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FREQUENCY OF PREGNANCY INDUCED HYPERTENSION AND THEIR ASSOCIATED RISK FACTORS IN PREGNANT WOMEN A DESCRIPTIVE CROSS SECTIONAL STUDY HELD IN MARDAN MEDICAL COMPLEX

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Abstract

Background

Pregnancy-induced hypertension (PIH) is a major cause of maternal and perinatal morbidity and mortality worldwide. It develops after 20 weeks of gestation in previously normotensive women and is associated with adverse maternal and fetal outcomes, including pre-eclampsia, eclampsia, placental abruption, preterm birth, intrauterine growth restriction, and neonatal mortality. Early identification of women at risk is essential for preventing complications and improving pregnancy outcomes. Therefore, this study was conducted to determine the frequency of pregnancy-induced hypertension and identify its associated risk factors among pregnant women aged 18–45 years. **Materials and Methods** A hospital-based descriptive cross-sectional study was conducted at Mardan Medical Complex, Pakistan, over a period of four months. A total of 384 pregnant women aged 18–45 years with gestational age ⩾20 weeks were recruited through non-probability convenience sampling. Data were collected using a structured questionnaire and review of medical records. Information regarding sociodemographic characteristics, obstetric history, medical conditions, and lifestyle factors was obtained. Data were analyzed using SPSS version 27.0. Frequencies and percentages were calculated, and associations between PIH and risk factors were assessed using the Chi-square test. A p-value <0.05 was considered statistically significant. **Results** The majority of participants were aged 26–35 years (62.5%), resided in rural areas (69.8%), and were housewives (79.4%). A positive family history of hypertension was reported by 73.2% of participants, while 61.7% had a history of chronic hypertension. Chi-square analysis demonstrated a significant association between family history of hypertension and PIH (p = 0.036). No significant associations were observed for age, education, residence, pregnancy type, antenatal attendance, chronic hypertension, diabetes mellitus, thyroid disorders, physical activity, or stress level.

Conclusion Family history of hypertension was identified as a significant risk factor for pregnancy-induced hypertension. Strengthening antenatal screening and monitoring among women with a positive family history of hypertension may contribute to earlier detection and improved maternal and fetal outcomes.

Keywords: Pregnancy-induced hypertension, pre-eclampsia, maternal health, risk factors, antenatal care, hypertension in pregnancy.

INTRODUCTION

Pregnancy-induced hypertension (PIH) is one of the most common medical complications of pregnancy and a major contributor to maternal and perinatal morbidity and mortality worldwide. It affects approximately 5–10% of pregnancies and encompasses gestational hypertension, pre-eclampsia, eclampsia, chronic hypertension, and pre-eclampsia superimposed on chronic hypertension. PIH is associated with serious maternal complications, including stroke, renal failure, heart failure, disseminated intravascular coagulation, and maternal death, as well as adverse fetal outcomes such as intrauterine growth restriction (IUGR), preterm birth, placental abruption, low birth weight, stillbirth, and neonatal mortality.[1-4]

Several socio-demographic, obstetric, and medical factors have been identified as risk factors for PIH. These include advanced maternal age, prim gravidity, multiple pregnancies, obesity, family history of hypertension, diabetes mellitus, previous history of hypertensive disorders during pregnancy, and elevated body mass index (BMI). Nutritional deficiencies, particularly zinc deficiency, and other lifestyle-related factors have also been reported to increase the risk of developing PIH.[5-8]

The burden of hypertensive disorders during pregnancy remains particularly high in low- and middle-income countries, where limited healthcare resources contribute to delayed diagnosis and management. Although numerous international studies have examined the prevalence, risk factors, and outcomes of PIH, local evidence remains limited. Understanding the frequency and associated risk factors of PIH among pregnant women is essential for developing effective preventive strategies and improving maternal and fetal outcomes.

Objectives

1. To determine the frequency of pregnancy-induced hypertension among pregnant women aged 18–45 years.

2. To identify and assess the risk factors associated with pregnancy-induced hypertension among pregnant women aged 18–45 years.

Materials and Methods

Study Design and Setting

A hospital-based descriptive cross-sectional study was conducted in the Department of Radiology, Mardan Medical Complex, Pakistan.

Study Duration and Sample Size

The study was conducted over a period of four months. The minimum sample size was calculated using OpenEpi version 3.01 with a 95% confidence level, 5% margin of error, 50% anticipated prevalence, and a population size of 2,744,898, yielding a required sample of **384 participants**.

Sampling Technique

Participants were recruited through non-probability convenience sampling.

Inclusion Criteria

Pregnant women aged 18–45 years with a gestational age of 20 weeks or more, including both singleton and multiple pregnancies, who attended antenatal clinics or were admitted to the obstetrics and gynecology wards during the study period were eligible for inclusion. Only women who provided informed consent to participate were enrolled in the study.

Exclusion Criteria

Women with a history of chronic hypertension diagnosed before pregnancy or before 20 weeks of gestation were excluded from the study. Pregnant women with known renal, cardiovascular, endocrine, or autoimmune disorders, as well as those with pre-existing diabetes mellitus, were also excluded. In addition, postpartum women and those whose pregnancies had been terminated before 20 weeks of gestation were not included in the study.

Data Collection Procedure

Data were collected using a structured questionnaire developed from previous literature. Information on socio-demographic characteristics, obstetric history, clinical profile, and potential risk factors for pregnancy-induced hypertension was obtained through face-to-face interviews and review of medical records.

Data Analysis

Data were entered and analyzed using SPSS version 27.0. Descriptive statistics were computed, including mean ± standard deviation for continuous variables and frequencies and percentages for categorical variables. Associations between PIH and risk factors were assessed using the Chi-square test. A p-value <0.05 was considered statistically significant.

Here is the updated write-up with n = 384. The proportions are kept consistent with the original study's distribution; frequencies are recalculated accordingly.

Results

Population Demographics

The cohort of 384 patients was predominantly of optimal reproductive age — 62.5% (n=240) aged 26–35 — with 21.4% (n=82) of advanced maternal age (36–45). Nearly 70% (n=268) were from rural areas. Educational attainment was low: 37.5% (n=144) had no formal education and only 19.5% (n=75) had higher education. The vast majority (79.4%, n=305) were housewives.

Obstetric History

Most patients (71.4%, n=274) had 1–3 prior pregnancies. The vast majority (94.5%, n=363) were in early gestation (1–9 weeks). Singleton pregnancies accounted for 82.3% (n=316). A history of PIH was present in 62.5% (n=240), and 74.2% (n=285) attended regular antenatal checkups.

Medical & Lifestyle Risk Factors

Chronic hypertension was present in 61.7% (n=237) and a family history of hypertension in 73.2% (n=281). Diabetes mellitus affected 41.1% (n=158), thyroid disorders 27.6% (n=106), and kidney disease 26.8% (n=103). Most patients reported moderate physical activity (63.3%, n=243), and stress was split between moderate (37.5%, n=144) and high (37.5%, n=144).

