**Original Research Article**

**A study to assess the socio demographic factors and risk factors associated with pre-eclampsia and the associated perinatal outcomes**

**ABSTRACT**

**Background**: Hypertensive disorders of pregnancy are the second most common cause of maternal mortality right after haemorrhage. They constitute about 16% of maternal mortality. [1] The incidence of PIH is around 5-15 % of all pregnancies in India and it increases the risk of maternal morbidity and neonatal mortality. This study was undertaken to assess the socio demographic determinants and risk factors associated with pre-eclampsia and its perinatal outcomes.

**Methods**: A cross-sectional hospital based study was conducted in the obstetrics and gynaecology department of Integral Institute of medical science and research from November 2023 to March 2025. 216 patients with PIH presenting to the OPD during this duration were taken up for the study. Data regarding socio demographic details, risk factors and adverse foetal outcomes were collected through a set of prepared questionnaires and hospital records and analysed.

**Results**: A total of 216 women diagnosed with PIH and consenting for the study were taken up. Maximum cases of PIH were seen in the age bracket of 16-20 which was 82 accounting to about 38%. 134 patients belonged to low socioeconomic background which comprise about 62% of the total. 58.3% patients presenting with PIH came from rural areas. 55.6% of total patients were uneducated. No significant difference in the incidence of PIH can be seen on the basis of occupation and religion. Majority of patients presenting with PIH which is 54.6% were primigravida. Most commonly observed adverse outcome was preterm delivery which occurred in around 56 patients accounting for about 25.9% of the cases followed by low birth weight babies which were 44 out of 216 which made up about 20.3%.

**Conclusion**: PIH being a multi system disorder has disastrous outcomes both on mother and child and due to its increasing incidence it is becoming a major public health concern. Therefore early identification, intervention and management is the need of the hour to help curb its detrimental impact on feto-maternal health. Spreading awareness, spotting high risk individuals and careful monitoring and follow up is required to help reduce mortality and morbidity.

*Keywords*: PIH, perinatal, mortality, Pre-eclampsia, complications

**INTRODUCTION**

According to ACOG, Hypertensive disorders of pregnancy comprise of 4 categories:

1. Gestational hypertension
2. Pre-eclampsia and eclampsia
3. Chronic hypertension
4. Pre-eclampsia superimposed on chronic hypertension

Gestational hypertension can be defined as increase in the blood pressure ≥140/90 mm of hg on 2 occasions 4 hours apart after 20 weeks period of gestation in a previously normotensive patient and BP returns to normal after 12 weeks of delivery. [2]

Pre-eclampsia is a multi-system disorder characterized by increase in blood pressure ≥140/90 mm hg in two readings 4 hours apart or >160/110 mm of hg after 20 weeks period of gestation with either proteinuria (24 hours urinary protein excretion >0.3g or protein /creatinine ration >0.3) or signs of end organ damage which include thrombocytopenia (platelet count <1 lakh), impaired liver function tests (transaminases greater than 2 times the normal range), increased creatinine >1.1 mg/dl, pulmonary oedema, visual symptoms (blindness, scotoma, diplopia, blurring of vision) or neurological symptoms (new onset headache not relieved by medications) in a previously normotensive and normo-proteinuric patient. [3, 4]

Eclampsia is when patients with severe pre-eclampsia develop generalized tonic clonic seizures which can ultimately result in hypoxia, aspiration and death. [5]

Chronic hypertension is either when a hypertensive female conceives or there is increase in blood pressure seen before 20 weeks period of gestation or hypertension persists beyond 12 weeks after delivery with no signs of proteinuria or end organ damage. [6,7]

Pregnancy induced hypertension is one of the prime causes of maternal and neonatal mortality. [8] Over 50000 of maternal deaths can be attributed to pre-eclampsia with a greater incidence in developing countries. [9,10] The incidence of pregnancy induced hypertension is around 15% in India and in recent years the incidence is increasing leading to a major public health concern. [11,12,13,14]

Risk factors include extremes of age (>35 or <19), nulliparity, obesity, multifetal pregnancies, pregestational diabetes, gestational diabetes, chronic hypertension, history of pre-eclampsia in previous pregnancy, molar pregnancy, assisted reproductive technologies, thrombophilias, chronic kidney disease, maternal anaemia, autoimmune diseases (SLE, APLA), new paternity and family history of hypertension. [6,15]

