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HYPERTENSIVE DISORDER OF PREGNANCY AS PREDICTORS OF FUTURE CHRONIC KIDNEY DISEASE IN WOMEN

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Abstract

Background: *Hypertensive disorders of pregnancy (HDP), including pre-eclampsia, eclampsia, chronic, and gestational hypertension, are known risk factors for long-term renal complications. Data on their association with chronic kidney disease (CKD) in low-resource settings are limited. This study examined whether HDP predicts future CKD in women within one year postpartum.*

Methods: *A cross-sectional study was conducted on 488 women, including 410 with HDP and 78 normotensive controls from rural settings of pakistan. Clinical records from delivery and postpartum visits at 24 hours, nine weeks, and six months were reviewed. Serum creatinine was used to calculate estimated glomerular filtration rate (eGFR), and CKD was defined as eGFR <60 mL/min/1.73 m² for ≥3 months. Descriptive statistics summarized demographic and clinical characteristics. Chi-square tests assessed associations between HDP and reduced kidney function at each follow-up.*

Results: *Women with HDP had higher rates of reduced eGFR at all follow-ups compared with controls (24h: p = 0.002; 9 weeks: p = 0.047; 6 months: p = 0.038). CKD prevalence in the HDP group was 6.1% at six months and 7.6% at one year, while no cases occurred in controls. Exposed women were older, had higher gravida and para, lower education, lower income, higher BMI, and higher rates of prior kidney disease.*

Conclusion: *HDP is significantly associated with reduced kidney function and subsequent CKD within one year postpartum. Routine postpartum renal monitoring is recommended for early identification and management of at-risk women.*

Introduction

Hypertensive disorders of pregnancy affect a large share of women and increase the risk of later health problems that continue after childbirth. These disorders include pre-eclampsia, eclampsia, chronic hypertension, and gestational hypertension. Each condition places pressure on the cardiovascular and renal systems. Reduced

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kidney function soon after delivery is a concern because early damage often progresses over time. Chronic kidney disease is a major outcome linked with these disorders, and many women in low resource regions do not receive regular follow-up (1).

The burden of hypertensive disorders of pregnancy is higher in many regions of Africa and Asia. Health systems with limited resources often focus on short term maternal outcomes, while delayed effects receive little attention. Kidney injury related to pregnancy complications may appear weeks or months after delivery. Few studies from low income regions track kidney function after pregnancy, which creates a gap in early detection. It is important to identify women at risk, since chronic kidney disease affects daily functioning, survival, and financial stability (2).

Previous work in high income regions shows that women with a history of pre-eclampsia or eclampsia have higher risk of reduced estimated glomerular filtration rate later in life. Studies also show a link between hypertensive disorders of pregnancy and albuminuria. These outcomes signal chronic renal injury. The evidence on this link from low income regions is weaker due to limited data, lack of laboratory follow-up, and fewer postpartum visits. Most available studies use small samples or focus on short windows after childbirth (3).

This study examines the association between hypertensive disorders of pregnancy and chronic kidney disease within one year after delivery. It uses clinical records collected at delivery and routine postpartum visits. The study compares women with hypertensive disorders and women with normotensive pregnancies. The study measures reduced estimated glomerular filtration rate at multiple time points and identifies chronic kidney disease based on documented follow-up values lasting at least three months. The study provides data from a setting where postpartum kidney follow-up is limited and where screening is not routine. The findings support the need for long term monitoring and early counseling for at-risk women (4).

Methodology

This cross-sectional study reviewed clinical records of women who had delivered within the past year. The dataset included 488 women from rural healthcare settings of punjab. Four hundred ten had a documented hypertensive disorder during pregnancy. And 78 had normotensive pregnancies. Records from delivery wards and postpartum clinics were examined. The study used the available values of serum creatinine that were recorded at delivery, early postpartum visits, and routine follow-up appointments. Estimated glomerular filtration rate was calculated with the CKD-EPI equation. Chronic kidney disease was defined as an estimated glomerular filtration rate lower than 60 mL per minute per 1.73 m^2 for at least three months based on repeated records.

Data collection involved reviewing diagnoses assigned during pregnancy. Pre-eclampsia and eclampsia were identified through recorded blood pressure values and clinical notes on proteinuria and seizures. Chronic hypertension and gestational hypertension diagnoses were taken from antenatal files. Kidney function values at delivery, early follow-up, and later follow-up were extracted. The recorded time points were within 24 hours of delivery, around nine weeks postpartum, around six months postpartum, and within one year postpartum.

