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A Systematic Review Connecting Pregnancy-Induced Hypertension to Neonatal Outcomes

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Abstract

Using data from 20 studies published between 2000–2025, this systematic review examines the relationship between pregnancy-induced hypertension (PIH) and neonatal outcomes. 5–10% of pregnancies are affected by PIH, which is defined by elevated blood pressure after 20 weeks of gestation and is associated with a range of newborn outcomes. Although some research indicates that preterm newborns with PIH have lower mortality and fewer morbidities, severe PIH and preeclampsia are linked to higher chances of stillbirth, low birth weight, necrotizing enterocolitis, and bronchopulmonary dysplasia. The review emphasizes how crucial it is to differentiate between gestational age and the severity of PIH when evaluating newborn hazards. Mitigating negative consequences requires effective management, which includes hypertension medication and preventative measures like low-dose aspirin. Furthermore, unequal prenatal care is necessary since healthcare inequities have a substantial impact on newborn health. To further understand and address the impact of PIH, future research should concentrate on standardized assessments and long-term neonatal outcomes.

Keywords: Pregnancy-Induced Hypertension, Neonatal Outcomes, Preeclampsia, Low Birth Weight, Preterm Birth, Neonatal Mortality

Introduction

After 20 weeks of pregnancy, women who were previously normotensive may develop pregnancy-induced hypertension (PIH), also known as gestational hypertension, a serious medical disorder marked by high blood pressure (≥140/90 mmHg) [1]. About 5–10% of pregnancies worldwide are affected by PIH, which is a subset of the larger spectrum of hypertensive diseases of pregnancy (HDP), which also includes preeclampsia, eclampsia, and chronic hypertension [2,3]. These conditions

contribute to difficulties such preterm delivery, low birth weight, and long-term health problems for both mother and child, making them one of the main causes of maternal and neonatal morbidity and death [4,5].

PIH has a complex and poorly understood effect on newborn outcomes. According to some research, PIH may be linked to lower neonatal mortality and specific morbidities in preterm infants, possibly as a result of increased medical monitoring [6]. On the other hand, there are negative consequences associated with severe PIH and associated disorders such as preeclampsia, such as elevated risks of fetal growth limitation, necrotizing enterocolitis (NEC), and bronchopulmonary dysplasia (BPD) [7, 8]. Understanding the connection between PIH and newborn outcomes is essential for improving clinical management and guiding preventive measures, given the substantial consequences for neonatal health.

The goal of this systematic review is to compile the available data about the relationship between PIH and newborn outcomes, with an emphasis on mortality, morbidity, and long-term health effects. This review aims to shed light on the intricate relationship between PIH and newborn health by looking at a variety of studies and identifying areas that require further investigation and advancements in clinical practice.

Materials & Methods

Studies examining the connection between PIH and newborn outcomes were found through a thorough literature search. In order to find publications published between January 2000 and April 2025, electronic databases such as PubMed, Embase, and the Cochrane Library were searched.

Keywords included “pregnancy-induced hypertension,” “gestational hypertension,” 7 “neonatal outcomes,” “preterm birth,” “low birth weight,” along with “neonatal mortality.” Terms were combined and the search was narrowed down using boolean operators (AND, OR).

Criteria for Inclusion : 1. cited gestational hypertension or PIH as the main exposure factor. 2. Presented information on at least one newborn outcome, such as Apgar scores, BPD, NEC, low birth weight, preterm birth, or mortality. 3. Had English-language publications. incorporated a comparator or control group (e.g., normotensive pregnancies).

The following were the exclusion criteria: 1. Case series or reports. 2. Research with no precise definition of PIH. 3. Research that fails to disclose neonatal results. 4. Publications not in English.

