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Pregnancy-Related Hypertensive Disorders: Correlation between Clinical Presentation and Features

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ABSTRACT

Introduction: Preeclampsia (PE), a condition characterized by hypertension that emerges after the 20th week of pregnancy and is characterised by proteinuria and some other signs of organ dysfunction, poses a important threat to maternal and perinatal both health. This risk is particularly pronounced when preeclampsia occurs early in pregnancy. Despite extensive scientific endeavours to develop preventive strategies, the incidence of preeclampsia has remained largely unchanged over recent decades. The current study aims to explore the relationship between historical indicators and several clinical markers as possible predictors of complications during pregnancy due to hypertension.

Materials and Methods: Current prospective observational study had 252 recruited patients and was carried out at SGT Hospital in Gurugram. Pregnant participants were interviewed about their medical and investigative history, and a comprehensive assessment of various clinical parameters was performed to identify potential factors contributing to the development of hypertensive pregnancy disorders. Data was collected using validated questionnaires.

Conclusion: Nulliparous women faced a higher risk compared to multiparous individuals, as did women with a family or clinical history of factors that could predispose them to preeclampsia or eclampsia, indicating an elevated risk.

Keywords: Preeclampsia, Pregnancy, Hypertension, Clinical Parameters, Eclampsia

1. Introduction

Maternal physiological and anatomical characteristics are altered throughout pregnancy as a result of the interaction between foetal and maternal components, which supports the growing foetus and ensures the health of the mother and her offspring [1]. Among the most dangerous medical conditions that pregnant women might have is preeclampsia [2]. PE refers to the presence of high blood pressure and proteinuria after the twentieth week of pregnancy in a previously normotensive patient according to the American College of Obstetrics and Gynaecology (ACOG) historical definition. However, it's important to consider that before proteinuria becomes apparent, many women may experience systemic symptoms of PE, such as low platelet counts or elevated liver enzymes, which can lead to delayed diagnosis [3,4]. The most widespread medical problem during pregnancy is high blood pressure condition [5]. Although uncommon, preeclampsia can develop prior to the twentieth week of pregnancy [6].

Preeclampsia is characterised by a substantial correlation with morbidity and death in mothers and perinatal units. It frequently manifests as preexisting or newly developed hypertension worsened with proteinuria or end-organ failure [7]. It is important to recognise that a large percentage of pregnancies globally do not have specialised healthcare providers (midwives, obstetricians, or physicians with obstetrics certification) supervising them during pregnancy, labour, or the postpartum phase. [8]. The search for preeclampsia prognostic biomarkers has gained more attention lately. Timely delivery, focused observation, and early diagnosis would all be aided by an efficient predictive test [9]. Preeclampsia usually manifests at term [10].

The risk associated with pregnancies complicated by PE is lower in high-income regions compared to low- and middle-income countries due to the availability of prompt medical interventions that mitigate these risks [11].

Preeclampsia and eclampsia risk factors are well documented in the literature, offering valuable information on diseases that may raise the risk of these syndromes but are not always causative [12]. Preeclampsia prevention requires identifying modifiable characteristics that may be addressed, given its significant public health impact [13].

Certain high-risk patient categories, including those with preexisting diabetes, previous history of PIH, multifetal gestation, or a prior experience of PE, have more chances of mild and severe PE both. These symptoms also may be indicators of other significantly present factors, like endothelial dysfunction along with placental abnormalities [14].

A study conducted in India in 2006 found that PE, eclampsia, and HELLP syndrome (characterized by hemolysis, elevated liver enzymes, and low platelet count) accounted for 44%, 40%, and 7% of cases, respectively [15].

Ghazi *et al.* found that albumin level of serum in PE patients were noticeably greater than healthy controls [16].

Early identification of PE, good prenatal care, and timely management can prevent eclampsia and its associated complications. In the few individuals where eclampsia develops without any preceding symptoms of PE, improved maternal and foetal health depends more on the right management of the condition than on its prevention [17]. Maternal mortality is still high in poor countries despite a decrease in developed countries. The leading cause of maternal death in these countries include HELLP syndrome, , eclampsia, unintentional bleeding, pulmonary oedema and intravascular coagulation [18].

