**A study to assess the sociodemographic determinants and risk factors associated with pre-eclampsia and its Associated perinatal outcomes**

**ABSTRACT**

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 Pregnancy Induced Hypertension (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. A cross-sectional hospital based study was conducted in the obstetrics and gynaecology department of Integral Institute of Medical Science and Research, Lucknow 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 sociodemographic details, risk factors and adverse foetal outcomes were collected through a set of prepared questionnaires and hospital records and analysed. 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 years which were 82 patients accounting to about 38% of the total. 134 patients belonged to low socioeconomic background which comprise about 62% of the total. Whereas 58.3% patients presenting with PIH came from rural areas and 55.6% patients were uneducated. No significant difference can be seen on the basis of occupation and religion in the incidence of PIH. Majority of patients presenting with PIH which is 54.6% were primigravida. Most commonly observed adverse outcome was preterm delivery which occurred in 56 patients accounting for about 25.9% of the cases followed by low birth weight babies which were 44 patients making 20.3% of the total. 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 associated with PIH.

*Keywords*: Pregnancy Induced Hypertension (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 which is a grave 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, however 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 an increase in levels of anti angiogenic factors (sFLT1, soluble endoglin levels), declining levels of angiogenic factors (placental growth factors, vascular endothelial growth factor), and 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, and 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, 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, 22]

PIH is accountable for almost 7% of the perinatal deaths occurring annually in India. [23, 24] Hence it is vital to diagnose PIH timely to minimize the risk of associated foetal and maternal complications and thereby reduce mortality, ICU admissions and hospital stay. [25]

**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. [26]

$$n= \frac{z^{2} p (1-p)}{d^{2}}$$

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 the trial version of SPSS software.

**RESULTS:**

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 % |

Fig. 1 – Bar graph showing the Incidence of PIH in different age brackets

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 years which were 82 cases making up 38% of the total. It was followed by the age bracket of 30-35 years which made up around 23% of the total cases. Least incidence of PIH was observed in the age group of 20-25 years which was only 39 resulting in about 18% of the total cases of PIH. Whereas 45 patients making up 20.8%, 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 % |

Fig. 2 - Bar graph showing the Incidence of PIH in different Socioeconomic status

Table 2 shows there is a stark difference seen in the incidence of PIH on basis of the 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 total 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 % |

Fig. 3 – Pie chart showing the Incidence of PIH on basis of Residence

Table 3 depicts the association between type of 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 belonged to urban areas accounting for 41.7% of the cases. A 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 % |

Fig. 4 - Pie chart showing the Incidence of PIH according to Education status

Table 4 exhibits the link between the education status and occurrence of pregnancy induced hypertension. Maximum number of cases were seen amongst illiterate people which was 120 making up about 55.6%. Whereas 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 % |

Fig. 5 – Bar graph showing the Incidence of PIH according to Religion

Table 5 presents the relation between different types of religion and the incidence of PIH. There is no significant difference seen in the incidence of PIH on the basis of religion. 70 patients presenting with PIH were Hindus and they comprise around 32.4%. Whereas majority of the patients were Muslims making up 40.7% of the cases. Least number of cases were seen in Christians.

**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 % |

Fig. 6 - Pie chart showing the Incidence of PIH according to Occupation status

Table 6 displays the correlation between the occupational status 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 occupational status.

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% |

Fig. 7 – Bar graph showing the Incidence of PIH according to risk factors

Table 7 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 the total cases whereas only 98 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 presenting with PIH had GDM accounting for 5.6% of the lot. 100 of the patients of PIH had maternal anaemia comprising around 46.3% of the total which came out to be significant. Out of the total patients, only 4.6% had given the 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% |

Fig. 8 – Bar graph showing the Incidence of perinatal outcome in patients with PIH

Table 8 demonstrates the incidence of adverse perinatal outcomes in patients with PIH. Most commonly observed adverse perinatal outcome was preterm delivery which occurred in around 56 patients accounting for about 25.9% of the cases. It was followed by low birth weight babies which occurred in 44 out of 216 cases which is about 20.3%. Intra uterine foetal death was seen in 8 patients accounting for about 3.7% of the cases. Neonatal death occurred in merely 5 patients which made 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.

**Discussion and Conclusion:**

Pregnancy induced hypertension is one of the leading causes of maternal mortality and contributes greatly to perinatal mortality as well. [22] With its climbing incidence in recent times, there is a crucial need to have a better understanding regarding of 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 noticed in obese females, and those with had a history of PIH in previous pregnancies and those with family history of hypertension. Maternal anaemia also had a positive correlation with the incidence 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. [25]

Hence it is imperative that we identify the modifiable risk factors and make amends accordingly. Females should be well informed about these risk factors and extra care should be taken like encouraging literacy, advocating weight loss in obese females before conceiving, making lifestyle modifications and taking proper diet and iron supplementation to avoid anaemia.

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 the antenatal, postnatal and perinatal complications. It is also vital to create awareness among such women of the associated risks they harbour 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.

Moreover, provisions of better and easily accessible health facilities will help in providing a 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 to get a greater comprehension regrading patients with pregnancy induced hypertension, the associated risk factors and its outcomes.

**Ethical Approval:**

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

**Consent:**

As per international standards or university standards, patient(s) written consent has been collected and preserved by the author(s).

**Disclaimer (Artificial intelligence)**

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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