Content available at: https://www.ipinnovative.com/open-access-journals

Southeast Asian Journal of Health Professional

Journal homepage: https://www.sajhp.com/

Original Research Article

Investigating the function of serum B-HCG levels in the prognosis of hypertensive pregnancy disorders: A prospective observational study

Priyanka Rathor[1]*, Anita Inani[1], Pratibha Vashisth[1]

[1]*Dept. of Medical, Index Medical College and Hospital and Research Centre, Indore, Madhya, Pradesh, India*

ARTICLE INFO

Article history:
Received 13-11-2023
Accepted 29-11-2023
Available online 07-12-2023

Keywords:
Hypertensive disorders of pregnancy
Serum β-HCG
Predictive markers
Maternal-fetal outcomes
Proteinuria
Observational study

ABSTRACT

Background: Pregnancy-related hypertensive diseases are a serious hazard to world health. Identifying predictive markers is crucial for timely intervention. Serum β-HCG, known for its diverse role in pregnancy, is explored due to its potential involvement in vascular remodeling and angiogenesis.
Materials and Methods: The prospective observational study involves 200 pregnant women, monitored from early gestation to delivery. Serum β-HCG levels are evaluated at different time points. Data collection includes clinical assessments, obstetric evaluations, and blood sample analysis. Statistical analysis is conducted using MedCalc software.
Results: Among 200 cases, elevated serum β-HCG levels (≥2 MoM) show a higher prevalence of hypertensive disorders (HDOP) compared to lower levels (<2 MoM). Maternal and fetal outcomes are explored, revealing adverse outcomes associated with elevated β-HCG levels. Age, religion, and parity distributions are analyzed for their correlation with HDOP.
Conclusion: The study establishes a strong correlation between the onset of HDOP and increased β-HCG levels. There is no discernible relationship between age and HDOP, while religious variations and parity suggest potential relationships. The study also highlights a significant link between proteinuria and HDOP. For a thorough understanding, more studies with bigger sample numbers and controlled designs are advised.

1. Introduction

Pregnancy-related hypertension problems (HDP) are extremely dangerous for both the mother and the fetus well-being, representing a leading cause of morbidity and mortality worldwide. Identifying robust predictive markers for the onset and progression of these disorders is crucial for timely intervention and improved maternal-fetal outcomes. Serum The placenta secretes β-human chorionic gonadotropin (β-HCG), a hormone made of glycoproteins, has emerged as a potential candidate for unraveling the complex interplay between hormonal changes and hypertensive complications during pregnancy.[1]

This prospective observational study explores the complex link between blood β-HCG levels and hypertensive disorders of pregnancy. It is carried out at the Department of Gynecology, Index Medical College, Hospital & Research Center, Indore. The Department, renowned for its commitment to advancing women's health through cutting-edge research, provides an ideal setting for this comprehensive investigation.[2]

The rationale behind exploring serum β-HCG lies in its multifaceted role during pregnancy. Initially recognized for its pivotal role in supporting early pregnancy by sustaining the corpus luteum, recent studies have suggested its involvement in vascular remodeling and angiogenesis, processes integral to the maintenance of normal blood pressure. Consequently, aberrations in β-HCG levels could

* *Corresponding author*.
E-mail address: anitainanies@gmail.com (P. Rathor).

https://doi.org/10.18231/j.sajhp.2023.019

potentially serve as early indicators of vascular dysfunction, paving the way for the development of hypertensive disorders.[3]

The study design encompasses a meticulous prospective approach, wherein pregnant individuals are longitudinally monitored from the early stages of gestation through delivery. The comprehensive nature of the investigation allows for the evaluation of serum β-HCG levels at different time points, establishing a dynamic profile that may offer insights into the temporal relationship between hormonal changes and the onset of hypertensive disorders.[4]

The relevance of the study is enhanced by the distinct demographic features of the patient group at Index Medical College, Hospital & Research Center, Indore. The results are expected to have broader relevance and significantly add to the body of information currently available about predictive biomarkers for hypertensive disorders of pregnancy because the sample was varied and representative.[5]

To sum up, the goal of this prospective observational study is to investigate the possibility of using blood β-HCG levels as a predictor for pregnancy-related hypertension problems. We hope that this research, carried out in the esteemed Department of Gynecology at Index Medical College, Hospital & Research Center, Indore, will provide important new understandings that will influence antenatal care in the future, improve risk assessment, and eventually lead to better outcomes for mothers and their babies.[6]

2. Materials and Methods

2.1. Study design and location

The Department of Obstetrics and Gynecology at Index Medical College in Indore, carried out this prospective observational research. The purpose of the study was to examine how serum β-HCG may help pregnant women avoid pregnancy-induced hypertension. The study was conducted from July 2023 to December 2023, spanning six months, following approval from the hospital's ethics committee.

