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FREQUENCY OF PREGNANCY-INDUCED HYPERTENSION IN PRIMIGRAVIDA

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Abstract

Objective: *To determine the frequency of pregnancy-induced hypertension in primigravida women and its association with selected maternal characteristics.*

Study Design: *Descriptive, cross-sectional study.*

Place and Duration of Study: *Department of Obstetrics and Gynaecology, Lady Willingdon Hospital, Khairpur Mirs, from July 2024 to December 2024.*

Methodology: *Primigravida women aged 18–40 years, with a singleton pregnancy confirmed on ultrasound and gestational age beyond 20 weeks, were enrolled through non-probability consecutive sampling. Women with chronic hypertension, gestational diabetes mellitus, multiple pregnancy or other pre-existing comorbidity were excluded. After written informed consent, demographic and clinical data were recorded. Blood pressure was measured by the auscultatory method after five minutes of rest; PIH was diagnosed when systolic blood pressure was ≥140 mmHg and/or diastolic blood pressure was ≥90 mmHg on two readings taken four hours apart, or a single diastolic reading ≥110 mmHg, without proteinuria. Data were analysed using SPSS version 23; the chi-square or Fisher's exact test was used for categorical variables and the independent-samples t-test for continuous variables, with $p<0.05$ considered significant.*

Results: *Of the 86 primigravida women enrolled, PIH was diagnosed in 15 (17.4%, 95% CI 10.9–26.8%). Mean maternal age (30.0±3.9 vs 27.0±4.5 years, $p=0.014$) and mean BMI (26.9±3.1 vs 24.5±3.9 kg/m², $p=0.015$) were significantly higher among women with PIH. PIH was numerically more frequent among women with a positive family history of hypertension, a higher BMI category, and rural residence (all $p>0.05$).*

Conclusion: *PIH affected roughly one in six primigravida women in this cohort. Higher maternal age and BMI were significantly associated with PIH; associations with educational status, residence, occupation and family history followed patterns reported elsewhere but did not reach statistical significance in this sample.*

INTRODUCTION

Pregnancy-induced hypertension (PIH) is hypertension developing for the first time after 20 weeks of gestation in a previously normotensive woman, with blood pressure exceeding 140/90 mmHg on at least two readings, in the absence of proteinuria.[1,3,4] Blood pressure should be checked in both arms at the initial assessment, and the arm with the higher reading used for all subsequent measurements to confirm the diagnosis.[2] Hypertensive disorders of pregnancy are among the most common medical complications of pregnancy worldwide and encompass a spectrum of conditions, including gestational hypertension, pre-eclampsia and eclampsia.[3]

PIH remains a major obstetric concern, affecting approximately 5–10% of pregnancies and constituting one of the leading causes of maternal mortality worldwide, with an estimated annual incidence of approximately 18.1 million cases based on the 2019 Global Burden of Disease study.[6] The reported frequency is approximately 5–8% in developed countries and is comparatively higher in developing countries.[5] Pakistani hospital-based studies have reported frequencies ranging from around 6% up to 18.5%, depending on setting, sample size and diagnostic threshold.[1]

The pathogenesis of PIH and pre-eclampsia is attributed primarily to abnormal placental development. Defective placentation initiates a cascade of pathophysiological events culminating in widespread maternal endothelial dysfunction, hypertension and multisystem involvement.[7] Established risk factors include genetic predisposition, advanced maternal age, primiparity, overweight and obesity, a previous history of PIH or pre-eclampsia, and a family history of chronic hypertension or diabetes mellitus; maternal anaemia, multifetal gestation, change of partner, inadequate antenatal care and poor nutritional status have also been implicated.[8]

Hypertensive disorders of pregnancy are disproportionately common in South Asian populations, reflecting a combination of genetic, metabolic and healthcare-access factors distinct from those reported in Western cohorts. Family history is a particularly well-documented predisposing factor: a cohort study found a markedly higher risk of gestational hypertension and pre-eclampsia among women with an affected parent. Maternal body mass index also shows a consistent, dose-dependent relationship with PIH; a 2025 meta-analysis of over 50 million pregnancies reported that each 5 kg/m² increase in pre-pregnancy BMI raised the adjusted odds of PIH by 82%, an association that was stronger in Asian populations than in American or European cohorts.[19]

