 13 – 20 weeks irrespective of parity were included in the study. All women were followed throughout the pregnancy for any sign of preeclampsia.. Serum Hcg levels were evaluated for their capacity to predict the onset of preeclampsia as well as its impact on both mother and foetal outcomes. Additionally, the levels of serum Hcg in preeclampsia were linked with the outcomes for both the mother and the newborn. Results were analysed statistically.

Results: Out of 150 women analysed 17 developed preeclampsia and 133 were normotensives. When compared to normotensive women, women who acquired preeclampsia had statistically highly significant systolic and diastolic blood pressure readings at the time of booking (12–24 weeks gestational age) and at delivery (p-value< 0.001). Women with high serum Hcg levels between 12 and 24 weeks of gestation have a 1.67-fold increased risk of developing preeclampsia (p = 0.035). Women with high levels of Hcg were shown to have severe preeclampsia as well as poor maternal and perinatal outcomes.

Conclusion: Hcg value in early 2nd trimester is helpful in predicting preeclampsia in later pregnancy.

Keywords: Maternal serum Hcg, Preeclamsia

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Introduction

Despite extensive investigation, hypertensive disorder of pregnancy remains a mysterious illness that is linked to high rates of maternal and perinatal mortality and morbidity. This is still a topic with significant clinical importance, enormous attention, and daily concerns for every obstetrician. About 3 to 5% of pregnancies result in preeclampsia, which continues to be a major source of illness and mortality in both foetuses and mothers around the world.[1-4] Preeclampsia can occur anywhere between 5 and 15% of the time overall. In India, 8 to 10% of all pregnancies result in preeclampsia. The incidence is 10% in primigravidae and 5% in multigravidae. Preeclampsia is best described as an exclusively human syndrome that affects almost all organ systems during pregnancy. Preeclampsia has been recognised by doctors for millennia, but surprisingly little is documented about its pathophysiology and prevention.[5-6]

The main issue with high blood pressure is that it could have detrimental effects on both the mother and the foetus. These possible negative consequences can be anything from insignificant to fatal. Preeclampsia is a multifactorial disease that only occurs during pregnancy in humans and has an unknown aetiology. It is characterized by impaired vascular reaction to placentation along with enhanced systemic vascular resistance, augmented platelet aggregation, stimulation of the coagulation cascade, and endothelial dysfunction. Additionally, the central nervous system, hepatic, renal, and coagulation systems may be impacted. Preeclampsia is associated with a higher risk of maternal mortality and morbidities in mothers, such as convulsions, abruptio placentae, severe renal failure, cerebrovascular problems, hepatic haemorrhage, and diffuse intravascular coagulation (DIC).[7-10]

Prematurity, somatic growth retardation, thrombocytopenia, delayed adaptation, patent ductus arteriosus, and gastrointestinal hypomotility are all much more common in the offspring of preeclamptic women.[11-12] The genesis and pathophysiology of the disease remain a mystery despite intensive research and advances in technology in recent years. Therefore, there are no effective treatment or preventative strategies. Clinicians evaluating suitable management must carefully weigh many criteria and individualise each patient. There are few written management guidelines for term preeclampsia. Therefore, these studies in low-resource environments will be very helpful in putting together the data for the best predictor and treatment for women who have preeclampsia at term.

Aims and objectives

• Calculate serum Hcg levels between 12 and 24 weeks of pregnancy and evaluate the prognostic significance of elevated Hcg levels in the antenatal development of preeclampsia.

• To compare the maternal and newborn outcomes in preeclampsia with serum Hcg levels.

Materials and Methods

In 150 prenatal women admitted to the obstetric ward and labour room of a rural, tertiary care hospital, this hospital-based prospective cohort study, time-bound research of analysis of serum Hcg in early second trimester as a predictor of preeclampsia, was conducted.

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Selection of Subjects

According to the established inclusion and exclusion criteria, consecutive prenatal women between the stages of 12 and 24 weeks who were willing to engage in the study and birth at the tertiary care facility were evaluated and enrolled in it.

Inclusion Criteria

• Singleton pregnancies among women between the ages of 18 and 30 with gestational ages of 12 and 24 weeks as indicated by the last period or an ultrasound

• Women who are willing to participate in the study and are prepared to give birth in this hospital;

• Pregnant women have first-trimester blood pressure records that are suggestive of normal blood pressure

Exclusion Criteria

Women who have diabetes or chronic hypertension, multiple pregnancy, congenital mal formations, molar pregnancy and history of down syndrome.