As per the findings from India's 3rd National Family Health Survey (NFHS-3, 2005-06) which consisted of women who were having live births five years before the study. The results shows that the occurrence of PE and eclampsia in India may also be higher than the global incidence rates (7.4–11.3% and ~28%, respectively) [19,20]. Spontaneous miscarriage, Placenta abruption, intrauterine growth restriction, stillbirth and early labour are among the adverse outcomes that are closely linked to PE [21].

Ali *et al* pointed that 42.9% instances of PE occurred in the third trimester, and the majority of the 32.9% fell into the age category of over 35 [22].

Antihypertensive medications can assist manage preeclampsia's systemic symptoms, which are often treated by placenta delivery [23]. The care of individuals with preeclampsia requires a thorough understanding of the pathophysiology and focused therapy [24].

The etiology of PE is characterized by elevated levels of various markers in the maternal systemic circulation, including VW (von Willebrand) factor, fibronectin, endothelin and thrombomodulin, which are indicators of endothelial cell activation [25]. Additionally, the excessive production of soluble fms-like tyrosine kinase 1 (sFlt-1) and endoglin during PE has revealed a clear connection between endothelial dysfunction and placental problems [26,27]. Vascular Endothelial Growth Factor (VEGF) and Placenta Growth Factor (PlGF), which are crucial for endothelial cell survival, vascular dilation, and glomerular endothelium integrity, are bound by sFlt-1 throughout a healthy pregnancy. Blood levels of PlGF and free VEGF typically fall in PE patients, resulting in an anti-angiogenic imbalance that causes endothelial cell dysfunction and glomerular nephropathy in mother [28].

1.1 Risk Predisposing Factors

There are several known risk factors for the development of PE. Epidemiology studies have demonstrated a genetic effect through both paternal and maternal transmission, with indications for familial grouping, parental transfer, identical sibling susceptibility, and racial differences [29]. Because placental insufficiency is the cause of preeclampsia, it is often known as a placental illness [30].

Genetic factors associated with PE risk include the couple (13%), the mother (35%), and the foetus (20%) (17). Men and women who got delivered from PE are more likely to become pregnant if they have PIH (18). 1.6% of instances showed increased PE risk with a new companion, and 2.9% of incidence shows an increase in PE risk when a woman becomes pregnant again after marrying a partner who had a PE-experienced spouse [31]. Depending on whether the problem existed during the first pregnancy, changing partners may be preventive or predisposing [32]. Garti *et al.* found a number of multi-level obstacles and facilitators for the management of preeclampsia [33].

Another critical component is identifying pregnant individuals who are at higher risk of PE, especially nulliparous women lacking a past of unfavourable pregnancy outcomes [34]. Currently, no single, trustworthy predictor of PE exists, independent of clinical risk variables or "omics" technology [35–40]. Figure 1 shows the study conducted by Sunil et al. in which they suggested that among various risk factors of PE was Nulliparity followed by maternal age [41].