Management centres on close monitoring of blood pressure, maternal symptoms and proteinuria, together with ultrasound and cardiotocography to assess fetal growth and wellbeing; hospital admission is warranted in severe cases or when maternal or fetal compromise is suspected. Antihypertensive agents such as labetalol, nifedipine and methyldopa are used to control blood pressure in moderate to severe disease, while magnesium sulphate is administered for seizure prophylaxis and treatment of severe pre-eclampsia. Timely delivery, guided by maternal and fetal condition and gestational age, remains the definitive management.[7]

Hypertensive disorders of pregnancy carry significant risk for both mother and fetus. Maternal complications include placental abruption and postpartum haemorrhage, both important contributors to maternal morbidity and mortality, while fetal complications include neonatal respiratory distress syndrome, stillbirth, neonatal mortality and preterm birth.[9] Given the scale of maternal and fetal morbidity attributable to PIH, further local data are needed to guide antenatal screening and care. This study was therefore undertaken to determine the frequency of pregnancy-induced hypertension among primigravida women at our institution, and to examine its association with selected maternal characteristics.

METHODOLOGY

This descriptive, cross-sectional study was conducted over six months, from July to December 2024, in the outpatient department of Obstetrics and Gynaecology, Lady Willingdon Hospital, Khairpur Mirs, after approval from the institutional Research & Ethical Review Committee, Khairpur Medical College, Khairpur Mir's (Ref:

KMC/RERC/178, dated 15 April 2026; approval letter on file).

A sample of 86 primigravida women was enrolled through non-probability consecutive sampling; the target sample size was calculated using the WHO sample size calculator by assuming a prevalence of 17.2%, a 95% confidence level, and an 8% margin of error. Participants comprised women aged 18–40 years with a singleton pregnancy, confirmed on ultrasound, and a gestational age beyond 20 weeks calculated from the last menstrual period. Multigravida women and those with a history of chronic hypertension, multiple pregnancy, gestational diabetes mellitus or any other pre-existing comorbidity were excluded.

After written informed consent, demographic and clinical details — including maternal age, gestational age, educational status, employment status, place of residence, family income, body mass index (BMI) and family history of hypertension — were recorded on a structured proforma. BMI was calculated from measured height and weight and classified per WHO categories as low (<18.5 kg/m²), normal (18.5–24.9 kg/m²) or high (≥25 kg/m²).

Blood pressure was measured using a mercury sphygmomanometer with the participant seated for at least five minutes, the arm supported at the level of the heart and an appropriately sized cuff applied to the upper arm; readings were taken by the auscultatory method, with systolic pressure recorded at the appearance of the first Korotkoff sound and diastolic pressure at its disappearance. PIH was diagnosed when systolic blood pressure was ≥140 mmHg and/or diastolic blood pressure was ≥90 mmHg on two readings taken four hours apart, or a single diastolic reading ≥110 mmHg, after 20 weeks of gestation, without proteinuria on laboratory testing, consistent with the diagnostic criteria of the American College of Obstetricians and Gynaecologists and the International Society for the Study of Hypertension in Pregnancy.[21,3]

Data were entered and analysed using SPSS version 23. Quantitative variables (maternal age, gestational age, BMI) were summarised as mean ± standard deviation and compared between women with and without PIH using the independent-samples t-test (Welch's correction where variances differed). Categorical variables were summarised as frequencies and percentages and compared using the chi-square test; where an expected cell count was below 5, Fisher's exact test was used instead. Odds ratios with 95% confidence intervals were calculated for selected binary comparisons. A two-tailed p-value <0.05 was considered statistically significant.

RESULTS

A total of 86 primigravida women meeting the inclusion criteria were enrolled during the study period. PIH was diagnosed in 15 women, giving a frequency of 17.4% (95% CI 10.9–26.8%).

Table I summarises the distribution of the enrolled women by age, gestational age, educational status, residence, occupation, BMI and family history of hypertension.