Evaluation

Name, age, symptoms, menstrual history for menarche, last menstrual period, obstetric history for gravidity, parity, abortions, preeclampsia in prior pregnancies, gestational diabetes mellitus, growth restriction, low birth weight, prematurity, late pregnancy losses, and neonatal deaths in prior pregnancies were all noted for all antenatal women attending outpatient departments as well as women admitted to obstetric ward For related medical diseases such diabetes, thyroid, and autoimmune illnesses, past medical history was requested. We also questioned you about your family history, significant surgery past, and diet and nutrition background. A complete clinical examination was performed, taking into account the patient's height, weight, pulse, pedal edoema, thyroid enlargement, etc.

According to the recommendations for taking blood pressure during pregnancy, blood pressure was measured. Obstetrical examination was done, and a fetoscope was used to listen for foetal heart tones. Depending on the timing of their last menstruation, the regularity of their menstrual cycle, the specifics of their clinical examination, or the results of an early ultrasound scan, every patient had their gestational age carefully analysed. Routine prenatal tests such blood group and Rh type, HIV, hepatitis B surface antigen, sickling, serum thyroid stimulating hormone, post-glucose blood sugar, urine for albumin, and microscopy were performed. Specific tests like serum Hcg level were delivered between 12 and 24 weeks of pregnancy.

All antenatal women received weekly checkups till 36 weeks, biweekly checkups from 36 weeks to birth, and postpartum checks for 7 days. Every time a patient visited for follow-up, their blood pressure was checked. Pregnancy-related hypertension was identified using the

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standards established by the National High Blood Pressure Education Program. Serum Hcg levels were evaluated for their capacity to predict the onset of preeclampsia as well as its impact on both mother and foetal outcomes. Additionally, the levels of serum Hcg in preeclampsia were linked with the outcomes for both the mother and the newborn.

Analytical Statistics

Data was gathered and then entered into an Excel worksheet. EpiInfo software version 7 and the Statistical Package for the Social Sciences 15 version were both used for the data analysis. Mean and standard deviation were used to represent continuous quantitative data, while numbers and percentage (%) were used to summarise discrete (categorical) data. The chi-square test was used to compare the category variables. P-values under 0.001 were regarded as very significant.

Results

Among the 150 women analysed, 17 (11.34%) had preeclampsia, and 133 (88.67%) had normal blood pressure. The majority of the women in the normotensive and preeclampsia groups were between the ages of 22 and 25. Women in the normotensive group had a mean age of 26.2986 years and those in the preeclampsia group of 27.24 years and 3.5180 years, respectively. Preeclampsia is more prevalent as people age.

According to table 1 when compared to normotensive women, women who acquired preeclampsia had statistically highly significant systolic and diastolic blood pressure readings at the time of booking (12–24 weeks gestational age) and at delivery (p-value< 0.001). Table 2 demonstrates that there is no association between low serum Hcg and preeclampsia (p = 0.334), while women with high serum Hcg levels between 12 and 24 weeks of gestation have a 1.67-fold increased risk of developing preeclampsia (p = 0.035). Women with high levels of Hcg were shown to have severe preeclampsia as well as poor maternal and perinatal outcomes.

Table 3 reveals that 11.79% of women with preeclampsia experienced antepartum haemorrhage, intrapartum DIC, and postpartum atonic postpartum haemorrhage with acute renal failure, compared to 5.2% of women without hypertension. It was statistically significant that the complications in the two groups differed. Among pregnant women with preeclampsia, 30.97% delivered vaginally at term compared to 55.486% of normotensive women; 72.36% underwent caesarean sections versus 46.736% of normotensive women. No instrumental deliveries were made. In both groups, the delivery method difference was statistically significant (p = 0.0001). Abnormal Doppler and foetal distress were the most frequent causes of caesarean delivery in women with preeclampsia. 86.11 percent of pregnant women who developed hypertension delivered their babies at term, compared to 95.48 percent of normotensive women. Preterm birth was necessary in 16% of pregnant women with preeclampsia compared to 6.736% of pregnant women with normal blood pressure. It was determined that there was a statistically significant difference between the two study groups (p = 0.0075). Compared to 27.36% of normotensive women, 56% of pregnant women with preeclampsia gave birth to infants with low birth weight. In comparison to normotensive women, those with preeclampsia had mean birth weights of 2.5183 0.6581 kg as opposed to

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2.7333 0.4391 kg. It was determined that there was a very statistically significant difference between the two study groups.