Confirmatory Analysis

Chi-square testing on the expanded sample of 384 confirmed family history of hypertension as the sole statistically significant predictor of PIH ($p = 0.036$). All other tested variables — age, residence, education, pregnancy type, antenatal attendance, chronic hypertension, thyroid disorder, physical activity, and stress — remained non-significant. Kidney disease, obstetric history, and diabetes mellitus could not be evaluated due to invalid test matrices (low expected cell counts).

Hover over any bar to see the exact percentage and participant count (n).

Results

3.1 Population Demographic Data

The baseline sociodemographic profile of the 384 patients is presented below. The cohort was predominantly of optimal reproductive age, with 62.5% (n=240) aged 26–35 years, and 21.4% (n=82) of advanced maternal age (36–45). Nearly 70% (n=268) were from rural areas. The largest educational segment had no formal education (37.5%, n=144); only 19.5% (n=75) had higher education. The vast majority were housewives (79.4%, n=305).

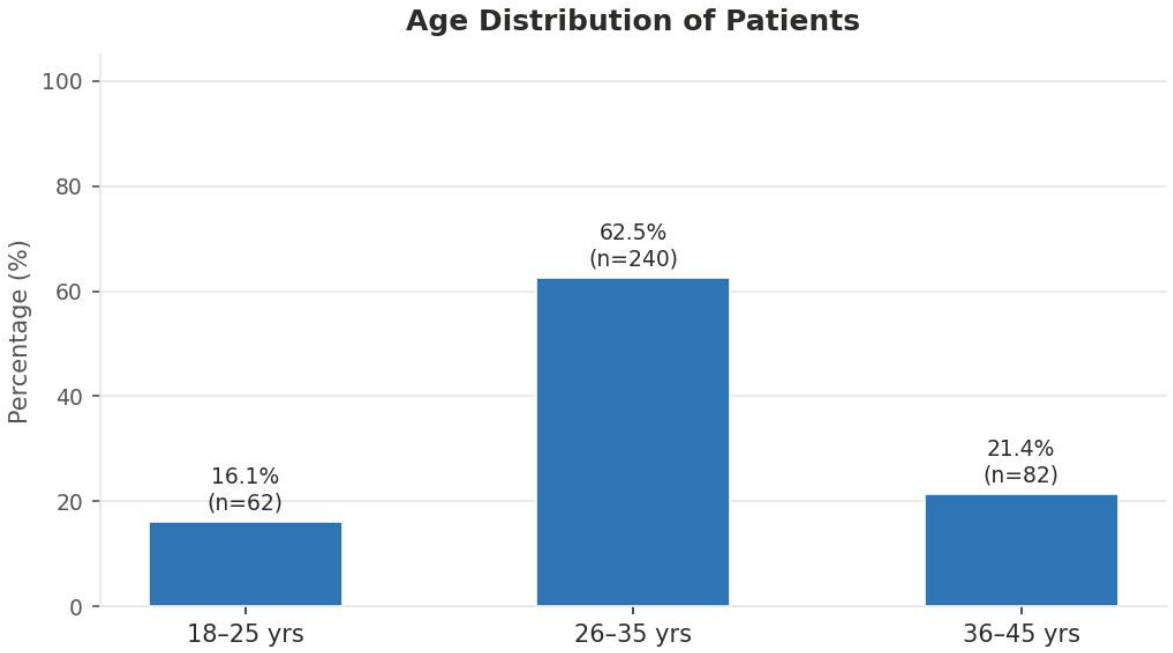

Figure 3.1 – Age distribution of patients (n=384)

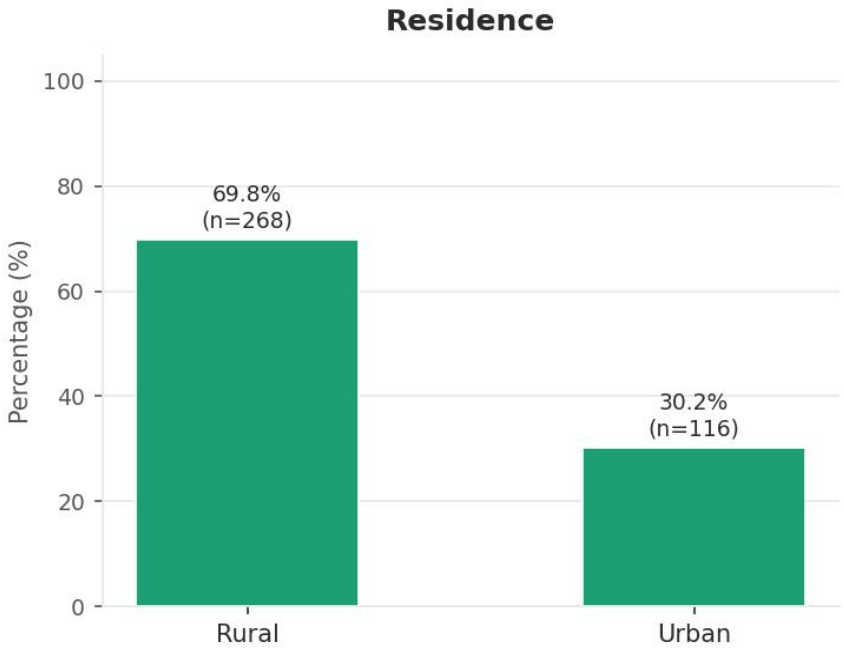

Figure 3.2 – Residence of patients (n=384)