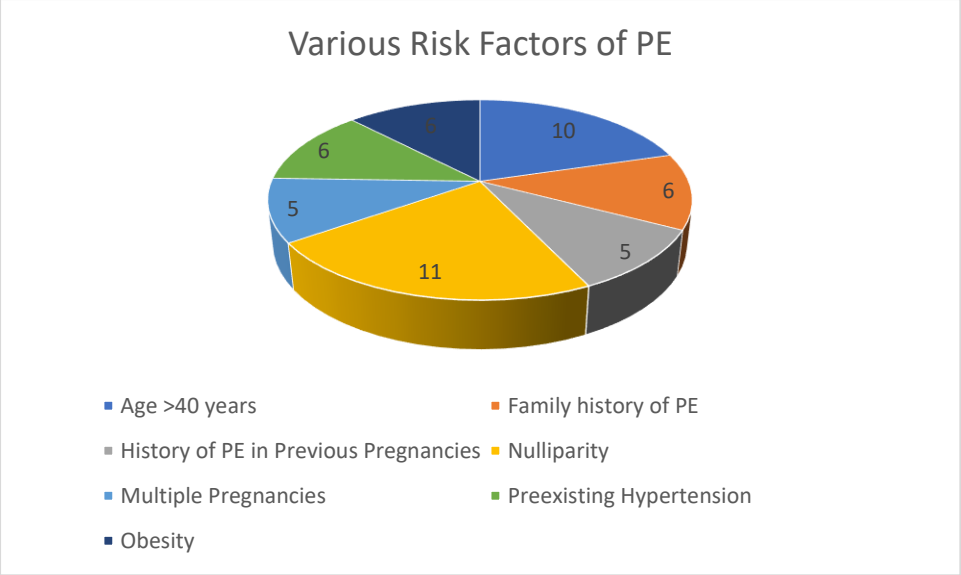

Figure 1. Various Risk Factors of PE

2. Materials and Methods

2.1 Study setting and design

The current hospital-based prospective observational study was approved by the Institutional Ethical Committee (IEC) at SGT Hospital, Budhera, Gurugram, and was carried out from August 2022 to March 2023.

2.2 Inclusion and Exclusion Criteria

We chose women having blood pressure more than 140/90 mmHg, having urine albumin more than 300 mg/g, and singleton pregnancy gestational age greater than 20 weeks for our study. On their first prenatal visit, informed permission was obtained after the study's female enrolled participants were properly informed in their native tongue of the significance and benefits of the research. Women diagnosed with more than one pregnancy, renal disease, diabetes mellitus, any illness that may disturbs a woman's lipid profile, thyroid disease, and congenital malformations verified by ultrasound and all not included in the research.

2.3 Variables studied

119 of the pregnant women in our research had hypertension, whereas 133 had normotension. Every woman was questioned about any past clinical events that might have been associated with Preeclampsia (PE/eclampsia), such as epigastric pain, headaches, seizures, oliguria (<400 ml), antepartum haemorrhage, pulmonary oedema, and HELLP. A questionnaire is used to record the replies.

The clinical signs and symptoms connected with the past history of hypertensive diseases, if they were there in prior pregnancies, as well as the features linked to the history of hypothyroidism (since it is one of the key variables associated with PE).

Pregnancy-related tests and exams that may or may not be associated with the occurrence of postpartum haemorrhage (PIH) were examined. These tests and examinations included, urine dipstick, thyroid enlargement, serum TSH, oligohydramnios, fundal height corresponding to the Period of Gestation (POG), and placenta.

Outcomes in pregnant females that were recorded in each patient's personal file, the ward's discharge file, and the delivery file were also examined.

2.4 Statistical analysis

Utilising Graphpad Prism for analysis, the data was produced using Microsoft Excel. To determine the factors and the association between the clinical aspects of PIH/eclampsia and the maternal outcomes, descriptive statistics (frequency and percentage) were employed. Logistic regression models, both bivariate and multivariate, were applied. The determination of statistical significance for the link was done by the computation of the Odds Ratio, 95% confidence interval, and P value below 0.05. The significance was examined using the Chi-square test.

3. Results

A total of 252 pregnant females were examined in this research. These ladies were separated into two groups: normotensive and hypertensive. These hypertensive conditions included eclampsia and PE.

3.1 Clinical Variables in normotensive and hypertensive patients

Table 1's results indicated that there were 119 hypertension individuals and 133 normotensive patients overall. To determine the prevalence of different clinical parameters among the pregnant women who were included, frequency as well as percentage were computed. Since the P value for epigastric discomfort was more than 0.05, it was determined that it was not significant. Features such as headache, oliguria (<400ml), and antepartum haemorrhage were not highly significant. Conversely, a number of indicators demonstrated significance with a P value which is less than 0.05, including pulmonary oedema (58.81%), convulsion in hypertension and (47.36%) in normotensive females, and HELLP (64.72%) in hypertensive along with (9.78%) in normotensive females. In a prior pregnancy, a hypertensive patient also experienced one stillbirth.