Table 4 demonstrates that unfavourable foetal outcomes occurred in 31.2% of pregnant women with preeclampsia compared to 7.023% of normotensive women. It was highly noteworthy that there was a difference between the two study groups.

Compared to 72.35% of normotensive women, 59.86% of pregnant women with preeclampsia had a high level of education. It was determined that there was no statistically significant difference between the two study groups ($p = 0.5728$). The development of preeclampsia and women's educational status are unrelated.

61.0% of normotensive women and 63.6% of pregnant women with hypertension belonged to the middle socioeconomic class. It was not significant because the p-value was only 0.808. The groups were comparable as a result. Pregnant women made up 44.86% and 47.36%, respectively, of the normotensive and preeclampsia groups.

While 60.17% of women with normotension followed a vegetarian diet, 62.36% of women with preeclampsia did so. At the time of booking (12–24 weeks gestational age) and at delivery, weight gain during pregnancy and body mass index (BMI) were compared for both women with preeclampsia and normotensive women. The pregnancy-related weight gain's p-value is 0.572. The development of preeclampsia and women's educational status are unrelated.

61.0% of normotensive women and 63.6% of pregnant women with hypertension belonged to the middle socioeconomic class. It was not significant because the p-value was only 0.808. The groups were comparable as a result. Pregnant women made up 44.86% and 47.36%, respectively, of the normotensive and preeclampsia groups. While 60.17% of women with normotension followed a vegetarian diet, 62.36% of women with preeclampsia did so. The chi-square test yielded a p-value of 0.001. At the time of booking (12–24 weeks gestational age) and delivery, weight increase during pregnancy and body mass index (BMI) were compared for both pregnant women with preeclampsia and normotensive women. The p-values for BMI ($p = 0.0013$) and weight gain during pregnancy ($p = 0.001$) were determined to be extremely significant. Comparing pregnant women with preeclampsia to normotensive women, the family history of diabetes mellitus and hypertension was significant. A statistically significant difference existed between the two groups ($p = 0.0259$). In contrast to 69.55% of normotensive women, 92.36% of prenatal women with preeclampsia experienced pedal edoema, which is itself a risk factor for preeclampsia. Given that the p-value for both groups was 0.001, they were equivalent.

Table 1: Systolic and diastolic blood pressure comparison between pregnant women with pregnancy-related hypertension and normotensive prenatal women at booking (12–24 weeks gestational age) and delivery

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Blood pressure	*Preeclampsia*	*Normotensive*	*t-test*	*p-value*
Systolic blood pressure	At booking (12–24 weeks) 113.96 ± 9.166	109.811 ± 9.7323	3.54	0.0008
	At delivery 144.0341 ± 13.1256	120.5736 ± 11.286	18.63	<0.001
Diastolic blood pressure	At booking (12–24 weeks) 73.825 ± 6.546	71.6938 ± 10.94	1.78	0.0963
	At delivery 94.5250 ± 9.0609	76.7406 ± 7.4652	19.33	<0.001

Table 2: Serum βHcg and risk of preeclampsia

BetaHcg	*Preeclampsia*	*Normotensive*	*Relative risk*	*95% CI (p-value)*
High (>30,000)	32.36%	22.36%	1.78	1.14–2.72 (0.046)
Low (<10,000)	29.86%	28.61%	1.38	0.895–2.16 (0.445)
Normal (10,000–30,000)	41%	52.36%	1	–

CI: Confidence interval

Table 3: Women are distributed based on antepartum, intrapartum, and postpartum problems.

