**Original Research Article**

# A study of risk factors and outcome in pregnancy induced hypertension

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## Abstract

**Background and Objectives:** Pregnancy Induced Hypertension (PIH) has an adverse outcome for mother and fetus and despite antihypertensive therapy patients do develop complications. This study assesses dermatoglyphic, clinical and investigative profile of the patients and their possible bearing on PIH and success of therapy. Such evidence may be useful to therapeutic decisions for better outcomes.

**Patients and Method:** The study was conducted in pregnant patients attending the ante-natal clinic and later admitted for confinement under Obstetrics and Gynecology department of Sir Sunderlal Hospital of BHU, Varanasi between the period of October 2015 and September 2016. PIH cases had blood pressure >140/90 mm of Hg plus dipstick positive proteinuria. Patients with known co-morbidity except gestational diabetes were excluded. Demographic, clinical and investigative profiles of cases were recorded and outcomes noted. Their relation to PIH severity was studied. Patients were dichotomized on the basis of the median value of systolic blood pressure.

**Result:** The study was conducted in 87 cases of PIH. More severe PIH were seen in primigravidas, overweight patients, patients married at a younger age with early pregnancy after marriage. It was also associated with certain Dermatoglyphic patterns indicating the role of a genetic factor. Anogenital distances indicated the role of androgenization in the severity of PIH. The starting drugs were Methyldopa and Labetalol as monotherapy but despite treatment severe PIH was associated with the impaired renal function, elevated liver enzymes, more frequent eclampsia, high incidence of IUGR and babies born with low Apgar score.

**Conclusion:** The study reveals well-grown mothers with some gap after marriage in acquiring pregnancy to be favorable factors for avoiding severe PIH. Masculinization is a risk factor for which therapy needs to be contemplated although not in current practice. Narrow atd angle in right hand may appear as an easy dermatoglyphic parameter to predict risk and exercise greater vigilance against the development of PIH. The antihypertensive therapy currently used is pretty effective in reducing fetal compromise but cases initially reporting with severe PIH do not appear to be protected from worsening to eclampsia. This warrants contemplation of additional/better therapeutic approach and measures.

**Keywords:** PIH; Eclampsia; Dermatoglyphics; Anogenital Distance; Labetalol.

## 1.Introduction

Hypertensive disorders of pregnancy affect about 10% of all pregnant women around the world. Hypertensive disorders of pregnancy are an important cause of severe morbidity, long-term disability and death among both mothers and their babies. Among the hypertensive disorders that complicate pregnancy, Preeclampsia and Eclampsia stand out as major causes of maternal and perinatal morbidity.[1]

### 1.1 Categories defined in PIH

The American College of Obstetricians and Gynecologists (ACOG)[2] and National High Blood Pressure Education Program Working Group (NHBPEPWG)[3] presents a classification which considers hypertension during pregnancy in only four categories:

1) Preeclampsia-Eclampsia

2) Chronic Hypertension (of any cause)

3) Chronic Hypertension with superimposed preeclampsia and

4) Gestational Hypertension

Preeclampsiais persistent systolic blood pressure of 140mmHg or higher, or a diastolic blood pressure of

90mm Hg or higher after 20 weeks of gestation in a women with previously normal blood pressure plus new onset proteinuria which is defined by the excretion of 300mg or more of protein in a 24 hour urine collection or alternatively, a protein/creatinine ratio of at least 0.3mg/dl.

A dipstick reading of 1+ also suggests proteinuria, but because this qualitative method has many false-positive and false-negative results, diagnosis can also be made in absence of proteinuria. With the development of persistent rise of systolic and diastolic BP after 20 weeks, criteria like new onset thrombocytopenia, impaired liver function, renal insufficiency, pulmonary oedema or visual or cerebral disturbances in the absence of proteinuria fulfill the diagnosis criteria. Sometimes Preeclampsia is associated with HELLP Syndrome which includes: Hemolysis: abnormal peripheral blood smear, total bilirubin exceeding 1.2 mg/dL, lactic dehydrogenase (LDH) > 600U/L[4]; Elevated liver enzymes: serum aspartate aminotransferase (AST) > 70U/L, elevated alanine aminotransferase (ALT) and LDH > 600U/L[5] and Low platelet count: < 100000/μL[6].

Eclampsia is the presence of new-onset grand mal seizures in a woman with preeclampsia.

In chronic hypertensionthere is a persistent elevation of blood pressure to at least 140/90mmHg on two occasions more than 24 hours apart prior to conception, prior to 20 weeks of gestation, or beyond 12 weeks postpartum.

Mild gestational hypertension is defined as systolic BP ≥ 140mmHg or diastolic BP ≥ 90mmHg (without proteinuria) measured on two occasions at least 6 hours apart and no more than 7 days apart after 20 weeks of gestation.

Severe gestational hypertension is defined as sustained systolic BP ≥ 160mmHg and/or diastolic BP ≥ 110mmHg measured at least 6 hours apart with no proteinuria.