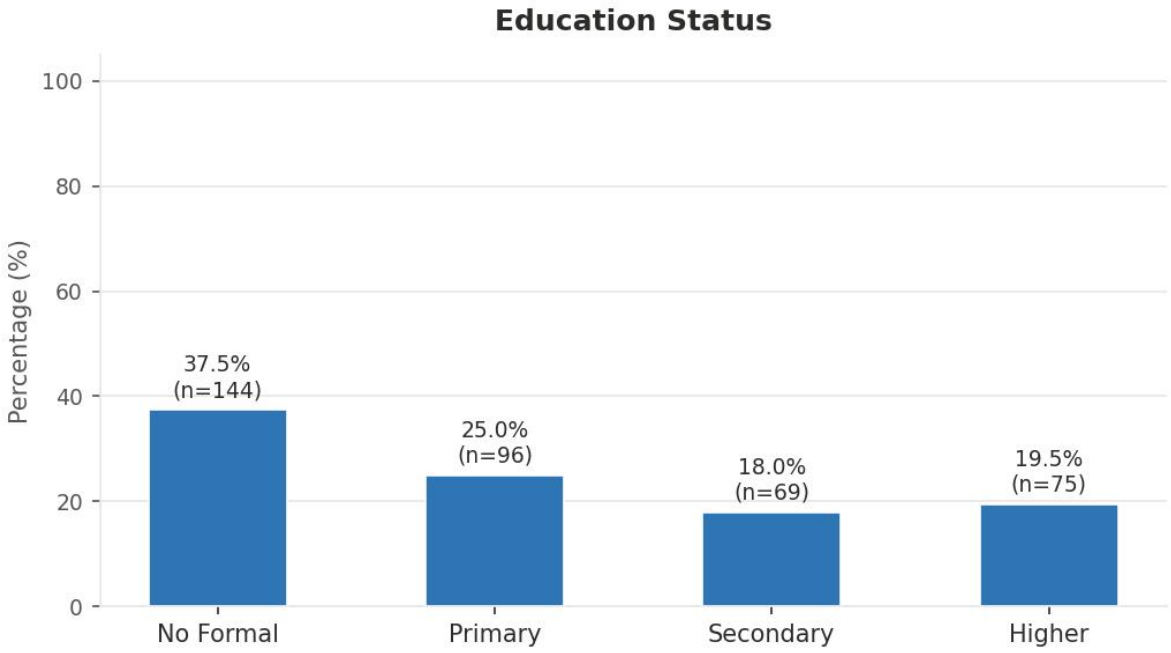

Figure 3.3 – Education status (n=384)

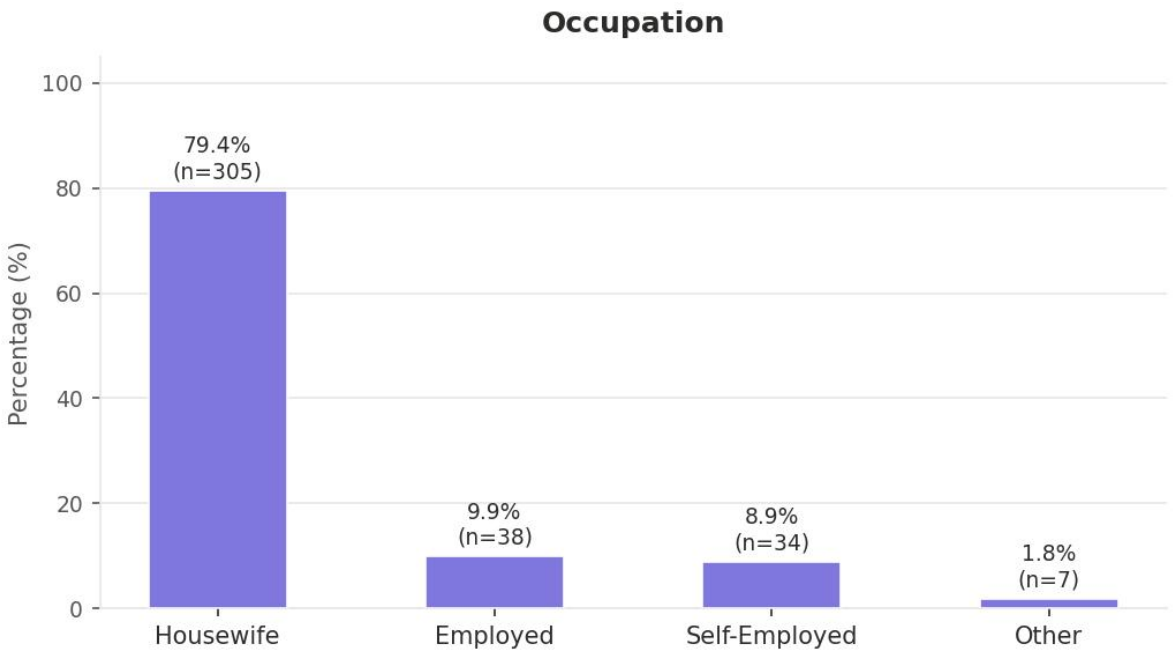

Figure 3.4 – Occupation (n=384)

3.2 Obstetric History

3.2.1 Gravidity (Number of Pregnancies)

The majority of patients (71.4%, n=274) had one to three prior pregnancies. A smaller proportion had four to six pregnancies (25.8%, n=99), while those with seven or more were rare (2.8%, n=11).

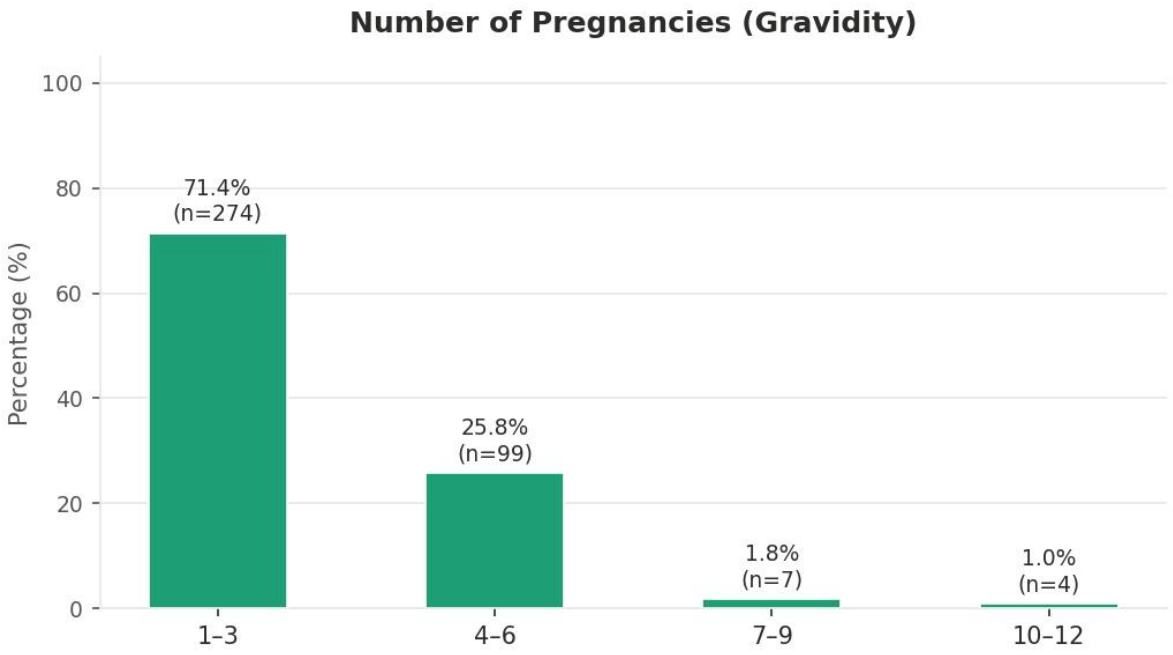

Figure 3.5 – Number of pregnancies (gravidity) (n=384)

3.2.2 Gestational Age (in Weeks)

The vast majority (94.5%, n=363) presented at 1–9 weeks of gestation. Only 1.8% (n=7) were in the 10–19 week range, and 3.7% (n=14) in the 20–39 week range.