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Complications	*Preeclampsia*	*Normotensive*
Antepartum—accidental hemorrhage	1.36%	2.6%
Placenta accreta	1.36%	0%
Intrapartum—DIC	2.61%	0%
Postpartum—atonic postpartum hemorrhage	3.86%	2.6%
Acute renal failure	2.6%	0%
Total	11.79%	5.2%
Normal	88.21	94.8

Table 4: Distribution according to fetal outcome

Fetal outcome	*Pregnancy-induced hypertension*	*Normotensive*
NICU	28.6%	6.6%
Anomalous baby	0%	0.423%
Intrauterine demise	2.6%	0%
Total	31.2 %	7.023
Normal	68.8%	92.97

Discussion

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One of the most prevalent pregnancy problems, hypertensive disorders of pregnancy impact up to 8% of all pregnancies.Maternal morbidity and death rates are significantly impacted by a fatal trio that includes infection, bleeding, and preeclampsia. The precise cause of preeclampsia is unknown, there are no guidelines for prediction, and most aspects of care are unclear, hence managing this condition is difficult and contentious. The international community places a high premium on reducing maternal and perinatal mortality and morbidity caused by preeclampsia because it is one of the Millennium Development Goals. The placenta is the primary known cause of preeclampsia.Preeclampsia is frequently shown to be related with pathophysiological placental anomalies.[13-14]

Women who experience hypertension during pregnancy may also develop hyperplacentosis or an abnormal placentation. Hypertensive diseases produce hypoxic placental injury, which leads to relative cytotrophoblastic cell hyperplasia and elevated levels of the hormone Hcg. Predictors are now better known than they were ten years ago. The hunt for the optimum predictor is still ongoing despite the existence of numerous predictors due to the dearth of bigger randomised trials. Since the cause is unknown, there are disagreements regarding the best course of treatment, which puts the doctor in a pickle.Despite the significant effects of its consequences on mother and foetal outcomes, preeclampsia is still a poorly understood phenomenon.[15-18]

The prevalence of preeclampsia at a tertiary care facility was determined to be 11.34% in the current study. In research by Vidyabati et al[6] (17.68%), U Singh et al.[7](21.48%), Kiran et al.[9] (17.5%), and Wander et al.[12] (23.636%), the frequency was comparable to that in our study. Serum Hcg levels were high in studies by Vidyabati et al[6] and Wander et al[12].

In our study, maternal complications in pregnant women with preeclampsia were found to be antepartum (accidental haemorrhage), intrapartum (DIC), postpartum (atonic postpartum haemorrhage and acute renal failure), compared to 5.2% in normotensive women. Preeclampsia affected 3.7% of the women in the Vrijkotte et al[13] study, while preeclampsia affected 4.9% of them. 2 (7.69%) of the women in Wander et al[12] study had eclampsia, while 18 (22.5%) experienced preeclampsia.

In the current study, unfavourable foetal outcomes occurred in 31.2% of women with preeclampsia compared to 7.023% of normotensive women. Intrauterine growth restriction, hypoxia, low birth weight, and hyperbilirubinemia were the reasons for the neonatal intensive care unit (NICU) admission. Asphyxia, indicated by a low Apgar, was the most prevalent. Infants born prematurely (16%) and with low birth weight (56%). According to Vrijkotte et al study[13], .'s 5.3% of pregnancies were preterm and 9.3% were undersized for gestational age.

According to the aforementioned study, 11.34% of pregnant patients at tertiary care hospitals experience pregnancy-related hypertension. A high-risk factor that aids in the prediction of preeclampsia is high serum levels of Hcg. Preeclampsia is 1.78 times more likely to occur in women with high serum Hcg levels measured from 12 to 24 weeks of gestation (relative risk = 1.78) than in those without. The level of serum Hcg was inversely correlated with the maternal and perinatal outcome. The diagnosis and treatment of preeclampsia are closely related to

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maternal and perinatal morbidity. When providing risk-based counselling, serum Hcg should be taken into account. The most frequent indicators of a woman's "increased risk" of pregnant hypertension are a personal or family history of high diastolic blood pressure, a chronic illness, and/or abnormal uterine Doppler results before 24 weeks.[19-22]

Conclusion

Hcg value in early 2nd trimester is helpful in predicting preeclampsia in later pregnancy. Preeclampsia is 1.78 times more likely to occur in women with high serum Hcg levels measured from 12 to 24 weeks of gestation (relative risk = 1.78) than in those without. The level of serum Hcg was inversely correlated with the maternal and perinatal outcome. The diagnosis and treatment of preeclampsia are closely related to maternal and perinatal morbidity. When providing risk-based counselling, serum Hcg should be taken into account

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