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[Intervention Review]

Planned early birth versus expectant management for hypertensive disorders from 34 weeks' gestation to term

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ABSTRACT

Rationale

Hypertensive disorders in pregnancy are significant contributors to maternal and perinatal morbidity and mortality. They include chronic hypertension, gestational hypertension and pre-eclampsia. Definitive management of these disorders is planned early birth. The alternative is expectant management with close monitoring, if severe complications are not present. There are benefits and risks associated with both policies, so it is important to establish the safest option.

Objectives

To assess the benefits and risks of planned early birth versus expectant management in pregnant women with hypertensive disorders, from 34 weeks' gestation onwards.

Search methods

An Information Specialist within the Cochrane Central Executive Team searched CENTRAL, MEDLINE, Embase, CINAHL, ClinicalTrials.gov and WHO ICTRP. The searches were run from 1 January 2016 to 16 January 2026 with no language restrictions. Reference lists of retrieved studies were also searched.

Eligibility criteria

We included randomised controlled trials comparing planned early birth (by induction of labour or by caesarean section) with expectant management for women with hypertensive disorders from 34 weeks' gestation. Cluster-randomised trials would have been eligible for inclusion in this review, but we found none.

Studies using a quasi-randomised design were not eligible for inclusion in this review. Studies using a cross-over design were not eligible for inclusion, because they are not a suitable study design for investigating hypertensive disorders in pregnancy.

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Outcomes

The prespecified critical outcomes (based upon a core outcome set agreed via Delphi consensus) were (1) a composite outcome of maternal mortality and morbidity; (2) a composite outcome of perinatal mortality and morbidity; (3) maternal death; (4) fetal death; (5) neonatal death.

The prespecified important maternal outcomes were: caesarean section, maternal admission to a high dependency unit, eclampsia, pulmonary oedema, severe renal impairment, and HELLP (haemolysis, elevated liver enzymes, low platelets) syndrome. The prespecified important perinatal outcome was neonatal unit admission. Additional maternal and perinatal outcomes were also analysed in accordance with the review protocol, including maternal quality of life measures and health resource use.

Risk of bias

Two review authors independently assessed risk of bias using the Cochrane Risk of Bias 2 (RoB 2) tool. The Cochrane trustworthiness screening tool was applied to all eligible studies at full-text review stage.

Synthesis methods

Two review authors independently assessed eligibility and risk of bias. Two review authors independently extracted data using a prespecified data extraction form. Data were checked for accuracy. Statistical analysis was carried out in RevMan using a random-effects meta-analysis. We assessed the certainty of evidence using GRADE.

Included studies

We included six studies involving 3491 women. All six studies were randomised controlled trials evaluating planned early birth compared to expectant management. Planned early birth was evaluated at between 34 and 37 weeks in four studies, between 36 and 38 weeks in one study and between 36 and 41 weeks in one study. One study took place in low- and middle-income countries, whilst five took place in high-income countries. Three studies included only women with pre-eclampsia, two studies included women with a mixture of hypertensive disorders in pregnancy and one study included only women with chronic hypertension.

Synthesis of results

Planned early birth reduces the risk of maternal mortality and morbidity compared to expectant management (RR 0.54, 95% CI 0.37 to 0.77; I^2 = 0%; 6 studies, 3491 participants; high-certainty evidence). There was no increased risk of caesarean section associated with planned early birth (RR 0.94, 95% CI 0.83 to 1.06; I^2 = 25%; 6 studies, 3539 participants; high-certainty evidence).

Planned early birth likely results in a large reduction in the risk of stillbirth (fetal death) (RR 0.25, 95% CI 0.07 to 0.87; I^2 not applicable; 5 studies, 3407 participants; moderate-certainty evidence), but probably results in little to no difference in rates of neonatal unit admission (RR 1.11, 95% CI 0.90 to 1.37; I^2 = 41%; 6 studies, 3560 participants; moderate-certainty evidence).

Planned early birth may result in little to no difference in maternal death (RR 0.33, 95% CI 0.05 to 2.10; I^2 = 0%; 6 studies, 3491 participants; low-certainty evidence) or neonatal death (RR 1.40, 95% CI 0.45 to 4.35; I^2 not applicable; 5 studies, 3407 participants; low-certainty evidence).

The evidence is very uncertain about the effect of planned early birth on composite perinatal mortality and morbidity due to high variation between the trials (RR 1.06, 95% CI 0.75 to 1.51; I^2 = 83%; 6 studies, 3576 participants; very low-certainty evidence).

Five of the six trials included in this analysis were at low risk of bias. We graded the evidence as high, moderate, low, or very low certainty based upon GRADE criteria. Where we downgraded the evidence, it was typically due to higher levels of heterogeneity or due to imprecision, whereby the confidence interval crossed the line of both appreciable benefit and harm or the number of events was low.

Authors' conclusions

For women with hypertensive disorders of pregnancy beyond 34 weeks' gestation, planned early birth is associated with a lower risk of maternal complications, and probably a reduced risk of fetal death (stillbirth), with no increased risk of caesarean section and probably no clear differences in the rate of neonatal unit admission or short-term neonatal morbidity.