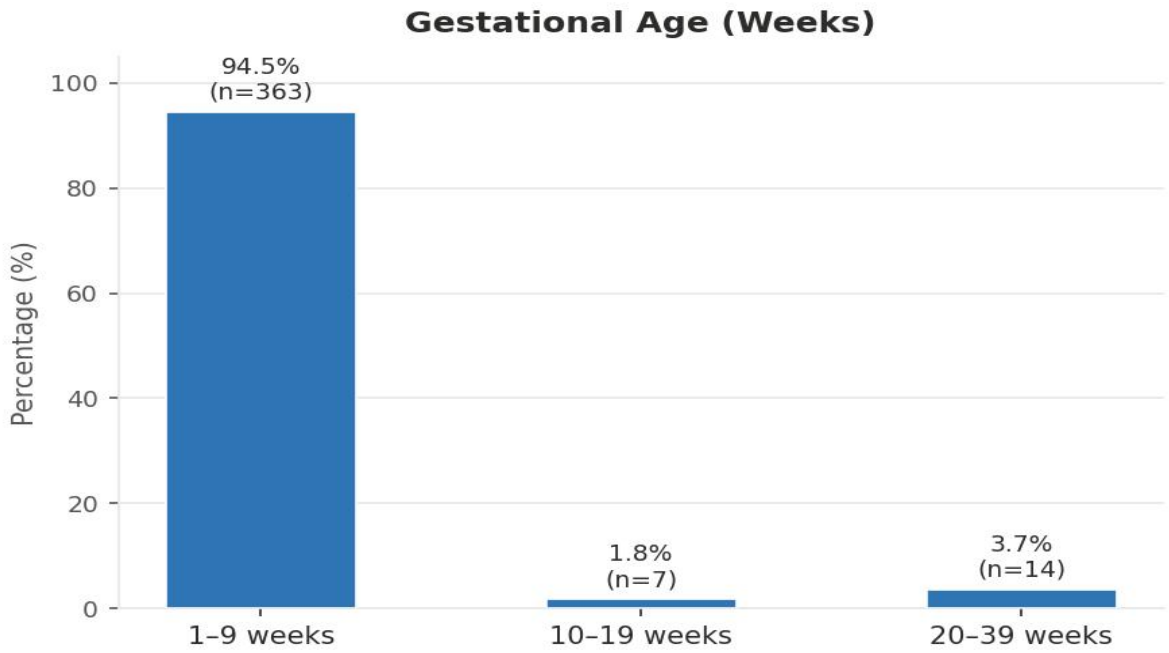

Figure 3.6 – Gestational age distribution (n=384)

3.2.3 Type of Pregnancy

Singleton pregnancies accounted for 82.3% (n=316) of the cohort, while 17.7% (n=68) were multiple pregnancies.

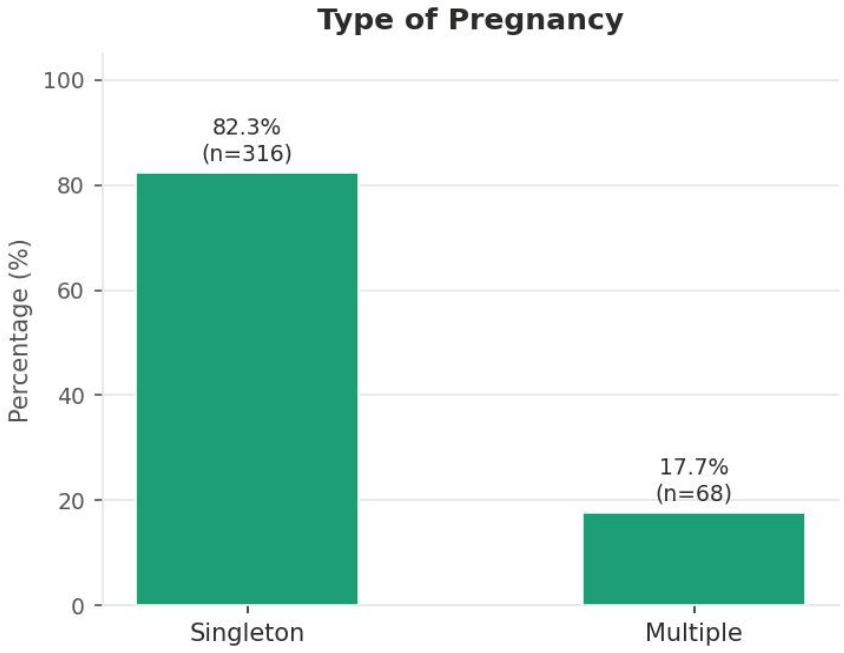

Figure 3.7 – Type of pregnancy (n=384)

3.2.4 History of PIH in Previous Pregnancies

A history of PIH was present in 62.5% (n=240) of participants. The remaining 37.5% (n=144) had no such history.

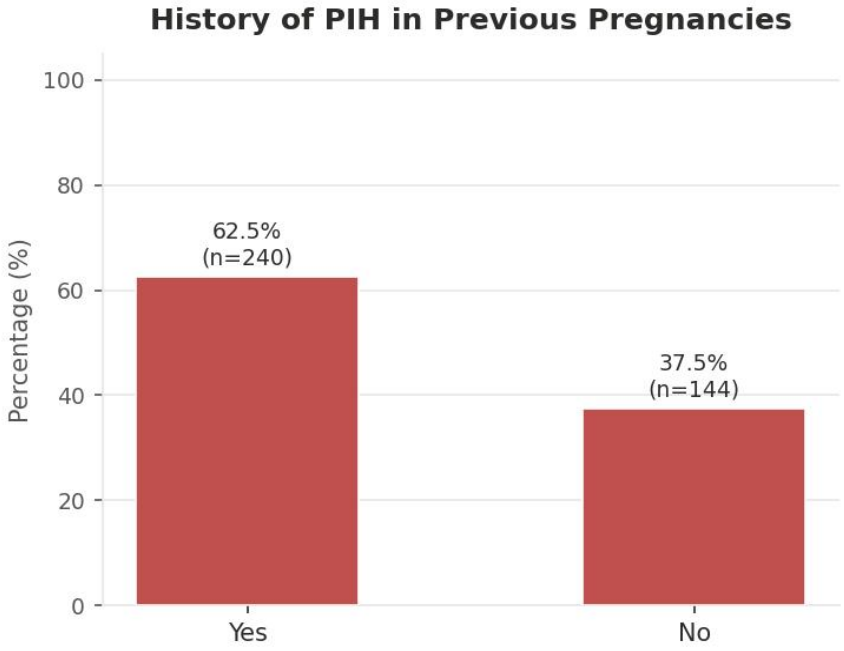

Figure 3.8 – History of PIH in previous pregnancies (n=384)

3.2.5 Regular Antenatal Checkup

Of the 384 respondents, 74.2% (n=285) attended regular antenatal checkups, while 25.8% (n=99) did not.