Table I: ***Distribution of the Study Participants by Demographic and Clinical Characteristics (n = 86)***

Characteristic	n	%
Age (years)		
< 20	4	4.7
20–30	58	67.4
> 30	24	27.9
Gestational Age (weeks)		
20–30	34	39.5
> 30–36	36	41.9
> 36	16	18.6
Educational Status		

Characteristic	n	%
Illiterate / Primary	40	46.5
Secondary / Intermediate	39	45.3
Graduate and above	7	8.1
Residence		
Urban	36	41.9
Rural	50	58.1
Occupation		
Working woman	13	15.1
Housewife	73	84.9
Body Mass Index		
Low (<18.5 kg/m²)	4	4.7
Normal (18.5–24.9 kg/m²)	36	41.9
High (≥25 kg/m²)	46	53.5
Family History of Hypertension		
Present	23	26.7
Absent	63	73.3
Total	86	100

Mean maternal age was 27.5 ± 4.5 years, mean gestational age at enrolment was 31.2 ± 5.9 weeks, and mean BMI was 25.0 ± 3.9 kg/m² for the cohort as a whole.

Table II: ***Association Between Selected Maternal Characteristics and Pregnancy-Induced Hypertension (n = 86)***

Characteristic	PIH n (%)	No PIH n (%)	p-value	OR (95% CI)
Age >30 years	6 (25.0)	18 (75.0)	0.342[c]	1.96 (0.61–6.28)
Age ≤30 years	9 (14.5)	53 (85.5)		Reference
Rural residence	9 (18.0)	41 (82.0)	1.000[c]	1.10 (0.35–3.42)
Urban residence	6 (16.7)	30 (83.3)		Reference
Illiterate / Primary education	5 (12.5)	35 (87.5)	0.394[c]	0.51 (0.16–1.66)
Secondary education and above	10 (21.7)	36 (78.3)		Reference
Housewife	14 (19.2)	59 (80.8)	0.450[c]	2.85 (0.34–23.76)
Working woman	1 (7.7)	12 (92.3)		Reference
High BMI (≥25 kg/m²)	11 (23.9)	35 (76.1)	0.153[c]	2.83 (0.82–9.73)
Normal/low BMI (<25 kg/m²)	4 (10.0)	36 (90.0)		Reference
Family history of hypertension present	6 (26.1)	17 (73.9)	0.214[c]	2.12 (0.66–6.81)

Characteristic	PIH n (%)	No PIH n (%)	p-value	OR (95% CI)
Family history of hypertension absent	9 (14.3)	54 (85.7)		Reference

[c] *Fisher's exact test (2×2 comparison).*

Continuous variables differed significantly between the two groups for maternal age and BMI, but not for gestational age at enrolment. Women with PIH were older (mean 30.0 ± 3.9 vs 27.0 ± 4.5 years; Welch's t=2.65, p=0.014) and had a higher BMI (mean 26.9 ± 3.1 vs 24.5 ± 3.9 kg/m²; Welch's t=2.62, p=0.015) than women without PIH. Mean gestational age at enrolment did not differ significantly between groups (31.7 ± 5.3 vs 31.1 ± 6.1 weeks; p=0.711).

None of the categorical comparisons in Table II reached statistical significance, although PIH was numerically more frequent among women with a positive family history of hypertension, a high BMI, older age (>30 years) and among housewives compared with working women. Given the small number of PIH cases (n=15), several of these comparisons had wide confidence intervals and limited statistical power.

DISCUSSION

This study assessed the frequency of PIH among primigravida women and its association with several sociodemographic and clinical factors, reporting a frequency of 17.4%. This is very close to the 18.5% reported by Khan et al. at Ayub Teaching Hospital, Abbottabad[1], and within the range reported for developing countries generally[5]. A hospital-based study by Gogoi et al. in Dibrugarh district, Assam, reported a hypertension prevalence of 9.1% among pregnant women[5], and a cross-sectional study across public hospitals in the Hadiya zone, Ethiopia, reported a prevalence of 13.4%, with family history of hypertension and higher BMI again emerging as the strongest associated factors[18]. The higher frequency observed here should be interpreted cautiously given the modest sample size (n=86) and the resulting wide confidence interval around the point estimate (10.9–26.8%).