It is important that the timing of delivery takes into account the woman's preferences, the type of hypertensive disorder and the presence or absence of severe features.

Further information is needed to establish the longer-term infant outcomes associated with late preterm birth and longer-term maternal cardiovascular health.

Funding

This Cochrane review had no dedicated funding.

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Registration

The original review and review protocol can be accessed via the following links.

Protocol (2011): DOI: 10.1002/14651858.CD009273

Original review (2017): DOI: 10.1002/14651858.CD009273.pub2

PLAIN LANGUAGE SUMMARY

What are the benefits and risks of planned early birth for women who have high blood pressure during pregnancy after 34 weeks?

Key messages

- Planned early birth leads to fewer complications for the woman, with no increase in the risk of caesarean section.
- Planned early birth probably reduces the risk of stillbirth and probably results in little to no difference in the risk of neonatal unit admission (special care baby unit). The effect on neonatal death is unclear.
- Further studies are needed to understand the effect of planned early birth on the longer-term health of women and children.

What is high blood pressure during pregnancy?

High blood pressure affects 1 in 10 pregnancies. Women who have high blood pressure during pregnancy are more at risk of developing complications. Pre-eclampsia (high blood pressure with protein in the urine or affecting other organs) is the most serious type of high blood pressure problem during pregnancy and is caused when there is a problem affecting the placenta.

If high blood pressure is not detected and treated early, complications can develop. These can include seizures (eclampsia), stroke, abnormal blood and liver function (HELLP syndrome), difficulty breathing because of fluid in the lungs (pulmonary oedema), detachment of the placenta (placental abruption), liver failure and kidney failure. The baby may also be affected, as it may not grow as well. This may lead to the baby needing more support after birth and a higher chance of admission to the special care baby unit. Sadly, it can also cause the baby to be stillborn.

How is high blood pressure during pregnancy treated?

For women who have high blood pressure in pregnancy, careful monitoring is advised, which may include regular blood pressure and urine checks as well as blood tests and ultrasound scans. Some women may need to take medication to help keep their blood pressure in a safe range.

Planned early birth is the only treatment that has been shown to reduce the risk of serious complications developing, but the timing of birth depends on what stage of pregnancy is reached and whether there are signs or symptoms of complications, as well as the type of blood pressure problem.

For women who have high blood pressure early in pregnancy (less than 34 weeks), careful monitoring is advised unless serious complications develop, because of the risks to the baby associated with early preterm birth. Later in pregnancy (after 34 weeks), the balance of risks and benefits is less certain.

What did we want to find out?

We wanted to find out if planned early birth for women who have high blood pressure in pregnancy after 34 weeks was better than careful monitoring (expectant management) at reducing complications for women and babies. We also wanted to find out if planned early birth was associated with any unwanted effects.

What did we do?

We searched for studies that looked at planned early birth compared with careful monitoring for women with any type of high blood pressure problem during pregnancy, after 34 weeks. We compared and summarised the results of the studies and rated our confidence in the evidence, based on factors such as study methods and sizes.

What did we find?

We found six studies that involved 3491 women with high blood pressure during pregnancy conducted between 2002 and 2022. Five of these studies took place in high-income countries (UK, The Netherlands, USA). One of these studies took place in two countries classified as low income (Zambia) and lower-middle income (India). The timing of planned early birth varied between the trials, depending on the time that the trial took place and the type of high blood pressure problem that was evaluated.

Main results

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Planned early birth reduces complications for women with high blood pressure in pregnancy after 34 weeks. Planned early birth after 34 weeks did not increase the risk of caesarean section. Planned early birth may result in little to no difference in the risk of maternal death.

For the baby, planned early birth likely results in a large reduction in the risk of stillbirth, but likely results in little to no difference in the risk of neonatal unit admission. Planned early birth may result in little to no difference in the overall risk of serious complications after birth, including neonatal death, but we are very uncertain about the results.

What are the limitations of the evidence?

We are confident in our results for the effect of planned early birth on the overall risk of complications for women and the risk of caesarean section. We are less confident in our results for the effect on the babies, because of the low number of unwanted effects reported.

How up to date is this evidence?

This review updates our previous review. The evidence is up to date to 16 January 2026.