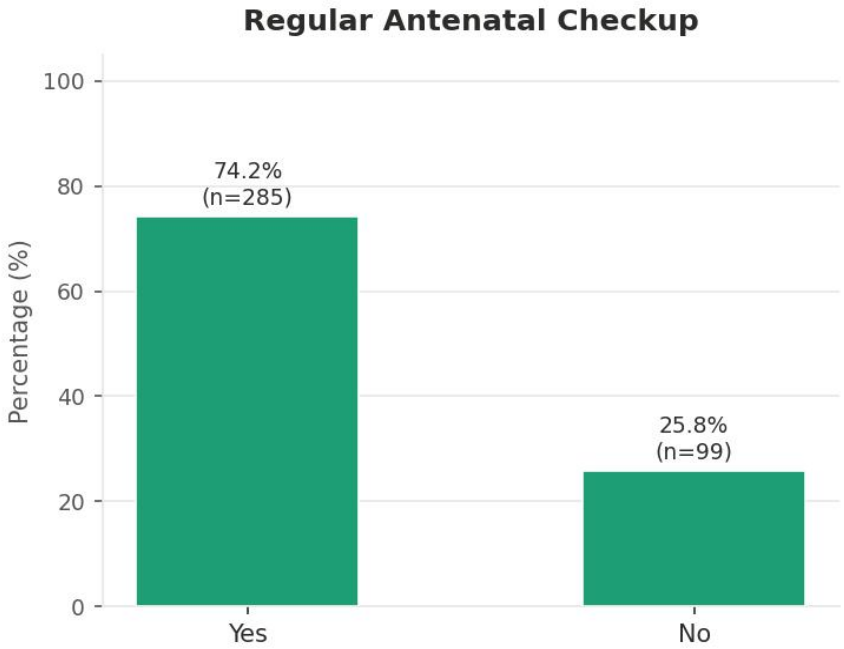

Figure 3.9 – Regular antenatal checkup attendance (n=384)

3.3 Medical Risk Factors

3.3.1 History of Chronic Hypertension

Of 384 participants, 61.7% (n=237) reported a history of chronic hypertension, while 38.3% (n=147) did not.

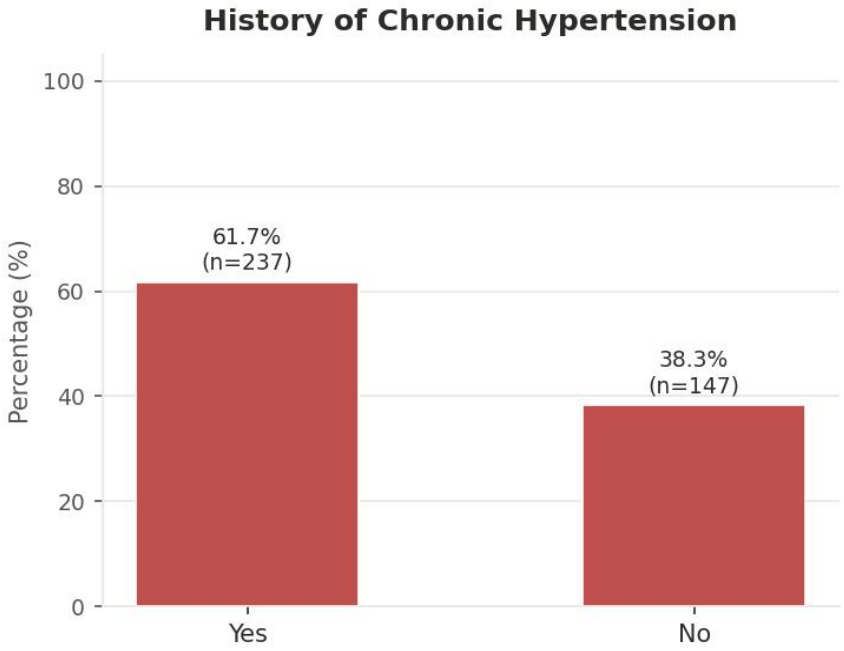

Figure 3.10 – History of chronic hypertension (n=384)

3.3.2 Family History of Hypertension

A positive family history of hypertension was present in 73.2% (n=281) of respondents. Only 26.8% (n=103) reported no such family history.

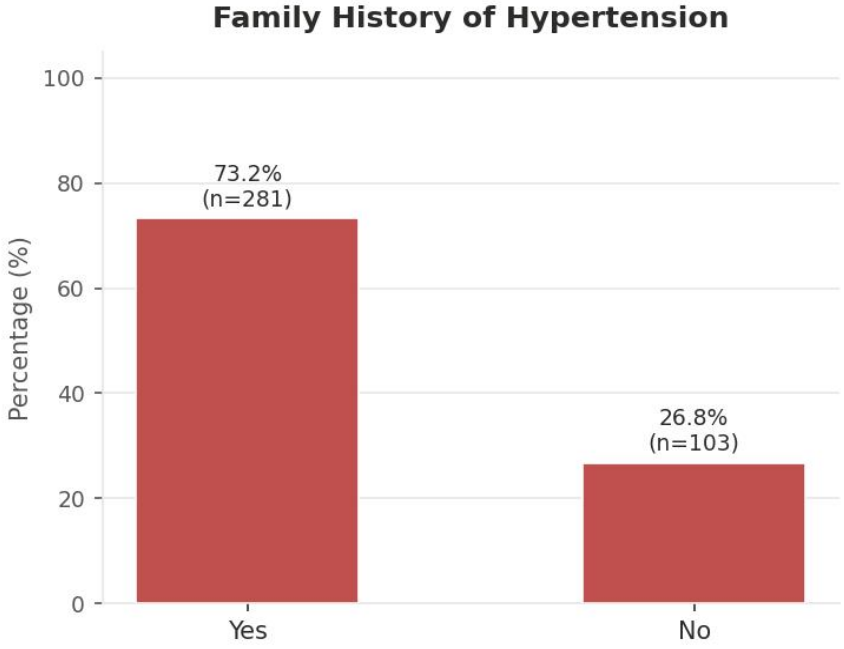

Figure 3.11 – Family history of hypertension (n=384)

3.3.3 History of Diabetes Mellitus

Diabetes mellitus was reported by 41.1% (n=158) of participants. The majority (58.9%, n=226) had no prior diagnosis.