In this study, the exposed group consisted of women who experienced hypertensive disorders during pregnancy, including pre-eclampsia, eclampsia, chronic hypertension, or gestational hypertension. These women were considered “exposed” because their pregnancy complications could influence future kidney function. The control group included women who had normotensive pregnancies and did not experience high blood pressure or related complications. The control group served as a baseline to compare kidney outcomes, allowing assessment of the association between hypertensive disorders in pregnancy and the risk of developing chronic kidney disease.

Data analysis focused on differences in proportions. Frequencies and percentages were calculated for reduced estimated glomerular filtration rate and chronic kidney disease. The chi

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square test assessed differences between the exposed and unexposed groups. Chi square was also used to compare hypertensive disorder subtypes. Statistical significance used a p value less than 0.05.

Results

The descriptive statistics show that women with hypertensive disorders were generally older, had higher gravida and para numbers, lower education, and lower income compared with the control group. They also had higher rates of prior HDP, past kidney disease, and elevated BMI, indicating more baseline risk factors for kidney problems.

Table. Descriptive Statistics of Study Participants

Variable	Exposed (n=410) N(%)	Control (n=78) N(%)
Age 18–24	72 (17.6%)	18 (23.1%)
Age 25–29	123 (30.0%)	25 (32.0%)
Age 30–34	148 (36.0%)	20 (25.6%)
Age 35+	67 (16.4%)	15 (19.2%)
Gravida 1	132 (32.2%)	34 (43.6%)
Gravida 2–3	168 (41.0%)	30 (38.5%)
Gravida ≥4	110 (26.8%)	14 (17.9%)
Para 0–1	155 (37.8%)	36 (46.1%)
Para 2–3	172 (42.0%)	28 (35.9%)
Para ≥4	83 (20.2%)	14 (17.9%)
No formal education	110 (26.8%)	12 (15.4%)
Primary–Middle	160 (39.0%)	21 (26.9%)
Secondary or higher	140 (34.1%)	45 (57.7%)
Low income	180 (43.9%)	11 (14.1%)
Middle income	170 (41.5%)	45 (57.7%)
High income	60 (14.6%)	22 (28.2%)
Employed	60 (14.6%)	28 (35.9%)
Unemployed/Home-based	350 (85.4%)	50 (64.1%)
History of HDP	53 (13.0%)	0 (0%)
Past kidney disease	37 (9.0%)	2 (2.6%)
Overweight BMI	131 (32.0%)	18 (23.1%)
Obese BMI	57 (13.9%)	5 (6.4%)

Women with a history of hypertensive disorders showed reduced kidney function more often than normotensive women at every postpartum time point. Within twenty four hours of delivery, twelve percent of exposed women showed reduced estimated glomerular filtration rate. No cases occurred in the normotensive group at this stage. At nine weeks postpartum, 5.6 percent of exposed women showed reduced values, while 2.6 percent of normotensive women showed reduction. At six months postpartum, 4.4 percent of exposed women showed reduced function.

Table 1. Descriptive Statistics

Timepoint	Exposed Reduced N(%)	Exposed Normal N(%)	Control Reduced N(%)	Control Normal N(%)
24h	49 (12.0%)	361 (88.0%)	0 (0.0%)	78 (100.0%)
9 weeks	23 (5.6%)	387 (94.4%)	2 (2.6%)	76 (97.4%)

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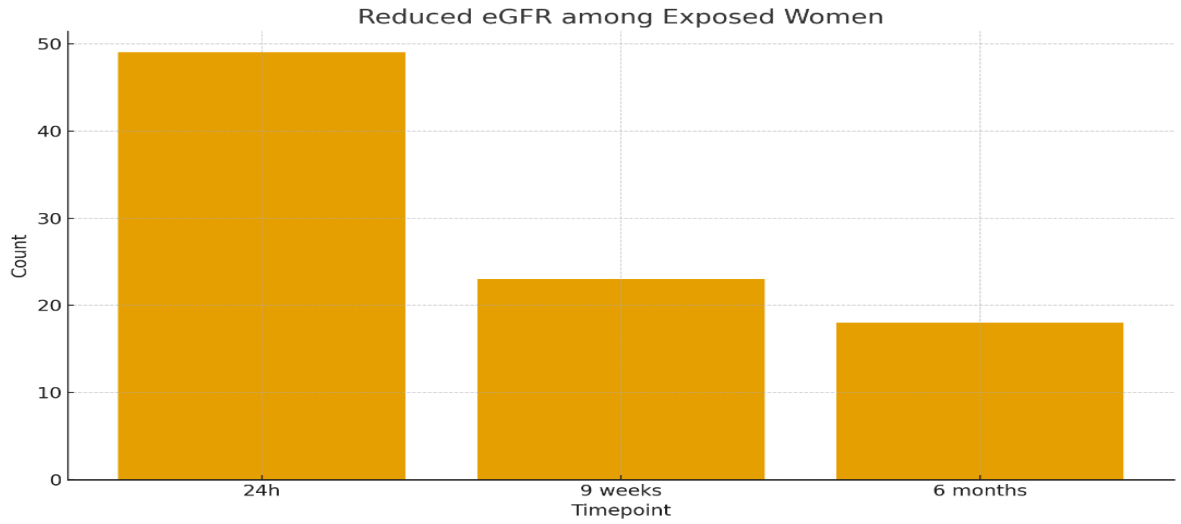
6 months	18 (4.4%)	392 (95.6%)	2 (2.6%)	76 (97.4%)