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Summary of findings 1. Summary of findings table - Planned early birth compared to expectant management for women with hypertensive disorders of pregnancy from 34 weeks' gestation onwards

Planned early birth compared to expectant management for women with hypertensive disorders of pregnancy from 34 weeks' gestation onwards

Patient or population: women with hypertensive disorders of pregnancy from 34 weeks' gestation onwards
Setting: maternity units
Intervention: planned early birth
Comparison: expectant management

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with expectant management	Risk with planned early birth				
Composite maternal mortality and morbidity events[a]	47 per 1000	**25 per 1000** (17 to 36)	**RR 0.54** (0.37 to 0.77)	3491 (6 RCTs)	⊕⊕⊕⊕ High	Planned early birth results in a reduction in composite maternal mortality and morbidity.
Composite perinatal mortality and morbidity[a]	425 per 1000	**450 per 1000** (319 to 641)	**RR 1.06** (0.75 to 1.51)	3576 (6 RCTs)	⊕⊝⊝⊝ Very low[b,c]	The evidence is very uncertain about the effect of planned early birth on composite perinatal mortality and morbidity.
Maternal death[a]	2 per 1000	**1 per 1000** (0 to 5)	**RR 0.33** (0.05 to 2.10)	3491 (6 RCTs)	⊕⊕⊝⊝ Low[d]	Planned early birth may result in little to no difference in maternal death.
Fetal death[a]	7 per 1000	**2 per 1000** (0 to 6)	**RR 0.25** (0.07 to 0.87)	3407 (5 RCTs)	⊕⊕⊕⊝ Moderate[e]	Planned early birth likely results in a large reduction in fetal death.
Neonatal death[a]	3 per 1000	**4 per 1000** (1 to 13)	**RR 1.40** (0.45 to 4.35)	3407 (5 RCTs)	⊕⊕⊝⊝ Low[d]	Planned early birth may result in little to no difference in neonatal death.
Caesarean section[a]	429 per 1000	**403 per 1000** (356 to 455)	**RR 0.94** (0.83 to 1.06)	3539 (6 RCTs)	⊕⊕⊕⊕ High	Planned early birth results in little to no difference in caesarean section.
Admission to neonatal unit[a]	233 per 1000	**258 per 1000** (209 to 319)	**RR 1.11** (0.90 to 1.37)	3560 (6 RCTs)	⊕⊕⊕⊝ Moderate[c]	Planned early birth likely results in little to no difference in admission to neonatal unit.

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*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the __relative effect__ of the intervention (and its 95% CI).

CI: confidence interval; **RR:** risk ratio

GRADE Working Group grades of evidence
High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.
Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

See interactive version of this table: https://gdt.gradepro.org/presentations/#/isof/isof_question_revman_web_458074095628656258.

[a] The evaluated time point for all outcomes presented in the summary of findings table is up until primary hospital discharge or as defined by trial authors.
[b] Very serious concerns about inconsistency due to significant heterogeneity. We downgraded by two levels.
[c] Serious concerns about imprecision: the 95% confidence interval includes both appreciable harms and benefits. We downgraded by one level.
[d] Very serious concerns about imprecision: the 95% confidence interval includes both appreciable harms and benefits and there were < 30 events. We downgraded by two levels.
[e] Serious concerns about imprecision due to low number of events (< 30). We downgraded by one level.

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BACKGROUND

Description of the condition

Hypertensive disorders in pregnancy (HDP) remain a significant contributor to maternal and perinatal morbidity and mortality globally, accounting for 16% of all maternal deaths [1] and affecting at least 10% of all pregnancies [2, 3]. HDP includes the following conditions [4].

- Chronic hypertension (present before pregnancy or diagnosed before 20 weeks' gestation)
- Gestational hypertension (defined as either a systolic blood pressure ≥ 140 mmHg or a diastolic blood pressure ≥ 90 mmHg at or beyond 20 weeks' gestation)
- Pre-eclampsia (gestational hypertension with one or more of proteinuria, maternal organ dysfunction, or uteroplacental dysfunction). This includes eclampsia, HELLP (haemolysis, elevated liver enzymes, low platelets) syndrome and superimposed pre-eclampsia.

Pre-eclampsia is the most serious form of HDP, affecting up to 5% of all pregnancies, and is estimated to cause at least 42,000 maternal deaths and 500,000 perinatal deaths (including 200,000 stillbirths) annually [5, 6].

Approximately 92% of all maternal deaths occur in low or middle income countries (LMIC), with the regions of Sub-Saharan Africa and South Asia accounting for 87% of the estimated maternal deaths in 2023 [1]. The majority of these deaths are preventable with timely detection of complications and early intervention.

Despite the disproportionate burden of disease in these regions, there is limited national data available from LMIC, making it difficult to ascertain the true global incidence of HDP; recent studies suggest that rates of pre-eclampsia and eclampsia may be much higher than current estimates [7, 8]. This may be explained by differences in maternal age distribution, the proportion of primiparous women amongst different populations, the presence of medical co-morbidities [9], nutritional status and genetic characteristics [10]. The wider social and economic determinants of health are also critical to understanding the high proportion of adverse outcomes in LMIC, where women may face multiple barriers to being able to access good quality care in the right place, at the right time [11, 12, 13, 14].

For every loss related to pre-eclampsia, at least 50 to 100 women experience substantial morbidity [5], such that the global burden of life-threatening maternal near-miss complications now exceeds that of maternal deaths [15].