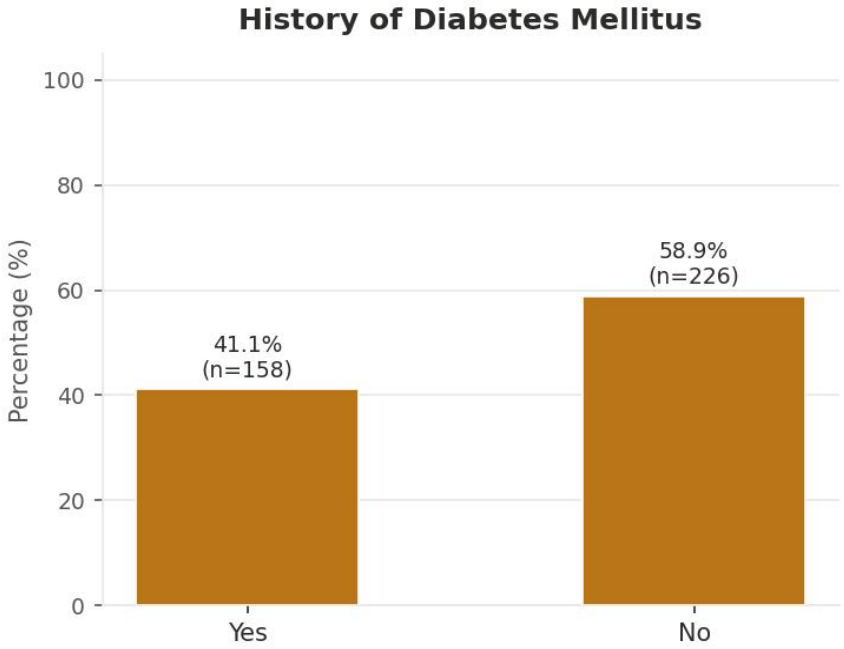

Figure 3.12 – History of diabetes mellitus (n=384)

3.3.4 Thyroid Disorder

Thyroid disorders were reported in 27.6% (n=106) of participants. The remaining 72.4% (n=278) had no history of thyroid disease.

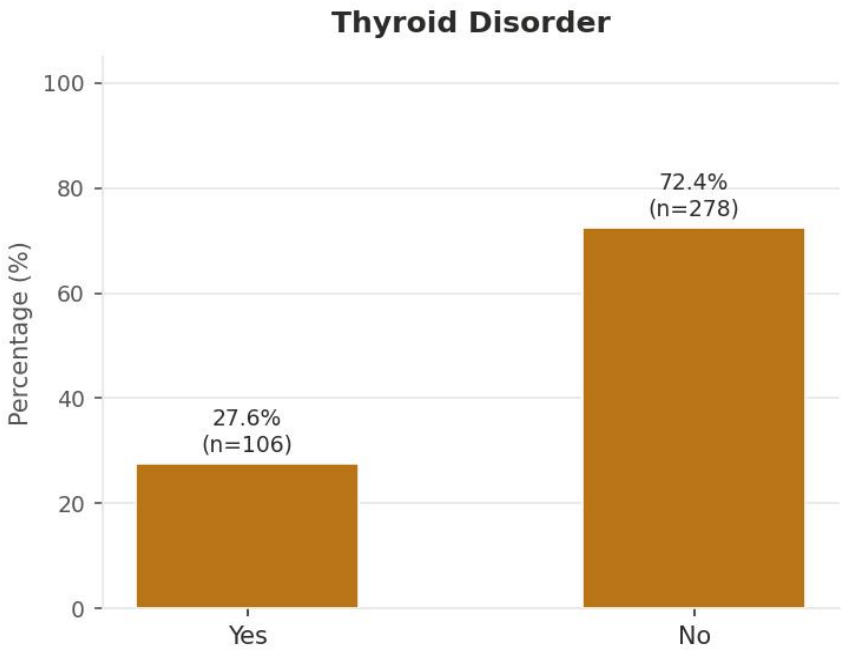

Figure 3.13 – Thyroid disorder (n=384)

3.3.5 Kidney Disease

A history of kidney disease was present in 26.8% (n=103) of participants. The majority (73.2%, n=281) reported no renal illness. Kidney disease approached borderline significance in confirmatory analysis (p=0.052).

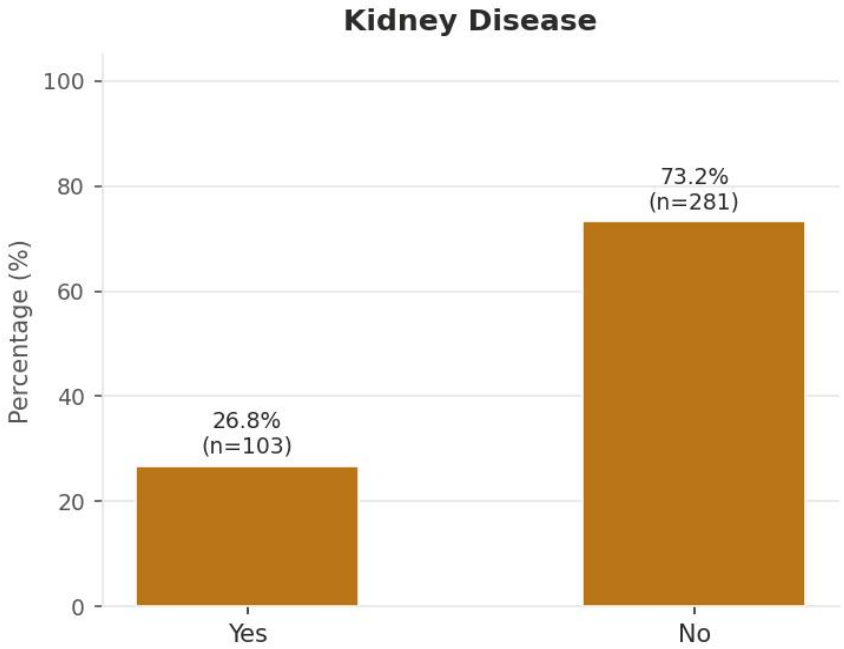

Figure 3.14 – History of kidney disease (n=384)

3.4 Lifestyle Factors

3.4.1 Physical Activity Level

Most participants reported moderate physical activity (63.3%, n=243). Low activity was reported by 24.2% (n=93), and high activity by 12.5% (n=48).