Table 1: Comparison of clinical parameters in hypertensive and normotensive patients

Parameters	Category	Hypertensive	%	Normotensive	%	Odds ratio	P-value
History of Features Suggestive of Severe Preeclampsia/Eclampsia							
Epigastric pain	Mild	27	22.7	15	11.27	2.4	0.066219 NS
	Moderate	7	5.89	9	6.76	0.87	
	Severe	4	3.37	2	1.51	2.26	
	No Pain	81	68.06	107	80.46	0.52	
Visual disturbances	Present	34	28.57	12	9.02	4.03	2.48E-63
	Absent	85	71.43	121	90.98		
Antepartum haemorrhage	Yes	22	18.49	6	4.51	4.8	4.89E-78
	No	97	81.51	127	95.49		
Oliguria (<400ml)	Yes	49	41.18	22	16.54	3.53	4.76E-46
	No	70	58.82	111	83.46		
Headache	Mild	57	47.9	25	18.8	3.97	2.14E-09
	Moderate	21	17.65	12	9.02	2.16	
	Severe	6	5.04	2	1.5	3.47	
	No Pain	35	29.41	94	70.68	0.17	

Convulsion	Yes	1	0.84	0	0	∞	0
	No	118	99.16	133	100		
Pulmonary oedema	Present	70	58.81	63	47.36	1.58	1.77E-16
	Absent	49	41.18	70	52.63		
HELLP	Present	77	64.72	13	9.78	16.9	6.50E-49
	Absent	42	35.29	120	90.23		
History of Features Suggestive of Hypothyroidism							
Fatigue	Present	82	61.65	71	53.38	1.94	6.85E-13
	Absent	37	27.82	62	46.62		
Constipation	Present	64	48.12	72	54.14	0.99	1.37E-16
	Absent	55	41.35	61	45.86		
Cold intolerance	Present	44	33.08	39	29.32	1.41	1.03E-36
	Absent	75	56.39	94	70.68		
Muscle cramp	Present	56	42.11	62	46.62	1.02	1.37E-21
	Absent	63	47.37	71	53.38		
family history	Present	41	30.83	33	24.81	1.59	5.34E-42
	Absent	78	58.65	100	75.19		
History of adverse Pregnancy outcome in prior pregnancies							
Pre-eclampsia	Present	36	30.26	89	66.93	0.22	4.26E-34
	Absent	83	69.75	44	33.08		
Abortion	Present	26	21.85	22	16.54	1.41	3.65E-60
	Absent	93	78.15	111	83.46		
Recurrent abortion	Present	11	9.25	12	9.03	1.04	6.82E-82
	Absent	108	90.77	121	90.97		
Abruptio placentae	Present	8	6.73	2	1.51	4.73	1.42E-94
	Absent	111	93.28	131	98.5		
IUGR	Present	77	64.71	42	31.58	3.97	2.99E-24
	Absent	42	35.29	91	68.42		
Still birth	Present	1	0.84	0	0	∞	0
	Absent	118	99.16	133	100		
Mental retardation	Present	5	4.2	1	0.75	5.79	1.17E-98

For qualitative data, odds ratio calculations were made. P>0.05 is denoted as non-significant and is represented by the symbol NS, but P<0.05 is seen to be a significant value

3.2 Examinations in normotensive and hypertensive patients

Table 2 presents the results of examinations conducted on pregnant women in two groups: hypertensive and normotensive. The examinations were compared and evaluated based on occurrence, odds ratio, and P value. The analysis revealed that, among all the parameters

presented in Table 2, blood pressure readings between 140/90 and 150/100 mmHg were noticeable, with a P-value of 5.22E-15. P values of 1.22E-47, 8.36E-42 and 8.86E-37 for the urinary dipstick, oligohydramnios's and fundal height that corresponds to period of gestation (POG) respectively, were also shown to be significant.