Its exact aetiology is not known but a variety of mechanisms have been said to play a role in its causation like abnormal trophoblastic invasion of the spiral arteries by endovascular trophoblasts, abnormal immune tolerance, genetic, immunological and environmental factors. [13, 16]

Its first clinical manifestation is increase in blood pressure, which may be followed by pathological edema and proteinuria. It is a multi-organ system disorder and hence there is haematological, liver, renal, and neurological involvement. [17] Signs of impending eclampsia are epigastric pain, headache, oliguria, visual disturbances and therefore urgent medical attention needs to be undertaken in case one develops any of these symptoms to prevent complications, morbidity and mortality. [7]

Certain predictors can be used to predict PIH which include anti angiogenic factors (sFLT1, soluble endoglin levels), angiogenic factors (placental growth factors, vascular endothelial growth factor), persistence of diastolic notch beyond 24 weeks in uterine artery doppler. [18]

Initial assessment includes a complete blood count, liver function test, kidney function test, urine protein creatinine ratio, ultrasound for foetal growth and amniotic fluid, umbilical artery doppler studies in cases of foetal growth restriction, fundus examination. If CBC is deranged then coagulation profile, and LDH levels needs to be assessed. [19]

Management includes use of antihypertensives (labetalol, nifedipine, hydralazine, methyldopa), mgso4 prophylaxis (in case of impending eclampsia or eclampsia), foetal surveillance and finally timely termination of pregnancy depending upon maternal, foetal conditions and blood pressure control and investigations. [7]

PIH has been known to complicate 5-15% of all pregnancies and leads to an increased incidence of complications like preterm birth, intrauterine growth retardation, low birthweight babies, still birth, perinatal death, post-partum haemorrhage, antepartum haemorrhage, HELLP syndrome, acute renal failure and cardiovascular diseases. [20, 21]

PIH is accountable for almost 7% of the perinatal deaths occurring annually in India. [22, 23] Hence it is vital to diagnose PIH as early as possible to minimize the risk of associated foetal and maternal complications and thereby reduce mortality.

**METHODS**

Study design: This is a cross-sectional hospital based study conducted in the obstetrics and gynaecology department of Integral Institute of medical science and Research, Lucknow, India.

Study population: All patients with pregnancy induced hypertension admitted in the obstetrics ward in Integral Institute of Medical Science and Research, Lucknow, India meeting the inclusion criteria.

Inclusion criteria: All pregnant women with PIH consenting for the study.

Exclusion criteria: Patients with chronic hypertension, chronic kidney disease, and heart diseases or any other chronic conditions.

**Sample size**:

Sample size is calculated using the formula given below. [25]

Where

n = sample size

p = (5 – 15) %

Confidence level = 95 %, z score = 1.96

Margin of error = 5 %

Non-response = 10 %

Sample size = 216

Data collection and analysis: Informed consent was taken from the patients. Data was collected from November 2023 to March 2025 using hospital records and questionnaires. Information regarding socio demographic determinants, risk factors and possible detrimental outcomes were recorded. It was tabulated in Microsoft Excel and analysed using trial version of SPSS software.

**RESULTS AND DISCUSSION**

A. Socio demographic characteristics

**Table 1 Incidence of PIH in different age brackets**

|  |  |  |
| --- | --- | --- |
| **Age brackets** | **No. of cases** | **Percentage (%)** |
| 16-20 | 82 | 38.0 % |
| 20-25 | 39 | 18.1 % |
| 25-30 | 45 | 20.8 % |
| 30-35 | 50 | 23.1 % |

Table 1 shows the corelation between different age brackets and incidence of patients with pregnancy induced hypertension. Maximum cases of PIH were seen in the age bracket of 16-20 which was 82 accounting to about 38% followed by the age bracket 30-35 which was 50 making around 23% of the total cases. Least incidence of PIH was observed in the age group 20-25 which was 39 resulting in about 18% of the total cases of PIH. Whereas 45 patients making up 20.8% of the lot belonged to the age group of 25-30.

**Table 2 Incidence of PIH in different Socioeconomic status**

|  |  |  |
| --- | --- | --- |
| **Socioeconomic status** | **No. of cases** | **Percentage (%)** |
| Low | 134 | 62 % |
| Middle | 62 | 28.7 % |
| High | 20 | 9.3 % |

Table 2 shows there is a stark difference seen in the incidence of PIH on basis of socioeconomic status of patients. Most cases belonged from low socioeconomic background which comprise about 134 of the total 216 cases making up 62% of the total. Patients belonging to middle socioeconomic status were 62 amounting to about 28.7% whereas only 20 patients belonged to high socioeconomic status making up only 9.3% of the cases. Thus, least incidence of PIH was seen in people belonging to high socio-economic status.