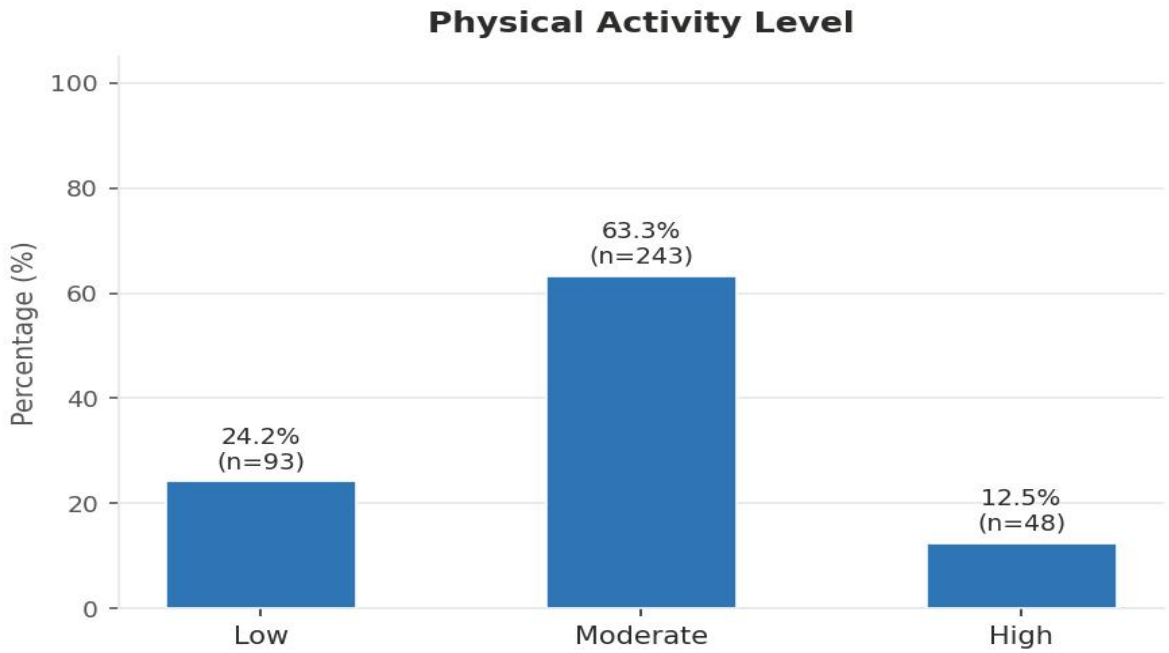

Figure 3.15 – Physical activity level (n=384)

3.4.2 Stress Level

Stress levels were evenly split between moderate (37.5%, n=144) and high (37.5%, n=144), with 25.0% (n=96) reporting low stress.

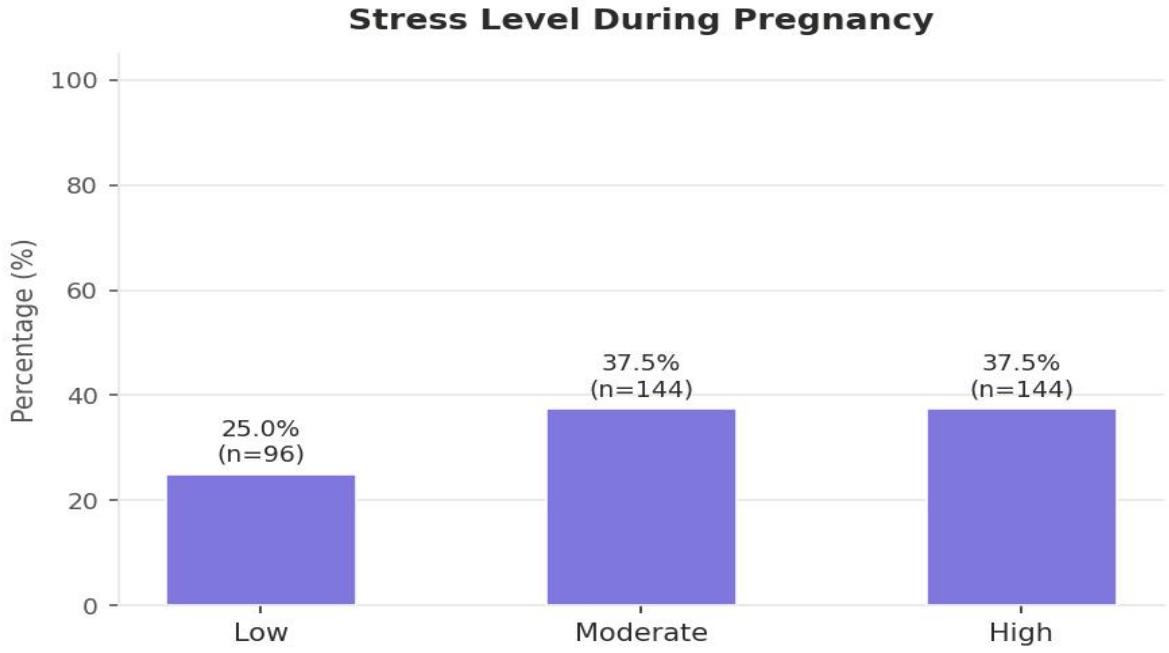

Figure 3.16 – Stress level during pregnancy (n=384)

3.5 Confirmatory Analysis

Chi-square analysis was performed across 13 demographic, obstetric, medical, and lifestyle variables. Family history of hypertension was the sole statistically significant predictor of PIH ($p = 0.036$), meeting all chi-square assumptions (0% cells with expected count < 5). All other valid variables failed to reach significance at $p < 0.05$. Kidney disease, obstetric history, and diabetes mellitus could not be conclusively evaluated due to test matrix violations.