Description of the intervention and how it might work

Planned early birth is currently the only curative treatment for hypertensive disorders related to pregnancy. The alternative is to manage the pregnancy expectantly with close maternal and fetal monitoring, including frequent blood pressure measurement, assessment of maternal symptoms and screening for end-organ complications via blood tests and obstetric ultrasound scans, when available. Whilst antihypertensive medications are critical in stabilising blood pressure, with a target diastolic blood pressure of < 85 mmHg now recommended, they do not alter disease progression [16, 17]. Low-dose aspirin, started before 16 weeks, is recommended for the prevention of pre-eclampsia in women who have risk factors for pre-eclampsia [18], including those with chronic hypertension. This has been shown to reduce the overall relative risk of developing pre-eclampsia by 18% [19]. Other interventions such as bed rest [20], dietary salt restriction [20], vitamin D supplementation [21], vitamin C and E supplementation, and thiazide diuretics are not recommended for the prevention of pre-eclampsia [22]. Calcium supplementation is also unlikely to prevent pre-eclampsia, even in areas with a low baseline intake [23]. Potential disease-modifying agents have been identified, with extended release metformin recently shown to prolong gestation in women with preterm pre-eclampsia; however, larger-scale randomised trials are needed to replicate these findings [24]. Thus, birth remains the only current intervention proven to reduce the risk of severe maternal morbidity and mortality [25].

Deciding when to initiate birth requires careful balancing of the risks and benefits for the woman and her infant, and will depend on the gestational age of the pregnancy as well as the type of hypertensive disorder and the presence or absence of severe features (e.g. inability to control blood pressure despite maximal therapy, acute kidney injury, or evidence of fetal compromise).

Before 34 weeks' gestation, the risks associated with early preterm birth justify a policy of expectant management, continuing the pregnancy unless severe features of pre-eclampsia are present, which would necessitate emergency birth at any stage of pregnancy [26].

Beyond 34 weeks, the balance of risks and benefits is less clear. Planned birth at this stage may result in increased rates of respiratory distress syndrome in the neonate, or an increased risk of neurodevelopmental delay in the infant. However, continuing the pregnancy may increase the risk of both maternal and perinatal complications associated with disease progression, such as pre-eclampsia, eclampsia, placental abruption, worsening fetal growth restriction (also associated with neurodevelopmental delay) and stillbirth.

Current international guidelines suggest the following.

- For women with gestational hypertension, without severe hypertension, consider birth between 37 and 39 weeks and 6 days' (39^{+6}) gestation. Offer birth at 40 weeks' gestation [4].
- For women with chronic hypertension, without severe hypertension, consider birth between 38 and 39 weeks and 6 days' (39^{+6}) gestation. Offer birth at 40 weeks' gestation [4].
- For women with pre-eclampsia without severe features, birth between 34 and 36 weeks and 6 days' (36^{+6}) gestation should be discussed. Offer birth at 37 weeks' gestation [4].

These recommendations are based on randomised controlled trials which have compared a policy of planned early birth to expectant management for HDP. This review seeks to update and synthesise the current evidence on this topic, so that future recommendations can be made based on the most recent evidence.

Planned early birth (either via induction of labour or caesarean section if indicated) is thought to have the following benefits.

- Prevention of severe maternal complications in women with hypertensive disorders in pregnancy

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- Prevention of poor fetal outcomes (including worsening fetal growth restriction and stillbirth)

The potential risks of planned early birth are as follows.

- Risk of complications associated with induction of labour (such as longer hospital stay, unsuccessful induction, uterine hyperstimulation and fetal distress); however, it is important to highlight that recent evidence demonstrates that induction of labour beyond 39 weeks' gestation is not associated with an increased risk of caesarean section [27, 28, 29]. Further to this, an individual participant data meta-analysis published in 2022 demonstrated no increase in caesarean section rates when comparing planned early birth from 34 weeks to expectant management for women with pre-eclampsia [30].
- Risk of late preterm birth for the infant; although adverse outcomes due to prematurity are uncommon after 34 weeks' gestation, infants born at this gestation may be more likely to require neonatal unit admission, primarily for short-term breathing or feeding support. Whilst some studies suggest an increase in morbidity during the first year of life for infants born between 37 and 39 weeks [31], it is important to note that the studies which describe this typically compare these infants with healthy controls born at term [32, 33], and therefore do not accurately describe the trade-off in outcomes relevant to HDP, where the alternative to preterm birth may be worsening growth restriction or stillbirth. A population-based full sibling cohort study published in 2023 showed no difference in adolescent cognitive outcomes between individuals born at 34 to 39 gestational weeks and those born at 40 gestational weeks [34]. Five-year follow-up data from the HYPITAT II trial (planned early birth between 34 and 37 weeks for HDP) showed that other factors such as parents' level of education, home environment, and socioeconomic status are likely to have a more important effect over time than gestational age at birth alone [35].

Why it is important to do this review

Hypertensive disorders of pregnancy are the second leading cause of maternal death worldwide [1]. Pre-eclampsia is the most serious of these conditions, and is associated with approximately 46,000 maternal deaths and 500,000 perinatal deaths every year. World Health Organization Guidelines currently recommend a policy of planned early birth for pre-eclampsia from 37 weeks onwards [22]; however, planned early birth from 34 weeks onwards could confer significant maternal and perinatal benefit. To date, there has been insufficient evidence to make a clear recommendation regarding the optimal timing of birth from 34 weeks' gestation onwards. There are benefits and risks associated with both policies (planned early birth and expectant management) in women with hypertensive disorders of pregnancy. It is therefore important to establish the safest option in order to optimise both maternal and perinatal outcomes.