**Table 3 Incidence of PIH on basis of Residence**

|  |  |  |
| --- | --- | --- |
| **Residence** | **No. of cases** | **Percentage (%)** |
| Rural | 126 | 58.3 % |
| Urban | 90 | 41.7 % |
| Total | 216 | 100.0 % |

Table 3 depicts the association between residence and incidence of PIH. 126 out of 216 patients presenting with PIH came from rural areas which constitute about 58.3% of the cases whereas only 90 patients belong to urban areas accounting for 41.7% of the cases. Clear majority was seen in the incidence of cases in rural areas.

**Table 4 Incidence of PIH according to Education status**

|  |  |  |
| --- | --- | --- |
| **Education status** | **No. of cases** | **Percentage (%)** |
| Literate | 96 | 44.4 % |
| Illiterate | 120 | 55.6 % |
| Total | 216 | 100.0 % |

Table 4 exhibits the link between education and occurrence of pregnancy induced hypertension. Maximum number of cases were seen amongst illiterate people which was 120 making up about 55.6%. Only a remainder of about 44.4% cases belonged to literate class.

**Table 5 Incidence of PIH according to Religion**

|  |  |  |
| --- | --- | --- |
| **Religion** | **No. of cases** | **Percentage (%)** |
| Hindu | 70 | 32.4 % |
| Muslim | 88 | 40.7 % |
| Christian | 58 | 26.9 % |
| Total | 216 | 100.0 % |

Table 5 presents the relation between religion and incidence of PIH. There is no significant difference seen between the religions and incidence of PIH. 70 patients presenting with PIH were Hindu and they comprise around 32.4% of the lot. Whereas majority of the patients that is 88 making up 40.7% of the cases were Muslims and Christians were around 58 of them.

**Table 6 Incidence of PIH according to Occupation status**

|  |  |  |
| --- | --- | --- |
| **Occupation status** | **No. of cases** | **Percentage (%)** |
| Housewife | 116 | 53.7 % |
| Working | 100 | 46.3 % |
| Total | 216 | 100.0 % |

Table 6 displays the correlation between occupation of patients and cases of PIH. Out of 216 cases, 116 of the females were unemployed making 53.7%. Whereas the rest 100 patients were employed. No significant difference can be seen in the incidence of PIH on basis of occupation of the patient.

B. Association of risk factors with pregnancy induced hypertension

**Table 7 Incidence of PIH according to risk factors**

|  |  |  |  |
| --- | --- | --- | --- |
| **Risk factors** | | **No. of cases** | **Percentage (%)** |
| Parity | Primigravida | 118 | 54.6 % |
| Multigravida | 98 | 45.4 % |
| Previous history of PIH | Present | 58 | 26.9% |
| Absent | 158 | 73.1% |
| Family history of HTN | Present | 44 | 20.4% |
| Absent | 172 | 79.6% |
| Obesity | Present | 131 | 60.6% |
| Absent | 85 | 39.4% |
| History of ART | Present | 10 | 4.6% |
| Absent | 206 | 95.4% |
| GDM | Present | 12 | 5.6% |
| Absent | 204 | 94.4% |
| Maternal Anaemia | Present | 100 | 46.3% |
| Absent | 116 | 53.7% |
| Multifetal pregnancy | Present | 50 | 23.1% |
| Absent | 166 | 76.9% |

This table shows the association of different risk factors to the incidence of pregnancy induced hypertension. On basis of parity, maximum number of cases were seen in primigravida females which were 118 comprising 54.6% of cases whereas only 98 of the females were multigravida. Out of 216 cases, around 58 patients had a history of PIH in previous pregnancies comprising 26.9% of the total cases and only 44 patients had a family history of hypertension, both of which were insignificant in relation to the incidence of PIH. 131 patients with PIH had a BMI >25 and comprised around 60.6% of the total 216 cases. 12 patients with PIH had GDM accounting for 5.6% of the lot. 100 patients of PIH had maternal anaemia as well comprising around 46.3% of the total which came out to be significant. Out of the total patients, only 4.6% had given history of use of ARTs. 50 patients with PIH had multifetal pregnancy out of a total of 216 comprising about 23.1%.