Maternal age and BMI were the only two variables significantly associated with PIH in this cohort. Women with PIH were, on average, three years older and had a BMI roughly 2.4 kg/m² higher than unaffected women. This is consistent with established evidence that advancing maternal age and higher pre-pregnancy BMI both increase the risk of PIH[8], and specifically with a 2025 dose-response meta-analysis of over 50 million pregnancies, which found a significant, consistent relationship between rising maternal BMI and PIH that was stronger in Asian populations than in American or European cohorts[19]. A study at Combined Military Hospital, Abbottabad, similarly reported a higher proportion of PIH among overweight compared with normal-weight women[14], broadly in keeping with the direction, though not the magnitude, of the association found here.

By contrast, categorical age grouping (>30 vs ≤30 years) did not reach significance, most likely because collapsing a continuous variable into three-year-imbalanced bands reduced statistical power relative to the continuous comparison above. This contrasts with a study from southern Thailand, which found a greater proportion of PIH among the youngest adolescent mothers[11]. Conversely, a study from Ethiopia identified advanced maternal age at first pregnancy as a significant risk factor for PIH[12], more consistent with the direction of the (non-significant) trend observed in this cohort. These divergent age findings across studies suggest that the relationship between maternal age and PIH varies with population characteristics, age distribution and antenatal care-seeking patterns.

A positive family history of hypertension was present in 26.7% of the cohort overall, and PIH was numerically almost twice as frequent among women with a family history compared with those without (26.1% vs 14.3%; OR 2.12, 95% CI 0.66–6.81), though this did not reach statistical significance. This trend is directionally consistent with cohort data showing a markedly elevated risk of gestational hypertension and pre-eclampsia among women with a parental history of hypertension[17], and with Khan et al.'s Ayub

Teaching Hospital cohort, which similarly reported a significant association between family history of hypertension and PIH[1]. Low awareness of such risk factors among pregnant women has itself been highlighted as a barrier to earlier presentation and screening in Pakistani settings[10].

Educational status, residence and occupation showed no statistically significant association with PIH in this cohort. Notably, the direction of the education finding (PIH 12.5% among illiterate/primary-educated women vs 21.7% among those with secondary education or higher) ran contrary to the pattern reported by a South Punjab study linking lower educational and socioeconomic status to a higher frequency of PIH[15]; this may reflect the small number of graduate-level participants (n=7) in this sample rather than a true difference in risk, and should not be over-interpreted. Rural residence was numerically, but not significantly, associated with a higher frequency of PIH (18.0% vs 16.7% in urban women), a much smaller difference than the rural excess reported in some other settings, plausibly reflecting differences in antenatal care access between this catchment area and those of other studies.

This study has several limitations. Its cross-sectional, single-centre design limits causal inference and restricts generalisability to other settings. Non-probability consecutive sampling may also have introduced selection bias. Most importantly, the achieved sample of 86 women, with only 15 PIH cases, provided limited statistical power to detect associations for the categorical risk factors examined; the wide confidence intervals around several odds ratios in Table II — spanning both a null and a strongly positive association — mean that clinically meaningful associations cannot be excluded on the basis of these data alone, and a larger, adequately powered study is needed to confirm or refute them. Longer-term maternal and neonatal outcomes were not assessed.

CONCLUSION

PIH was diagnosed in 17.4% of primigravida women in this cohort. Higher maternal age and higher BMI were significantly associated with PIH and represent the most robust findings of this study. Family history of hypertension, higher BMI category, rural residence and older age category showed associations in the expected direction that did not reach statistical significance, most likely reflecting the limited sample size; these findings should be confirmed in larger, adequately powered studies before being used to guide screening priorities.

CONFLICT OF INTEREST

The authors declared no conflict of interest.

DISCLOSURE

It is a Dissertation based article submitted to the College of Physicians and Surgeons Pakistan in partial fulfilment of the requirements for the FCPS-II examination in Obstetrics and Gynaecology.

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None.

PATIENT CONSENT

Written informed consent was obtained from all participants prior to enrolment, after the purpose and procedure of the study were explained to them.

Authors' Contribution:

SP: Conception and study design, data collection, data analysis and interpretation, drafting of the manuscript.

AG: Supervision, contribution to study design and data interpretation, critical revision of the manuscript for important intellectual content, final approval of the version to be published.

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