This is an update of a Cochrane review first published in 2017 [25]. The previous Cochrane review included five studies and concluded that for women with hypertensive disorders of pregnancy after 34 weeks, planned early birth is associated with less composite maternal morbidity and mortality. However, there were limited data (from two trials) to evaluate the impact on perinatal outcomes, with no clear difference observed in the composite outcome of perinatal mortality and severe morbidity. Since this review was published, at least two randomised controlled trials have been published, evaluating planned early birth versus expectant management for late preterm pre-eclampsia. We anticipate that updating this review to include the most recent data will add further information to guide clinicians, women, and their families, enabling a shared-decision-making process based upon the best available evidence.

Management of severe pre-eclampsia before term is dealt with in another Cochrane review comparing interventionist and expectant care [26].

OBJECTIVES

To assess the benefits and risks of planned early birth versus expectant management in pregnant women with hypertensive disorders, from 34 weeks' gestation onwards.

METHODS

We followed the Methodological Expectations of Cochrane Intervention Reviews (MECIR) for conducting this review update [36], and PRISMA 2020 for the reporting [37].

The original review and review protocol can be accessed via the following links.

- Protocol (2011) [38]: DOI: 10.1002/14651858.CD009273
- Original review (2017) [25]: DOI: 10.1002/14651858.CD009273.pub2

In this updated review, we did not make any major changes to the review protocol, eligibility criteria, or the review PICO, which are described in the Criteria for considering studies for this review section below.

We used a random-effects meta-analysis for combining data instead of the fixed-effects model used in the previous version of this review. This was due to the potential differences in trial populations between high-income and low-income countries (the previous review included only studies conducted in high-income countries).

Changes to maternal outcomes

In this updated review, we made minor changes to the original composite maternal outcome, adding cortical blindness, retinal detachment, intensive care unit admission, intubation and mechanical ventilation (not for childbirth) and postpartum haemorrhage as individual components, in order to align this with established core outcome sets, developed through Delphi consensus [39].

The nature of the maternal composite outcome has been further clarified at the review stage, such that intensive care unit admission and postpartum haemorrhage were reported as secondary outcomes rather than components of the composite maternal outcome.

Composite Maternal Outcome

The composite maternal outcome included the following individual components.

- Maternal mortality (death during pregnancy or up to 42 days after birth)

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- Severe maternal morbidity (eclampsia; cerebral vascular event; cortical blindness; retinal detachment; pulmonary oedema as defined by trial authors; intubation and mechanical ventilation (not for childbirth); severe renal impairment, defined as a creatinine level greater than 125 µmol/L or a need for dialysis or urine output less than 0.5 mL/kg/hour for four hours unresponsive to hydration with two intravenous boluses, or as defined by trial authors; liver haematoma or rupture; liver failure, defined as the rapid impairment of synthetic function and development of encephalopathy or as defined by trial authors; haemolysis elevated liver enzymes and low platelets (HELLP) syndrome; disseminated intravascular coagulation (DIC); thromboembolic disease; and placental abruption, defined as a retroplacental clot of more than 15% of the maternal surface or as defined by trial authors).

The maternal composite outcome was calculated based on the number of events, rather than women, or as reported by the trial authors.

Secondary outcomes

The following secondary outcomes were added at the review stage.

- Postpartum haemorrhage (blood loss of more than 500 mL within 24 hours of birth): this was included as a secondary outcome, instead of being an individual component of the maternal composite, as it is not a reliable indicator of severity of hypertensive disease and estimated blood loss at birth may often be inaccurately and inconsistently reported.
- Hepatic dysfunction (defined as elevated liver enzymes alanine transaminase or aspartate transaminase ≥ 70 IU/L). We decided to report this as a separate secondary outcome as it was reported by several studies, but did not qualify as liver failure.
- Admission to high dependency unit. Previously, this was combined as one outcome: 'Admission to a high care or intensive care unit'. We decided to report admission to a high dependency unit and admission to an intensive care unit as separate secondary outcomes. Intubation and ventilation (not for childbirth) was reported as part of the composite maternal outcome as an objective measure of requiring critical care, in line with the recommended core outcomes set [39].

Changes to fetal/neonatal outcomes

In the protocol for this updated review, we made minor changes to the composite perinatal outcome, adding need for respiratory support and admission to the neonatal unit as individual components, in order to align this with established core outcome sets [39].

The nature of the perinatal composite outcome was not changed at the review stage. If trials reported both acute respiratory distress syndrome and need for respiratory support (continuous positive airway pressure (CPAP) or invasive ventilation), we reported the outcome that had the higher event rate.