C. Incidence of adverse perinatal outcomes

**Table 8 Incidence of perinatal outcome in patients with PIH**

|  |  |  |
| --- | --- | --- |
| **Perinatal outcomes** | **No. of cases** | **Percentage (%)** |
| PRETERM | 56 | 25.9% |
| IUD | 8 | 3.7% |
| Still birth | 3 | 1.4% |
| Neonatal death | 5 | 2.3% |
| LBW | 44 | 20.3% |
| IUGR | 16 | 7.4% |

Table 8 demonstrates the incidence of adverse perinatal outcomes in patients with PIH. Most commonly observed adverse outcome was preterm delivery which occurred in around 56 patients accounting for about 25.9% of the cases followed by low birth weight babies which were 44 out of 216 which made up about 20.3%. Intra uterine foetal death was seen in 8 patients accounting 3.7% of the cases. Neonatal death occurred in merely 5 patients which make up only 2.3% of the lot. 16 patients with PIH ended up with Intra uterine growth retardation in babies. The least common adverse outcome as a result of PIH was noticed to be still birth which was only seen in 3 patients.

**CONCLUSION**

Pregnancy induced hypertension is one of the leading causes of maternal mortality and contributes greatly to perinatal mortality as well. With its incidence increasing in recent times, there is a need to have a better understanding regarding its risk factors, determinants and possible detrimental outcomes to help educate and make people aware of the harm associated.

We came to the conclusion that PIH had greater prevalence in the younger age brackets, low socio-economic strata, illiterate individuals, and those coming from rural settings. No significant inclination was seen with religion and occupation of the concerned individuals.

Simultaneously we also noticed a larger portion of cases in primigravida females as compared to multigravida. There was also a greater prevalence of PIH in obese females, and those who had a history of PIH in previous pregnancies and family history of hypertension. Maternal anaemia also had a positive correlation with the prevalence of PIH. No such influence was seen with GDM or use of ART. We also observed that prematurity and low birth weight babies were the most common adverse outcome seen in patients with PIH.

Those risk factors which are modifiable should be well informed to these females and extra care should be taken like encouraging literacy, weight loss before conceiving, lifestyle modifications and taking proper diet and iron supplementation to avoid anaemia should be done.

Thus, we can draw the inference that it is essential to identify such high risk females at the earliest possible so that proper antenatal monitoring and vigilant foetal monitoring can be done form very early on to minimize antenatal, postnatal and perinatal complications. It is also vital to create awareness among such women of the associated risks they harbor and its complications to help them understand the importance of regular and strict antenatal visits. Educating pregnant women about the warning signs of PIH will help in early recognition, intervention and a better outcome both for the mother and the baby.

Better and more easily accessible health facilities should be made to provide a more superior level of antenatal care to high risk females.

Further, more study needs to be done with a larger sample size varying across different regions and to get a greater comprehension regrading patients with pregnancy induced hypertension, the associated risk factors and its outcomes.

**Disclosure Statement**

**Ethical Approval**

Ethical approval was received from the Ethics Committee of the Institution, and written informed consent was obtained.