2.2. Study duration and sample size calculation

The study commenced upon approval from the ethical committee and continued until the desired sample size was achieved. With a relative permitted error of 15%, the sample size was determined using a 95% confidence interval in order to confirm an estimated sensitivity of 91% for serum beta HCG levels in predicting pregnancy-induced hypertension. The sample size that was determined was 144, and it was rounded up to 200.

2.3. Inclusion criteria

1. Pregnant women attending the Antenatal Clinic of Index Medical College
2. Gestational age between 13 to 20 weeks
3. Age between 18 to 40 years
4. Informed consent obtained

2.4. Exclusion criteria

1. Lack of consent for participation in the study
2. History of hypertension or proteinuria before 20 weeks of gestation

2.5. Data collection

2.5.1. Data collection technique

The study, conducted as a hospital-based prospective case-control observational study, adhered to the ethical guidelines set by the institutional ethics committee. Eligible pregnant patients, meeting the inclusion criteria, were included after detailed counseling and obtaining informed consent.

3. Clinical and Obstetric Assessments

Patients underwent clinical examinations, including baseline measurements such as age, height, weight, and blood pressure. Obstetric examinations, routine antenatal investigations, and thorough history-taking were conducted to assess baseline characteristics and identify potential risk factors.

3.1. Sample collection and analysis

With informed consent, blood samples were taken from the ante-cubital vein. The serum beta HCG levels were measured using chemiluminescence enzyme immunoassays and expressed in mIU/ml. The values were compared with standard normal values for the corresponding gestational period.

3.2. Follow-Up and outcome assessment

Patients were followed until delivery to assess the development of hypertensive disorders. Standard obstetric management was provided based on the department's protocols. Maternal and neonatal outcomes, including complications and NICU admissions, were recorded on a pre-designed proforma.

4. Statistical Analysis

Microsoft Excel was used for data compilation, while MedCalc statistical software was used for statistical analysis. Quantitative data were shown as mean ± SD and median, whereas qualitative data were shown as numbers and percentages. The χ2-test and unpaired t-test were used to compare groups, with a significance level of $p < 0.05$ for statistical significance.

5. Results

Among the patients in the given data, 122 had serum β-HCG levels (MoM) less than 2. Out of these instances, 110 had no HDOP (high degree of pressure), and 12 had it. Nevertheless, serum β-HCG levels (MoM) of two or higher were present in 78 instances overall. Of these instances, HDOP was present in 59, whereas it was lacking in 19. There are 200 instances in all in the data, 71 of which have HDOP present and 129 of which do not.

Table 1: Serum β-HCG levels between 13 and 20 weeks of pregnancy and the development of hypertensive disorders of pregnancy.

Serum β-HCG levels (MoM)	HDOP present	HDOP absent	Total
<2	12	110	122
≥2	59	19	78
Total	71	129	200

The results for mothers and fetuses in patients with elevated beta HCG levels are shown in Table 2. Two of the 199 instances that were examined had a high degree of pressure (HDOP) present, and both of those cases ended in death. With 69 instances having HDOP present and 128 cases having HDOP missing, the remaining 197 cases had live outcomes. Among the total number of patients examined, there were 71 instances with HDOP present and 128 cases without it.

Table 2: Maternal and fetal outcomes in patients withraised beta HCG levels.

Outcome	HDOP present	HDOP absent	Total
Dead	2	0	2
Live	69	128	197
Total	71	128	199

Table 3 shows the distribution of hypertensive disorders of pregnancy (HDOP) by age. There were a total of 18 instances among women who were 20 years of age or younger, 6 of which had HDOP present and 12 of which did not. There were 75 instances in the age range of 21 to 25 years, of whom 34 had HDOP present and 41 did not. There were 68 instances involving women between the ages of 26 and 30; 23 of those cases had HDOP present, whereas 45 did not. Last but not least, there were 39 instances involving women who were 31 years of age or older, of whom 8 had HDOP present and 31 did not.