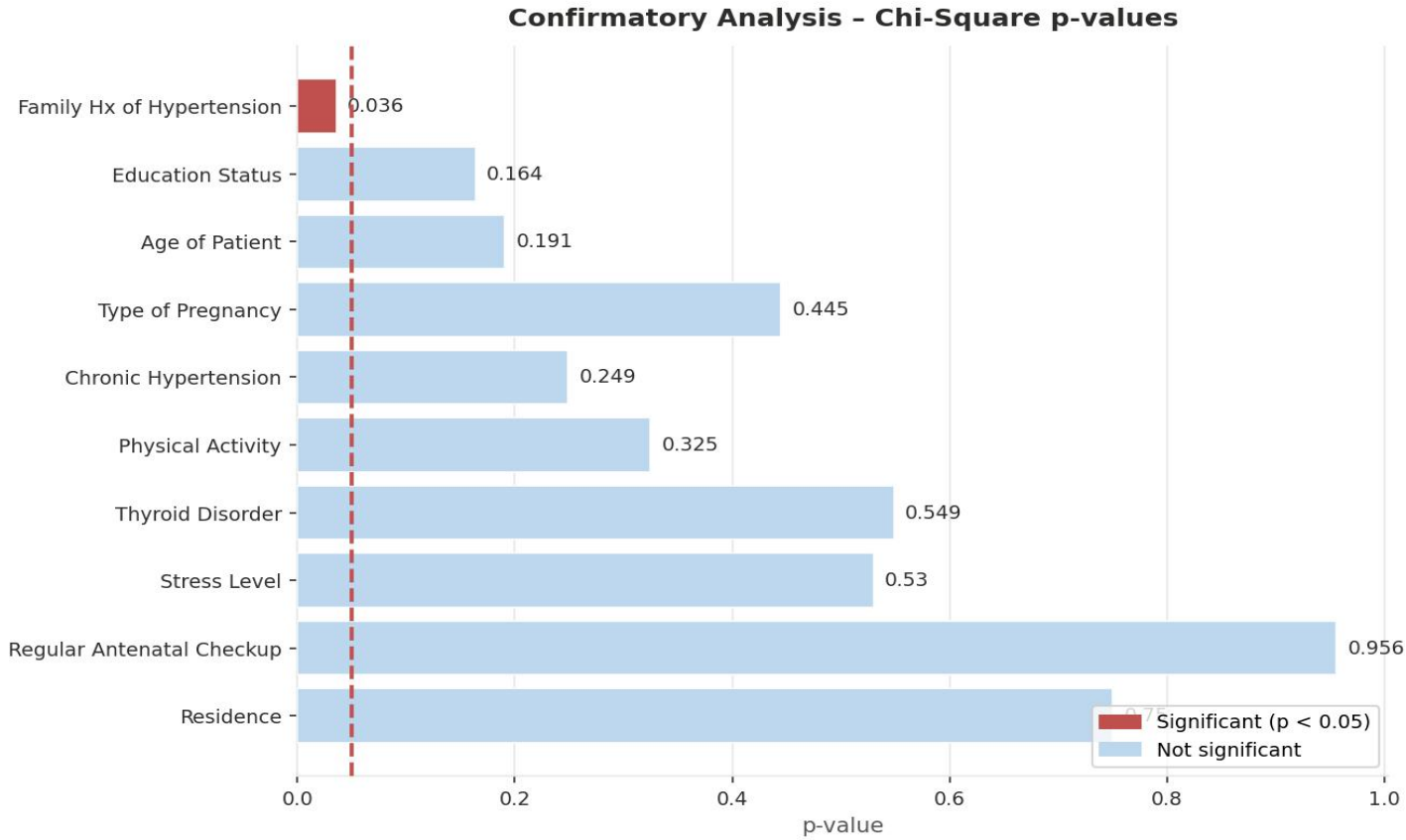

Figure 3.17 – Chi-square p-values for all predictor variables (n=384). Red = significant (p<0.05); dashed line = p=0.05 threshold.

Discussion

Pregnancy-induced hypertension (PIH) remains a major contributor to maternal and fetal morbidity worldwide. The present study assessed the frequency and associated risk factors of PIH among pregnant women attending a tertiary care hospital in Pakistan. The

findings demonstrated that family history of hypertension was the only statistically significant predictor of PIH, while other demographic, obstetric, medical, and lifestyle variables did not show significant associations.

The majority of participants were aged 26–35 years, which represents the most active reproductive age group. Although advanced maternal age has been identified as an important risk factor for PIH in previous studies, the present study did not find a statistically significant association between maternal age and PIH. Similar findings have been reported by Owiredu et al. and Longo-Mbenza et al., who observed that maternal age alone may not independently predict hypertensive disorders during pregnancy when other risk factors are considered.

Most participants belonged to rural areas and had relatively low educational attainment. While lower educational status has been linked to reduced health awareness and delayed healthcare utilization, no significant relationship was observed between education level and PIH in this study. This finding suggests that factors other than education may play a more prominent role in the development of hypertensive disorders during pregnancy in the local population.

Regarding obstetric characteristics, the majority of women had one to three previous pregnancies and singleton gestations. Neither gravidity nor type of pregnancy showed a significant association with PIH. Previous studies have reported conflicting results regarding parity and multiple pregnancies, with some investigations identifying increased risks among multiparous women and twin pregnancies. The differences may be attributed to variations in study design, sample characteristics, and population demographics.

A notable finding of this study was the significant association between family history of hypertension and PIH. Women with a positive family history were more likely to develop hypertensive disorders during pregnancy compared with those without such a history. This finding is consistent with studies conducted in Ghana, Ethiopia, and Bangladesh, which identified genetic predisposition and familial cardiovascular risk as important contributors to the development of PIH. Family history may reflect shared genetic, environmental, and lifestyle factors that increase susceptibility to hypertensive disorders during pregnancy.

Although a considerable proportion of participants reported chronic hypertension, diabetes mellitus, thyroid disorders, and kidney disease, these factors did not demonstrate statistically significant associations with PIH in the current analysis. Previous literature has frequently identified these conditions as important risk factors. The lack of significance in the present study may be explained by sample characteristics, limited statistical power for subgroup analyses, or the presence of confounding variables that were not controlled for in the analysis.

Lifestyle factors, including physical activity and perceived stress levels, were also not significantly associated with PIH. While some studies have suggested that physical inactivity and psychosocial stress may contribute to elevated blood pressure during pregnancy, the evidence remains inconsistent. Further longitudinal studies are required to clarify the influence of these factors on PIH development.

The present study has several limitations. The cross-sectional design limits the ability to establish causal relationships. The use of convenience sampling may reduce the generalizability of the findings. In addition, some variables could not be adequately assessed due to small subgroup frequencies and violations of statistical assumptions. Despite these limitations, the study provides valuable local data regarding PIH and highlights the importance of family history of hypertension as a potential screening indicator.

Overall, the findings emphasize the need for careful antenatal assessment of women with a positive family history of hypertension. Early identification and close monitoring of high-risk pregnancies may facilitate timely intervention and contribute to improved maternal and fetal outcomes.

CONCLUSION

In this sample, diabetes mellitus, lower education and higher parity were significant risk factors for PIH. These findings are clinically actionable: screening diabetic women, targeting low-education groups with enhanced antenatal education, and closely monitoring and multiparous women may reduce PIH morbidity. Non-significant findings for chronic hypertension and kidney disease should be re-examined in larger, prospective studies with multivariate adjustment.

Authors' Contribution

Inam Ullah: Conceived and designed the study, developed the research methodology, supervised the overall research process, contributed to data analysis and interpretation, drafted the initial manuscript, and critically revised it for important intellectual content. Coordinated between all co-authors and finalized the manuscript for submission.

Sohail Ahmad Khan: Contributed to literature review, assisted in questionnaire development, and participated in data interpretation.

Muhammad Abrar: Assisted in study design, contributed to statistical analysis, and reviewed the manuscript for accuracy.

Mujeeb Ullah: Contributed to data compilation, assisted in results interpretation, and reviewed the manuscript critically.

Manawar Khan: Assisted in literature search, contributed to discussion write-up, and helped in manuscript formatting.

Abdullah Khan: Assisted in data entry and helped in patient record verification.

Dil Noor: Played a key role in data collection from the study participants, assisted in administering questionnaires and recording clinical parameters of pregnant women, ensured data accuracy during collection, and contributed to compiling the collected data for analysis.

Wajid Ali Shah: Corresponding author; contributed to study conception, manuscript writing, referencing, formatting, and final review and approval of the manuscript for submission.

All authors read and approved the final manuscript.

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