**COMPETING INTERESTS DISCLAIMER:**

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

**References**

1. World Health Organisation. Many pregnancy-related complications going undetected and untreated – WHO [Internet]. 2025 [cited 2025 Apr 6]. Available from: <https://www.who.int/news/item/08-03-2025-many-pregnancy-related-complications-going-undetected-and-untreated--who>
2. Hypertension in pregnancy. Report of the American College of Obstetricians and Gynecologists’ Task Force on Hypertension in Pregnancy. Obstet Gynecol. 2013 Nov;122(5):1122–31.
3. Dutta DC. Text book of obstetrics. 3rd ed. Calcutta: New Central Book Agency (Pvt) Ltd.; 1995.
4. Parmar MT, Solanki HM, Gosalia VV. Study Of Risk Factors of Perinatal Death in Pregnancy Induced Hypertension (PIH). Natl J Community Med [Internet]. 2012 Dec. 31 [cited 2025 Apr. 6];3(04):703-7. Available from: <https://njcmindia.com/index.php/file/article/view/1799>
5. Magley M, Hinson MR. Eclampsia. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 [cited 2025 Apr 6]. Available from: <http://www.ncbi.nlm.nih.gov/books/NBK554392/>
6. Gestational hypertension and preeclampsia. ACOG Practice Bulletin No. 222. American College of Obstetricians and Gynecologists. Obstet Gynecol 2020;135:e237–60.
7. Abbas RA, Ghulmiyyah L, Hobeika E, Usta IM, Mirza F, Nassar AH. Preeclampsia: A Review of Early Predictors. Maternal-Fetal Medicine. 2021 Jul;3(3):197.
8. Preeclampsia: Clinical features and diagnosis - UpToDate [Internet]. [cited 2025 Apr 6]. Available from: <https://www.uptodate.com/contents/preeclampsia-clinical-features-and-diagnosis#H1371265892>
9. Schmieder RE. End Organ Damage In Hypertension. Dtsch Arztebl Int. 2010 Dec;107(49):866–73.
10. Karrar SA, Martingano DJ, Hong PL. Preeclampsia. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 [cited 2025 Apr 6]. Available from: <http://www.ncbi.nlm.nih.gov/books/NBK570611/>
11. ACOG Committee on Obstetric Practice. ACOG practice bulletin. Diagnosis and management of preeclampsia and eclampsia. Number 33, January 2002. American College of Obstetricians and Gynecologists. Int J Gynaecol Obstet. 2002 Apr;77(1):67–75.
12. Parmar MT, Solanki HM, Gosalia VV. Study Of Risk Factors of Perinatal Death in Pregnancy Induced Hypertension (PIH). National Journal of Community Medicine. 2012 Dec 31;3(04):703–7.
13. Directorate of Women’s Health, Ministry of Health, Trinidad and Tobago. Hypertension in Pregnancy: Clinical Guideline [Internet]. 2018 [cited 2025 Apr 6]. Available from: <https://platform.who.int/docs/default-source/mca-documents/policy-documents/guideline/TTO-CC-31-04-GUIDELINE-2018-eng-MOH-Hypertension-in-Pregnancy-Clinical-Guideline-2018.pdf>
14. World Health Organization. The World health report: 1998: Life in the 21st century: a vision for all [Internet]. Geneva: World Health Organization; 1998 [cited 2025 Apr 8]. Available from: <https://apps.who.int/gb/archive/pdf_files/wha51/ea3.pdf>
15. American College of Obstetricians and Gynecologists. Preeclampsia and Pregnancy [Internet]. Available from: <https://www.acog.org/-/media/project/acog/acogorg/womens-health/files/infographics/preeclampsia-and-pregnancy.pdf>
16. Shandilya V, Sinha N, Rani S. Preeclampsia: Prevalence, Risk Factors, and Impact on Mother and Fetus. Indian J Cardiovasc Dis Women. 2023 Jun 19;8(3):193–9.
17. August P, Sibai BM. Preeclampsia: Clinical features and diagnosis. In: Connor RF editor. UpToDate[internet]. Wolters Kluver; 2025 Mar [cited 2025 Apr 08]. Available from: <https://www.uptodate.com/contents/preeclampsia-clinical-features-and-diagnosis#H1371265892>
18. Prathap, Pranidha Shree CA, Triveni K. Biochemical and hematological investigations in pregnancy induced hypertension. International Journal of Clinical Obstetrics and Gynaecology. 2018;2(4):18–20.
19. Paul S, Parashar H, Upadhyay A, Srivastava K. Spectrum of presentation of pregnancy induced hypertension with maternal and perinatal outcomes at a tertiary care centre. Int J Reprod Contracept Obstet Gynecol. 2025 Mar 27;14(4):1251–5.
20. Mallick S, Barik N, Pradhan S. Gestational hypertension and fetal outcome: A prospective study in a tertiary care centre. Indian Journal of Obstetrics and Gynecology Research. 7(4):595–9.
21. Paola Aghajanian P, Ainbinder S, Andrew E, Vicki VB, Heather B, Helene B, et al. Current diagnosis and treatment in Obstetrics and Gynecology. McGraw-Hill; 2016.
22. Meh C, Sharma A, Ram U, Fadel S, Correa N, Snelgrove JW, et al. Trends in maternal mortality in India over two decades in nationally representative surveys. BJOG. 2022 Mar;129(4):550–61.
23. Bramham K, Parnell B, Nelson-Piercy C, Seed PT, Poston L, Chappell LC. Chronic hypertension and pregnancy outcomes: systematic review and meta-analysis. BMJ. 2014 Apr 15;348:g2301.
24. Daniel WW, Editor. Biostatistics: a foundation for analysis in the health sciences. 7th ed. New York: John Wiley & Sons; 1999.