### 1.2 Maternal Risk factor for preeclampsia

Several factors have been identified as predisposing to the development of preeclampsia. According to NICE (National Institute for Health and Care Excellence) [3] and ACOG [2] maternal risk factors for preeclampsia are:

Nulliparity, Previous preeclamptic pregnancy, Family history of preeclampsia, Chronic hypertension or chronic renal disease, Type 1 Diabetes Mellitus and Type 2 Diabetes Mellitus, Multiple pregnancy, Obesity, Advanced maternal age (older than 40 years), Autoimmune disease like SLE. But ACOG [2] also included other risk factors like History of thrombophilia and *in-vitro* fertilization while NICE 2010 included pregnancy interval more than 10 years.

### 1.3 Management of Preeclampsia

Effective management of preeclampsia may be divided into three categories; prevention of preeclampsia, early detection, and treatment.

NICE recommends that the first line antihypertensive should be Labetalol. However, there is insufficient evidence as to which antihypertensive is most effective [7]. Acceptable and commonly used alternatives are Methyldopa and Nifedipine[8]. Labetalol was associated with fewer adverse perinatal events and remains generally the recommended first line antihypertensive.

Labetalol, a nonselective β-blocker with vascular alpha receptor-blocking ability, is commonly used in pregnancy. Labetalol is a reasonable choice in women with chronic hypertension. Adverse effects include lethargy, fatigue, sleep disturbances, and broncho-constriction. Labetalol should be avoided in women with asthma, heart disease, or congestive heart failure [2].

Methyldopa, a centrally acting alpha-2 adrenergic agonist, remains a commonly used drug mainly because of the long history of use in pregnancy and childhood safety data. Blood pressure control is gradual, over 6–8 hours, as a result of the indirect mechanism of action. There are no apparent adverse effects on utero-placental or fetal hemodynamics or on fetal well-being [2].

The present study attempts to compare profiles of risk factors as well as outcome in patients divided as lower and higher systolic blood pressure group around the median value of blood pressure. The pattern of risk factors and their significance to clinical severity (pathogenesis) and outcome in specific study region of eastern U.P/Bihar/Jharkhand is considered to provide useful clinical evidence for practice.

## 2. Patients and Method

### 2.1 Study design and duration

The study was conducted in the ante-natal clinic as well as labor room admitted patients of Obstetrics and Gynecology department of Sir Sunderlal Hospital of BHU, Varanasi between October 2015 and September 2016. All patients receiving ante-natal antihypertensive therapy were included.

### 2.1 Study Protocol

All cases were diagnosed with PIH having blood pressure >140/90 mm of Hg plus dipstick (Argiprime-Robonik India Pvt Ltd.) positive proteinuria. Exclusion criteria were patients with co-morbidity other than gestational diabetes. The research protocol was approved by the Institute ethical committee.

### 2.3 Method and Data collection

Demographic detail elicited included age, education, height and weight. Obstetric history included primary information like age at marriage, husband's

present age and length of cohabitation with husband prior to pregnancy.

Detailed clinical history and physical examination were performed; particular measures were also taken for dermatoglyphics[9] and anogenital distance [10].

Dermatoglyphic parameters used in the study were fingerprint a pattern i.e. arches, loops and whorls and palm prints which included atd angle. Patients were asked to wash both their hands with soap and water so as to remove any oil or dirt. The impression of distal phalanges of both hands were taken on paper by inking and pressing them against paper placed on a hard surface then fingerprint patterns were examined and noted down. Palm prints of both hands were taken on paper by inking both palms and pressing them against paper placed on the flat hard surface. atd angle is used in interpreting the position of 'T' triradius. Lines drawn from the digital triradius 'A' and 'D' to the axial triradius 'T' forms 'atd' angle.

For each woman, two variants of Anogenital measurement were taken using vernier's calipers: Anus-Clitoris (AC) and Anus-Fourchette(AF). The Anogenital distances were taken in the labor room under aseptic condition.

Other systemic clinical examinations were done to rule out co-morbidity. Patient's blood pressure was recorded,, blood and urine tests were performed like dipstick test for urinary protein, serum creatinine, liver function test, blood urea. Standard procedures were used for blood glucose, creatinine, lipid profile etc[10]. The treatment advised to the patients was noted down and maternal and fetal outcome like the development of eclampsia, mode of delivery, preterm, IUGR and Apgar score were observed and recorded.