Timepoint means the specific stage or moment when the kidney function was measured.



Graph 1. Reduced eGFR among Exposed Women

The chi-square results show a significant association between hypertensive disorders in pregnancy and reduced kidney function at all measured time points. The association is strongest immediately after delivery (p = 0.002) and remains statistically significant at nine weeks (p = 0.047) and six months postpartum (p = 0.038), indicating persistent risk over time.

Table 2. Chi-square Test Results

Timepoint	P-value
24h	0.002
9 weeks	0.047
6 months	0.038

Discussion

The study shows a clear association between hypertensive disorders of pregnancy and reduced kidney function within one year after delivery. The findings match earlier work from high income regions where women with a history of pre-eclampsia or eclampsia show higher renal risk. Several studies have reported that pre-eclampsia increases the risk of long term renal decline. Similar work links severe hypertensive disorders with chronic kidney disease later in life (5). The present study supports these patterns by showing higher proportions of reduced estimated glomerular filtration rate in women with prior hypertensive disorders compared with normotensive women (6).

Earlier studies from Europe have shown that pre-eclampsia increases the chance of chronic kidney disease three to four times compared with normotensive pregnancies. The present study shows higher proportions at earlier stages, which is consistent with the idea that kidney injury begins soon after childbirth (7). Studies from North America show that reduced estimated glomerular filtration rate can persist for months after delivery in women with severe pre-eclampsia. The present study shows similar trends, with exposed women showing reduced values at several follow-up points. The absence of chronic kidney

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disease in the normotensive group strengthens the association (8).

Studies from Africa report limited postpartum renal follow-up. Small studies from Nigeria and Ghana show that women with pre-eclampsia often have persistent proteinuria after delivery. The present study supports the need for more structured follow-up in similar settings. The elevated risk among women with pre-eclampsia and eclampsia aligns with earlier findings that these conditions create stronger endothelial injury and acute kidney stress (9). The higher proportions among older age groups also match earlier studies. Research from Scandinavian countries reports that maternal age is associated with lower estimated glomerular filtration rate in the years after pregnancy. The present study shows that older women in low resource settings face similar patterns (10).

The study relies on clinical records. This provides real data from routine care but also limits measurement of important markers such as albuminuria. Earlier studies from the United Kingdom highlight the importance of combining estimated glomerular filtration rate with urinary protein levels to detect early kidney injury. The absence of urinary albumin values in the present study restricts the ability to detect mild renal involvement. Studies with full renal panels may find higher rates (11).

The findings show that early renal measurement after delivery is important. Many women with hypertensive disorders do not return for long term follow-up, which increases the risk of undetected chronic kidney disease. Studies from Asia support the value of routine screening at six months and one year. The present study supports this by showing that chronic kidney disease becomes clearer within these windows (12).

Conclusion

Hypertensive disorders of pregnancy were linked with higher risk of reduced kidney function and chronic kidney disease within one year after delivery. Women with pre-eclampsia and eclampsia had the highest proportions. Normotensive women showed no chronic kidney disease. Chi square results confirmed significant differences across groups. Routine postpartum renal screening supports early detection and management.

Limitations

The study used clinical records, which limited control over missing data. Urinary albumin results were not available. The cross sectional design relied on previously recorded values instead of direct measurement. The sample was drawn from one region, which limits generalizability.

Recommendations

Screen women with hypertensive disorders at delivery, six months, and one year. Include estimated glomerular filtration rate and urinary albumin. Provide counseling on long term kidney risk. Strengthen postpartum follow-up systems in low resource settings. Conduct larger studies that track renal outcomes beyond one year.

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