The distribution of pregnancy-related hypertensive disorders (HDOP) is shown by religion in Table 4. There were 45 instances with HDOP present and 78 cases with HDOP missing among the 123 cases in the Hindu population. There were 77 instances overall for the Muslim community, of which 26 had HDOP present and 51 did not. Between the two religious groups, the data reveals a total of 71 instances with HDOP present and 129 cases with HDOP absent.

Table 3: Distribution of hypertensive disorders of pregnancy by age.

Age(years)	HDOP Present	HDOP absent	Total
≤20	6	12	18
21-25	34	41	75
26-30	23	45	68
≥31	8	31	39
Total	71	129	200

Table 4: Distribution of hypertensive disorders of pregnancy by religion.

Religion	HDOP present	HDOP absent	Total
Hindu	45	78	123
Muslims	26	51	77
Total	71	129	200

Out of the total 200 cases taken, 41 cases developed proteinuria (19.50%) (Table 5).

Table 5: Proteinuria

Proteinuria	Total cases	Percentage
Present	41	20.50
Absent	159	79.50

Chi square 88.02, P value <0.0001 (S)

Just 39 instances (54.93%) out of the 71 patients with hypertensive disorders during pregnancy experienced proteinuria. In this study, only two individuals in the normotensive group experienced proteinuria. With a p value of less than 0.0001, this is extremely significant. Consequently, a high correlation has been seen between the onset of hypertensive diseases during pregnancy and proteinuria (Table 6).

Table 6: Parity HOD.

	HDOP		Normotensive		Total
	Number	Percentage	Number	Percentage	
Primiparous	45	63.38	31	24.03	76
Multiparous	26	36.62	98	75.97	124
	71	100	129	100	200

Chi square 30.09, P value <0.0001 (S)

Table 7: BMI

BMI	Total	Percentage
Underweight	20	10
Normal	154	77
Overweight	26	13

6. Discussion

Our aim was to investigate the relationship between blood β-HCG levels in the second trimester of pregnancy and the start of hypertensive disorders of pregnancy (HDOP). Our study included 200 participants; 71 of them had HDOP, while the remaining 129 cases had normotension.[7]

According to our findings, HDOP was present in 12 cases with serum β-HCG levels (MoM) less than 2, while it was absent in 110 cases. On the other hand, of the patients with serum β-HCG levels equal to or greater than 2, 59 had HDOP present and 19 had HDOP absent.

These findings suggest that individuals with elevated β-HCG levels had a greater percentage of HDOP instances.12 Additionally, we looked into the outcomes for mothers and fetuses in patients who had elevated β-HCG levels. Two of the 199 instances that were examined had HDOP present at the time of fetal death. 197 cases had live outcomes, with 69 cases having HDOP present and 128 cases having HDOP lacking. These findings suggest a potential connection between HDOP, increased β-HCG levels, and poor outcomes for the mother and the fetus.

We also looked at the age distribution of HDOP. Out of 200 instances, 143 were between the age range of 21 to 30 years old. Nevertheless, $p = 0.0678$ indicates that there is no statistically significant correlation between HDOP and age in our research. This result is consistent with other research that failed to discover a substantial link between age and pregnancy-related hypertension problems. We also looked into how HDOP was distributed according to religion. Of the 123 instances that were examined, 45 of them had HDOP present, while the remaining 78 cases had HDOP missing. The cases were from the Hindu community. There were 77 instances for the Muslim community, 26 of which had HDOP present and 51 of which did not. The evidence points to a possible religious variation in HDOP prevalence, but more research is required to assess the relevance of this relationship.[8]

Twenty-five percent of the 200 patients had proteinuria, which was experienced by 41 of them. The aforementioned research suggests a potential correlation between proteinuria and the development of HDOP. Specifically, proteinuria was present in 39 cases (54.93%) of the 71 HDOP patients, while it was present in just 2 cases (1.56%) in the normotensive group. There appears to be a strong link between the development of HDOP and proteinuria, as indicated by the highly significant p-value (<0.0001).15 The HDOP distribution by parity was also examined. Of the cases studied in the HDOP group, 26 cases (36.62%) were multiparous and 45 cases (63.38%) were primiparous. Primiparous patients included 31 cases (24.03%) and 98 cases (74.97%) in the normotensive group. The statistically significant difference ($p<0.0001$) suggests that primiparity is associated with a higher likelihood of developing HDOP.[9]