Extracting Data and Evaluating Quality

Using a standardized form, two reviewers independently retrieved data that included study design, population characteristics, neonatal outcomes, PIH definition, and statistical metrics (such as odds ratios and confidence intervals). Discussions were used to settle disagreements. The Cochrane Risk of Bias tool for randomized controlled trials and the Newcastle-Ottawa Scale for observational studies were used to evaluate the quality of the included research. Priority for inclusion was given to studies with a low to moderate risk of bias.

Synthesis of Data A narrative synthesis

It was carried out because study designs and outcome measures varied widely. Quantitative information was retrieved and summarized whenever feasible, using metrics like odds ratios (OR) and confidence intervals (CI).

Results & Discussion

Study	Design	Population	Neonatal Outcome	Odds Ratio (95% CI)	Notes
Razak et al. (2018) [6]	Systematic Review and Meta-Analysis	Preterm infants (<37 weeks)	Lower mortality	aOR 0.65 (0.54-0.79)	Adjusted for confounders
Razak et al. (2018) [6]	Systematic Review and Meta-Analysis	Preterm infants (<37 weeks)	Lower severe retinopathy of prematurity (ROP)	aOR 0.83 (0.72-0.96)	Adjusted for confounders
Razak et al. (2018) [6]	Systematic Review and Meta-Analysis	Preterm infants (<37 weeks)	Lower severe brain injury	uOR 0.57 (0.49-0.66)	Unadjusted
Razak et al. (2018) [6]	Systematic Review and Meta-Analysis	Infants <29 weeks	Higher BPD	aOR 1.15 (1.06-1.26)	Adjusted for confounders
Razak et al. (2018) [6]	Systematic Review and Meta-Analysis	Severe PIH	Higher mortality	uOR 2.36 (1.07-5.22)	Unadjusted
Razak et al. (2018) [6]	Systematic Review and Meta-Analysis	Severe PIH	Higher invasive ventilation	uOR 3.26 (1.11-9.61)	Unadjusted
Muti et al. (2015) [9]	Cross-Sectional	Zimbabwe, 180 PIH cases	Low birth weight	OR 3.00 (p=0.0115)	Compared to normotensive controls
Muti et al. (2015) [9]	Cross-Sectional	Zimbabwe, 180 PIH cases	Stillbirth	OR 4.34 (p=0.0517)	Compared to normotensive controls
Muti et al. (2015) [9]	Cross-Sectional	Zimbabwe, 180 PIH cases	Low Apgar score at 5 min	OR 4.47 (p=0.0155)	Compared to normotensive controls
Gibson et al. (2016) [10]	Cohort	US, low-risk term pregnancies	Preterm birth	Not reported (significant association)	Increased maternal and neonatal morbidity

The main conclusions were arranged according to the severity of PIH and neonatal outcome. Findings After screening for titles, abstracts, and full texts, 20 of the 150 potentially pertinent papers found by the literature search satisfied the inclusion criteria. Twelve cohort studies, five case-control studies, two randomized controlled trials, and one systematic review with meta-analysis were among the included investigations. Numerous newborn outcomes were the subject of the investigations, which included populations from the US, Zimbabwe, and other countries.

Death and Morbidity

Razak et al. (2018) conducted a systematic analysis and discovered that in preterm newborns (less than 37 weeks gestation), PIH was linked to lower [13] neonatal death (adjusted odds ratio [aOR] 0.65, 95% CI 0.54-0.79) and severe retinopathy of prematurity (aOR 0.83, 95% CI 0.72-0.96) [6]. There was also evidence of less severe brain damage (unadjusted OR [uOR] 0.57, 95% CI 0.49-0.66) [6]. However, PIH was associated with increased odds of bronchopulmonary dysplasia in infants born before 29 weeks gestation (aOR 1.15, 95% CI 1.06-1.26) [6]. Severe PIH was linked to higher risks of invasive ventilation (uOR 3.26, 95% CI 1.11-9.61) and increased newborn death (uOR 2.36, 95% CI 1.07-40 5.22) [6]. Higher chances of BPD (uOR 1.21, 95% 30 CI 1.03-1.43) and NEC (uOR 2.79, 95% CI 1.57-4.96) were linked to preeclampsia, a related HDP [6].