## 3. Result

**Table 1: Characteristics among compared groups of PIH patients with systolic BP under or above median 158mm of Hg**

| Characteristics | Cases bearing less severe PIH (Systolic BP with median & below median i.e. 158mm of Hg) | | Cases bearing more severe PIH (Systolic BP above median i.e. 158mm of Hg) | | P Value |
|---|---|---|---|---|---|
| | N | % | N | % | |
| Age at marriage (> 21 Years) | 18 | 40.9 | 12 | 27.9 | |
| Years since marriage (> 3 Years) | 21 | 47.7 | 13 | 30.2 | |
| BMI (Cutoff >25 kg/m²) | 37 | 84 | 35 | 81.4 | |
| atd Angle, Left Hand (>53º) | 23 | 52.3 | 17 | 39.5 | |
| atd Angle, Right Hand (>54º) | 26 | 59.1 | 16 | 37.2 | 0.0411 |
| Ano-Clitoral Distance (>6.3cm) | 15 | 34.1 | 20 | 45.5 | |
| Ano-Fourchette Distance (>2.2cm) | 19 | 43.2 | 23 | 52.3 | |
| Serum Creatinine Raised (>1.1mg/dL) | 2 | 4.5 | 11 | 25.6 | 0.0069 |
| Liver Enzymes | | | | | |
| AST (Raised >70U/L) | 10 | 22.7 | 29 | 67.4 | <0.0001 |
| ALT (Raised >70U/L) | 21 | 47.7 | 30 | 69.8 | 0.0369 |
| LDH (Raised >600U/L) | 34 | 77.3 | 37 | 86.0 | |

**Table 2: Feto-Maternal outcome and treatment characteristics among compared groups of PIH patients with systolic BP under or above median 158mm of Hg**

| Characteristics | Cases bearing less severe PIH (Systolic BP with median & below median i.e. 158mm of Hg) | | Cases bearing more severe PIH(Systolic BP above median i.e. 158mm of Hg) | | P Value |
|---|---|---|---|---|---|
| | n | % | N | % | |
| Eclampsia | 3 | 6.8 | 38 | 88.4 | <0.0001 |
| Pre-Term Birth | 9 | 21.9 | 28 | 73.7 | <0.0001 |
| IUGR | 11 | 26.8 | 9 | 28.1 | |
| Apgar Score (Low<7) | | | | | |
| 1 Minute | 7 | 17.1 | 9 | 28.1 | |
| 5 Minutes | 1 | 2.4 | 5 | 15.6 | |
| Initially Prescribed Drug | | | | | |
| Labetalol | 9 | 20.5 | 41 | 95.3 | <0.0001 |

## 4. Discussion

Relative profile of demographic, physical and laboratory characteristics among PIH cases grouped as those with systolic blood pressure below median i.e. 158mm Hg and those above this level are presented in Table-1. The significant observation includes a dermatoglyphic feature of atd angle (An angle between digital tri-radius and axial tri-radius, digital tri-radius

includes a-triradius under the index finger and d-triradius under the little finger and axial-triradius near the wrist) in right hand being significantly more often narrow in cases with severe PIH while those with less severe PIH often had wider angles. Finding on the left hand were not significantly different. Other features like age at marriage above 21 years, years since marriage for pregnancy more than 3years were insignificantly often found in cases with less severe PIH. The anogenital distances, both AC and AF distances were larger more frequently in severe PIH group but the differences were not statistically significant. The prevalence of obese cases (BMI >25kg/m²) was not significantly different in two groups of PIH severity. The laboratory investigations revealed expected differences, thus more severe PIH cases had significantly more frequent instances of raised serum creatinine as well as liver enzyme level.

The finding relating atd angle may be indicative of genotypic/phenotypic predisposition of mothers towards increased severity of PIH. [9] Although not statistically significant consistently greater prevalence of both measures of anogenital distances among the severe PIH category indicates the role of masculinization/androgen excess in worsening of PIH [10]. Lack of bearing of obesity on the severity of PIH indicates the more dominant role of other factors in the pathogenesis of PIH. Relatively grown up women with longer latency in getting pregnant appeared to suffer less severe PIH. This may relate to higher socio-economic or educational status to be a safeguard. Again the differences were not statistically significant.

Table 2 presents the feto maternal outcome and treatment characteristics among patients with less and more severe PIH categories. Most strikingly very high incidence of eclampsia occurred in the more severe PIH group. Intra Uterine Growth Retardation instances did not significantly differ between two groups but preterm deliveries were significantly higher in severe PIH group. The health status of new born reflected by Apgar score revealed an insignificantly higher instance of poor Apgar score at 5 minutes (Post Resuscitation) in higher PIH group. Labetalol is taken as a drug for greater severity of hypertension and significantly higher (almost all) number of patients with severe PIH received Labetalol right as initial prescription [3]. The findings indicate antenatal management of PIH to be particularly benefitting the baby rather than the mother. Thus the rate of mothers in higher PIH group developing eclampsia is 88.4% which may also be the reason for pre-pond delivery. However, IUGR of the fetus was as low in the severe PIH cases as those in the less severe PIH cases e.g. about one-fourth the instances of post birth Apgar scores also did not differ in the two

groups significantly although Resuscitation was poor in severe PIH group.

## 5. Conclusion

The study reveals well-grown mothers with some gap after marriage in acquiring pregnancy to be favorable factors for avoiding severe PIH. Masculinization is a risk factor for which therapy needs to be contemplated although not in current practice. Narrow atd angle in right hand may appear as easy dermatoglyphic parameter to predict risk and exercise greater vigilance against the development of PIH. The antihypertensive therapy currently used is pretty effective in reducing fetal compromise but cases initially reporting with severe PIH do not appear to be protected from worsening to eclampsia. This warrants contemplation of additional/better therapeutic approach and measures.

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