Composite perinatal outcome

- The composite perinatal outcome included the following individual components: fetal or neonatal death (within six weeks after the expected due date or as defined by trial authors); grade III or IV intraventricular haemorrhage; necrotising enterocolitis (NEC); acute respiratory distress syndrome (ARDS) or need for respiratory support; admission to neonatal unit required; small-for-gestational age (growth below the 10th centile or as defined by trial authors); and neonatal seizures.

The perinatal composite outcome was calculated based on number of events, rather than infants, or as reported by the trial authors.

Secondary outcomes

We did not make any major changes to the secondary perinatal outcomes.

We added the following outcomes at the review stage.

- Need for supplementary oxygen: we reported this separately from 'need for respiratory support', which we defined as the need for CPAP or invasive ventilation.
- Duration of neonatal unit stay: we reported this separately from 'duration of hospital stay' due to the fact that only one trial reported overall length of stay for the baby, but a number of trials reported duration of neonatal unit stay.

Criteria for considering studies for this review

Types of studies

We included adequately randomised controlled trials comparing planned early birth (induction of labour or caesarean section) with expectant management of women with hypertensive disorders from 34 weeks' gestation to term. We would have included cluster-randomised trials, but we found none. Studies using a quasi-randomised design were not eligible for inclusion in this review. Similarly, studies using a cross-over design were not eligible for inclusion, because they are not a suitable study design for investigating hypertensive disorders in pregnancy.

Types of participants

We included women with hypertensive disorders at 34 weeks' gestation or longer.

Types of interventions

The intervention of interest was a policy of planned early birth (by induction of labour or by caesarean section) compared with a policy of delayed birth (expectant management).

Outcome measures

We evaluated the following outcomes, up until primary hospital discharge for women and infants, or as defined by trial authors. Full outcome definitions are provided in Supplementary material 10.

Critical outcomes

- Composite maternal outcome, including maternal mortality (death during pregnancy or up to 42 days after birth) and severe morbidity (eclampsia; cerebral vascular event; cortical blindness; retinal detachment; pulmonary oedema as defined by trial authors; intubation and mechanical ventilation (not for childbirth); severe renal impairment, defined as a creatinine level greater than 125 µmol/L or a need for dialysis or urine output less than 0.5 mL/kg/hour for four hours unresponsive to hydration with two intravenous boluses, or as defined by trial authors; liver haematoma or rupture; liver failure, defined as the rapid impairment of synthetic function and development of encephalopathy or as defined by trial authors; haemolysis

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elevated liver enzymes and low platelets (HELLP) syndrome; disseminated intravascular coagulation (DIC); thromboembolic disease; postpartum haemorrhage; and placental abruption, defined as a retroplacental clot of more than 15% of the maternal surface or as defined by trial authors) [39].

- Composite perinatal outcome, including fetal or neonatal death (within six weeks after the expected due date or as defined by trial authors); grade III or IV intraventricular haemorrhage; necrotising enterocolitis (NEC); acute respiratory distress syndrome (ARDS); respiratory support; admission to neonatal unit required; small-for-gestational age (growth below the 10th centile or as defined by trial authors); and neonatal seizures.
- Maternal death (individual component of composite maternal outcome)
- Fetal death (individual component of composite perinatal outcome)
- Neonatal death (individual component of composite perinatal outcome)

Important outcomes

Maternal

- Caesarean section (secondary outcome)
- Maternal admission to high dependency unit (secondary outcome)
- Eclampsia (individual component of composite maternal outcome)
- Pulmonary oedema (individual component of composite maternal outcome)
- Severe renal impairment (individual component of composite maternal outcome)
- HELLP syndrome (individual component of composite maternal outcome)

Perinatal

- Neonatal unit admission (individual component of composite perinatal outcome)

Additional maternal outcomes

- Cerebrovascular event (individual component of composite maternal outcome)
- Retinal detachment (individual component of composite maternal outcome)
- Cortical blindness (individual component of composite maternal outcome)
- Liver failure (individual component of composite maternal outcome)
- Liver haematoma or rupture (individual component of composite maternal outcome)
- Disseminated intravascular coagulopathy (individual component of composite maternal outcome)
- Thromboembolic disease (individual component of composite maternal outcome)
- Intubation and ventilation (individual component of composite maternal outcome)
- Placental abruption (individual component of composite maternal outcome)
- Maternal hepatic dysfunction (secondary outcome)
- Postpartum haemorrhage (secondary outcome)
- Severe hypertension (secondary outcome)
- Assisted birth (secondary outcome)
- Maternal morbidity of caesarean section (secondary outcome)
- Maternal morbidity related to induction of labour (secondary outcome)
- Maternal admission to an intensive care unit (secondary outcome)
- Duration of hospital maternal stay (secondary outcome)
- Women's experiences of care (secondary outcome)

Additional perinatal outcomes

- Grade III or IV intraventricular or intracerebral haemorrhage
- Necrotising enterocolitis
- Respiratory distress syndrome
- Respiratory support (CPAP or invasive ventilation)
- Need for supplementary oxygen
- Small-for-gestational age
- Neonatal seizures
- Apgar score less than seven at five minutes
- Cord blood pH less than 7.1
- Surfactant use
- Early neonatal sepsis
- Duration of hospital stay

Economic outcomes

- Health resource use data

Search methods for identification of studies

The following Methods section of this review is based on a standard template that was used by Cochrane Pregnancy and Childbirth.