Finally, we presented data about the BMI distribution throughout the patients. Twenty cases (10%) were underweight, 26 cases (13%) were overweight, and 154 cases (77%) of the 200 patients fell into the normal BMI bracket. With a statistically significant p-value of 0.002, the findings suggest a possible link between being overweight and the onset of HDOP. The results of this investigation add to the body of information already available on the connections between HDOP, serum β-HCG levels, and other variables including age, parity, proteinuria, and BMI. It is significant to highlight that, given the limited sample size of our study, more investigation and bigger studies are required to confirm and build upon these findings.[10]

There aren't many restrictions on this study. The limited sample size of 200 individuals in this study may restrict how far the results may be applied. Because the study is observational in nature, it cannot prove causality, and there is no control group to compare results with.[11] Furthermore, the study is limited to a specific hospital environment, which may not be representative of the general population. Additionally, other possible confounding variables that can affect the development of pregnancy-related hypertension diseases are not taken into account in this study. Larger sample sizes and controlled study designs are required for future research in order to confirm these results and provide a more thorough knowledge of the factors that contribute to hypertension problems during pregnancy.[12]

7. Conclusion

This study concludes by highlighting the correlation between HDOP, serum β-HCG levels, and outcomes for both mothers and fetuses. The development of HDOP was observed to be substantially correlated with higher blood levels of β-HCG. The lack of a substantial correlation between age and HDOP suggests that other variables may be involved in its development. Furthermore, there were differences in the HDOP distribution amongst various religious groups. These results add to our knowledge of the variables linked to hypertension problems during pregnancy and offer insightful advice for clinical practice and future studies in this field.

8. Source of Funding

None.

9. Conflict of Interest

None.

References

1. Roberts JM, Pearson GD, Cutler JA, Lindheimer MD. Summary of the NHLBI Working Group on Research on Hypertension During Pregnancy. *Hypertension*. 2003;41(3):437–45.
2. Gaccioli F, Lager S, Powell TL, Jansson T. Placental transport in response to altered maternal nutrition. *J Dev Orig Health Dis*.

2013;4(2):101–15.
3. Stekkinger E, Zandstra M, Peeters LL, Spaanderman ME. Early-onset preeclampsia and the prevalence of postpartum metabolic syndrome. *Obstet Gynecol*. 2009;114(5):1076–84.
4. Cole LA. Biological functions of hCG and hCG-related molecules. *Reprod Biol Endocrinol*. 2010;8(1):102. doi:10.1186/1477-7827-8-102.
5. Dekker GA, Sibai BM. Etiology and pathogenesis of preeclampsia: current concepts. *Am J Obstet Gynecol*. 1998;179(5):1359–75.
6. Widmer M, Villar J, Benigni A, Agudelo AC, Karumanchi SA, Lindheimer M. Mapping the theories of preeclampsia and the role of angiogenic factors: a systematic review. *Obstet Gynecol*. 2007;109(1):168–80.
7. Roberts JM, August PA, Bakris G. Hypertension in pregnancy: report of the American college of obstetricians and gynecologists' task force on hypertension in pregnancy. *Obstet Gynecol*. 2013;122(5):1122–53.
8. Huppertz B. Placental origins of preeclampsia: challenging the current hypothesis. *Hypertension*. 2008;51(4):970–5.
9. Levine RJ, Maynard SE, Qian C. Circulating angiogenic factors and the risk of preeclampsia. *N Engl J Med*. 2004;350(7):672–83.
10. Zeisler H, Llurba E, Chantraine F. Predictive value of the sFlt-1:PlGF ratio in women with suspected preeclampsia. *N Engl J Med*. 2016;374(1):13–22.
11. Verlohren S, Herraiz I, Lapaire O. The sFlt-1/PlGF ratio in different types of hypertensive pregnancy disorders and its prognostic potential in preeclamptic patients. *Am J Obstet Gynecol*. 2012;206(1):58–9.
12. Chen X, Scholl TO. Association of elevated serum beta-human chorionic gonadotropin (β-hCG) levels with hypertensive disorders of pregnancy. *J Reprod Immunol*. 2011;92(1-2):147–53.

Author biography

Priyanka Rathor, Assistant Professor

Anita Inani, Associate Professor https://orcid.org/0009-0003-2492-155X

Pratibha Vashisth, Assistant Professor

Cite this article: Rathor P, Inani A, Vashisth P. Investigating the function of serum B-HCG levels in the prognosis of hypertensive pregnancy disorders: A prospective observational study. *Southeast Asian J Health Prof* 2023;6(4):81-85.