Other Outcomes

- According to a study conducted in Zimbabwe by Muti et al. (2015), women with PIH had four times the risk of a stillbirth (OR 4.34, p=0.0517), three 26 2 times the risk of delivering a baby with a low birth weight (OR 3.00, p=0.0115), and four times the risk of having a baby with a low Apgar score at five minutes (OR 4.47, p=0.0155) in comparison to women with normotension [9]. In low-risk term pregnancies, Gibson et al. (2016) discovered that PIH was linked to a higher rate of preterm birth and 13 neonatal morbidity [10]. Additional research revealed links between PIH and small-for-gestational-age babies, 35 19 indicating placental hypoperfusion-induced fetal growth limitation [4,5].

The results of this comprehensive research demonstrate the intricate connection between PIH and ten neonatal outcomes. Although PIH is linked to lower mortality and several morbidities (such as severe ROP and brain damage) in preterm children, this could be due to the influence of higher medical surveillance in high-risk pregnancies or survival bias [6]. PIH is associated with increased risks of BPD in extremely preterm newborns (less than 29 weeks), indicating that gestational age is a crucial factor in determining outcomes [6]. Negative newborn outcomes, such as increased mortality, the requirement for invasive ventilation, BPD, and NEC, are frequently correlated with severe PIH and preeclampsia [6]. These results highlight how crucial it is to differentiate between mild and severe forms of HDP when evaluating the dangers to newborns. The global burden of PIH is further highlighted by the higher probabilities of low birth weight, stillbirth, and low Apgar scores that have been shown in regional studies, such as in Zimbabwe [9]. These outcomes are influenced by the pathophysiology of PIH. Fetal hypoxia and growth limitation are caused by placental hypoperfusion, which is brought on by incorrect spiral artery remodeling and raises the risk of low birth weight and preterm delivery [3]. Long-term effects of these difficulties may include increased risks of cardiovascular disease, insulin resistance, and neurodevelopmental problems in offspring of mothers with HDP [5]. Risk mitigation requires management techniques including low-dose aspirin for preeclampsia prevention and hypertension medication (e.g., labetalol, nifedipine) [11,12].

The CHAP 38 trial (2022) showed that without increasing small-for-gestational-age infants, treating moderate chronic hypertension to a blood pressure target of <140/90 mmHg decreased the risk of unfavorable outcomes, such as preterm delivery and neonatal 21 death [13]. These results provide credence to a more proactive strategy for treating moderate pregnancy hypertension. Disparities in healthcare are also important. Due to systemic variables like restricted access to prenatal care

and socioeconomic pressures, Black women and those from poorer socioeconomic origins have greater incidence of HDP and worse neonatal outcomes [14]. Improving results requires addressing these discrepancies via inclusive research, culturally competent treatment, and telemedicine [15].

Restrictions

There are various restrictions on this review. A meta-analysis was not possible due to the heterogeneity in study designs and outcome measures 9. Unadjusted odds ratios, which could introduce confounding, were used in certain research. Furthermore, regional variations in PIH management and healthcare availability may restrict how broadly the results may be applied. To evaluate long-term neonatal outcomes, future research should concentrate on longitudinal studies and standardized outcome measures.

Conclusion

Induced by pregnancy From decreased mortality and specific morbidities in preterm children to elevated risks of BPD, NEC, low birth weight, and stillbirth in severe cases, hypertension is linked to a variety of neonatal outcomes. Two important factors influencing newborn health are the degree of PIH and gestational age at birth (14). Risks can be reduced with effective care, which includes early identification, hypertension medication, and preventative measures such low-dose aspirin.To guarantee fair results, healthcare inequities must be addressed. To further understand the processes behind PIH's impacts on neonates and to create focused therapies, more study is required.

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