Electronic searches

An Information Specialist within the Cochrane Central Executive Team conducted a comprehensive literature search on 18 June 2024 using date limits from the date of the last search in January 2016 from the previous published review. The searches were repeated on 16 January 2026 and did not identify any new potentially eligible studies.

We searched the following databases:

1. Cochrane Central Register of Controlled Trials (CENTRAL), in the Cochrane Library; Issue 12 of 12 2025
2. MEDLINE ALL (Ovid); 1 January 2016 to 16 January 2026
3. Embase Classic and Embase (Ovid); 1 January 2016 to 16 January 2026
4. CINAHL (Cumulative Index to Nursing and Allied Health Literature; EBSCOhost); 1 January 2016 to 16 January 2026
5. US National Institutes of Health Ongoing Trials Register ClinicalTrials.gov (www.clinicaltrials.gov; searched 1 January 2016 to 16 January 2026)
6. World Health Organization International Clinical Trials Registry Platform (apps.who.int/trialsearch; searched 1 January 2016 to 16 January 2026)

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The Cochrane Pregnancy and Childbirth specialised register was not searched as the group has closed, and the register is no longer maintained. However, the databases that it covered were searched separately, as above.

A randomised controlled trial filter was used for MEDLINE, Embase and CINAHL [40]. For MEDLINE, the Cochrane Highly Sensitive Search Strategy for identifying randomised trials in MEDLINE: sensitivity- and precision-maximising version was applied, and an adaptation of this was applied to Embase. For CINAHL, the Cochrane Highly Sensitive Search Strategy for identifying controlled trials in CINAHL EBSCO was applied.

The full search strategy is provided as an additional table in Supplementary material 1.

We did not apply any language restrictions. We applied a date limit (only studies published after 1 January 2016) in order to try to only retrieve results added to the databases since the previous review.

Searching other resources

We searched the reference lists of retrieved studies.

We also examined any relevant retraction statements and errata for included studies. This was performed via the CENTRAL search and via the retraction watch database (retractionwatch.com) as part of our trustworthiness assessment.

Data collection and analysis

The following Methods section of this review is based on a standard template that was used by Cochrane Pregnancy and Childbirth.

Selection of studies

We uploaded studies retrieved through electronic searches to electronic reference management software (Covidence) for screening [41]. After automatic deduplication, we screened studies manually by title and abstract. Two review authors independently assessed all the potential studies we identified as a result of the search strategy. We resolved any disagreement through discussion and consultation with the senior review author. Studies found to be eligible by title and abstract screening were then included in the full-text review, and included or excluded on the basis of the review eligibility criteria, with reasons for exclusion recorded.

Review authors applied the Cochrane Pregnancy and Childbirth Trustworthiness Screening Tool to all studies identified as eligible at full text stage [42]. This screening tool covers four domains: research governance, baseline characteristics, feasibility and results, described in more detail in Supplementary material 8. Two review authors (ABG, CFT) applied the checklist to each eligible RCT independently and in duplicate. This process is described further in Supplementary material 8.

Data extraction and management

We designed an online data extraction form using the same electronic reference management software (Covidence) to extract data [41]. After piloting the form, two review authors (ABG, CFT) independently extracted the data using the agreed form for eligible studies. We resolved discrepancies through discussion and consultation with the senior review author (CC). We entered data into Review Manager (RevMan) software [43], and checked the data for accuracy.

When information regarding any of the above was unclear, we attempted to contact authors of the original reports to provide further details.

Risk of bias assessment in included studies

We assessed the risks of bias for each study using the Cochrane Risk of Bias 2 (RoB 2) Tool, as outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* [44]. Two review authors independently applied the risk of bias tool to each prespecified critical and important outcome for each study (those contributing to the summary of findings table), utilising discussion with a third author used to resolve any disagreements. Review authors did not assess their own studies.

The RoB 2 tool asses the following domains, using a series of signalling questions.

1. Bias arising from the randomisation process
2. Bias due to deviations from intended interventions
3. Bias due to missing outcome data
4. Bias in measurement of the outcome
5. Bias in selection of the reported result

For each prespecified outcome, in each study, we used the signalling questions to reach one of three judgements: 'low risk of bias', 'some concerns', or 'high risk of bias'. We used the RoB 2 Excel tool to record answers to the signalling questions. We focused on the effect of assignment, and the time frame for all outcomes was up until primary hospital discharge or as defined by the trial authors.

The tool generates an overall judgement for each study as follows.

- Low risk of bias: all domains have a 'low risk' judgement
- Some concerns: there are 'some concerns' in at least one domain, but no domains have a 'high risk' judgement.
- High risk of bias: at least one domain has a 'high risk' judgement, or there are 'some concerns' in multiple domains.