Table 2. Comparison of Examinations in Normotensive and Hypertensive Patients

Examinations	Category	Hypertensive	%	Normotensive	%	Odds ratio	P-value
Pulse rate	70-90	50	42.02	124	93.23	0.05	8.18E-17
	91-120	45	37.82	8	6.02	9.5	
	121-140	15	12.61	1	0.75	19.03	
	>140	9	7.56	0	0.00	∞	
Blood pressure	<140/90 mmHg	3	2.52	122	91.73	142.1	5.22E-15
	140/90-150/100 mmHg	112	94.12	11	8.27	177.4	
	>150/100 mmHg	4	3.36	0	0.00	∞	
Temperature	97-99° F	107	89.92	127	95.49	0.42	2.24E-25
	>100 °F	12	10.08	6	4.51		
Pedal edema	Yes	98	82.35	108	81.20	1.08	7.94E-16
	No	21	17.65	25	18.80		
Thyroid enlargement	Yes	86	72.27	29	21.80	9.35	1.61E-33
	No	33	27.73	104	78.20		
Uric acid	<6	51	42.86	45	33.83	1.47	6.05E-30
	>6	68	57.14	88	66.17		
Urinary dipstick	Yes	91	76.47	16	12.03	23.77	1.22E-47
	No	28	23.53	117	87.97		
Fundal height corresponds to period of gestation (POG)	Yes	36	31.26	103	76.45	0.14	8.86E-37
	No	83	68.76	30	21.55		
Oligohydramnios	Yes	32	25.88	101	76.95	0.13	8.36E-42
	No	87	72.12	32	23.07		

For qualitative data, odds ratio calculations were made. P>0.05 is denoted as non-significant and is represented by the symbol NS, but P<0.05 is seen to be a significant value

3.2 Examinations in Normotensive and Hypertensive Patients

The studies conducted on normotensive and hypertensive pregnant women are shown in Table 3. Based on P values less than 0.05, this table demonstrates the much greater relevance of Fundoscopy, Ultrasound (USG) and serum Thyroid Stimulating Hormone (TSH) for foetal development and placenta in comparison to serum creatinine and platelet count. In the

hypertensive group, 81.51% of patients have serum TSH levels less than 0.4. Intrauterine Growth Retardation Rate (IUGR) was also higher in hypertension individuals (90%) according to fundoscopy USG for foetal growth. Likewise, 78.15% of women with hypertension had low lying placental positions.

Table 3. Comparison of Examinations in Normotensive and Hypertensive Patients

Examinations	Category	Hypertensive	%	Normotensive	%	Odds ratio	P-value
Serum creatinine	<2	113	94.96	126	94.74	1.05	2.34E-26
	>2	6	5.04	7	5.26		
Platelet count	<50,000	0	0.00	0	0.00	∞	0.75 NS
	50,000-1,00000	2	1.68	1	0.75	2.25	
	1,00000-2,00000	15	12.61	22	16.54	0.72	
	>2,00000	102	85.71	110	82.71	1.25	
Serum TSH	<0.4	97	81.51	4	3.01		6.92E-36
	0.4-3	19	15.97	109	81.95		
	≥3.1	3	2.52	20	15.04		
Fundoscopy USG for foetal growth	Normal	29	24.37	117	87.97	0.04	9.74E-51
	IUGR	90	75.63	16	12.03		
Placenta	Fundal	26	21.86	123	92.49	0.03	2.21E-56
	Low lying	93	78.16	10	7.53		

For qualitative data, odds ratio calculations were made. P>0.05 is denoted as non-significant and is represented by the symbol NS, but P<0.05 is seen to be a significant value

4. Discussion

Current study shows the relationships between several clinical parameters, allowing for the prediction of the likelihood that hypertensive illnesses may manifest. In Gurugram's rural environment, the aspects that are taken into account illustrate the traits so that appropriate preventative actions may be implemented. This study shown that preeclampsia may be effectively handled at an early stage to prevent it from progressing to eclampsia with timely prenatal visits. Although there are parallels between this finding and previous study [42], it is difficult to make direct comparisons since these studies focus on cumulative preeclampsia (30). Women with eclampsia had a higher likelihood of being admitted to the intensive care unit (ICU) compared to those with severe preeclampsia, which is consistent with data from another research. Out of those who were sent to the ICU, twelve (12; 22.2%) passed away as mothers [17]. Nulliparous women were more vulnerable than multiparous ones.

The current study has constraints in that the corelation of clinical variables were not demonstrated in an expanded population or multicentre inquiry; thus, more comprehensive research is needed in the future.

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6. Conflict of Interest

No potential conflict of interest was reported by the author(s).

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