In future updates of this review, if cluster-randomised trials are found, we will use the RoB 2 tool variant to assess risk of bias as outlined in Chapter 23 of the *Cochrane Handbook for Systematic Reviews of Interventions* [45].

Measures of treatment effect

Dichotomous data

For dichotomous data, we presented results as a summary risk ratio (RR) with a 95% confidence interval (CI).

Continuous data

For continuous data, we used the mean difference if outcomes were measured in the same way between trials.

Unit of analysis issues

Cluster-randomised trials

We did not identify any cluster-randomised trials in the analyses. If we had, we would have followed Chapter 23 of the *Cochrane*

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Handbook for Systematic Reviews of Interventions to perform analysis of cluster-randomised trials [45]. We would have calculated the intra-cluster correlation coefficient (ICC) and design effect. We would have multiplied the standard error of the effect estimate (from analysis ignoring clustering) by the square root of the design effect. We would have performed meta-analysis using the inflated variances and the generic inverse-variance method [45].

Cross-over trials

Cross-over trials are inappropriate for this intervention.

Multi-armed trials

We did not identify any multi-armed trials. If we had, we would have combined all relevant experimental intervention groups of the study into a single group and all relevant control intervention groups into a single control group when we analysed the data. If we had considered one of the arms irrelevant, we would have excluded it from analysis.

Dealing with missing data

For included studies, we noted levels of attrition. We did not need to explore the impact of including studies with high levels of missing data in the overall assessment of treatment effect by using sensitivity analysis.

For all outcomes, we carried out analyses, as far as possible, on a modified intention-to-treat basis, i.e. we attempted to include all participants randomised to each group in the analyses, and analysed all participants in the group to which they were allocated, regardless of whether or not they received the allocated intervention. The denominator for each outcome in each trial was the number randomised minus any participants whose outcomes were known to be missing.

Reporting bias assessment

There were fewer than 10 studies in the meta-analysis. In future updates of this review, if there are 10 or more studies in a meta-analysis, we will investigate reporting biases (such as publication bias) using funnel plots. We will assess funnel plot asymmetry visually. If asymmetry is suggested by a visual assessment, we will perform exploratory analyses to investigate it.

Synthesis methods

We carried out statistical analysis using RevMan [43]. We used a random-effects meta-analysis to combine data instead of the fixed-effect model that was used in the previous version of this review. This was due to the potential differences in trial populations and clinical diversity between high-income and low-income countries (the previous review included only studies conducted in high-income countries).

The DerSimonian and Laird estimator was used to estimate between-trial variance. The Hartung-Knapp-Sidik-Jonkman method was used to calculate a confidence interval for the meta-analysis effect estimate when there were at least three studies, and the estimate of heterogeneity was greater than zero. In other scenarios (i.e. in pooled analyses of two studies, or where the estimate of heterogeneity was equal to zero) we used the Wald-type method [46].

We assessed statistical heterogeneity in each meta-analysis using the Tau^2, I^2 and Chi^2 statistics. We regarded heterogeneity as substantial if an I^2 was greater than 30% and either a Tau^2 was greater than zero, or there was a low P value (less than 0.10) in the Chi^2 test for heterogeneity.

We have presented the results as the average treatment effect with its 95% confidence interval, and the estimates of Tau^2 and I^2.

Investigation of heterogeneity and subgroup analysis

For critical and important outcomes, we carried out the following prespecified subgroup analyses.

1. Type of hypertensive disorder (pre-eclampsia, gestational or chronic hypertension, or any type of HDP)
2. Regional income classification (i.e. low- or middle-income countries versus high-income countries)
3. Gestational age at randomisation (34 to 35^{+6} weeks versus ≥ 36 weeks' gestation).

Additionally, if we identified substantial heterogeneity in additional secondary outcomes, we investigated it using the same subgroup analyses above.

We assessed subgroup differences by interaction tests available within RevMan [43]. We reported the results of subgroup analyses quoting the Chi^2 statistic and P value, and the interaction test I^2 value.

Equity-related assessment

In this updated review we have included studies from across different income-classification settings and reported women's experiences of care if available.

Sensitivity analysis

It was not indicated to perform sensitivity analyses for aspects of the review that might affect the results; we only assessed one study to be at high risk of bias (Martin 2014 [47]), which did not contribute a large number of participants to the pooled effects reported. There were no trials with high levels of missing data. Where statistical heterogeneity was identified, we investigated it using the prespecified subgroup analyses described above.

Certainty of the evidence assessment

Two review authors (ABG, CR) independently evaluated the certainty of the evidence according to the five GRADE domains (study limitations, consistency of effect, imprecision, indirectness and publication bias) using GRADEpro GDT software [48], and following the methods and recommendations provided in the *Cochrane Handbook for Systematic Reviews of Interventions* [49].

We evaluated the certainty of the evidence for the following critical and important outcomes and included them in the Summary of findings 1.

Critical outcomes

- Composite maternal outcome, including maternal mortality and morbidity [39]
- Composite perinatal outcome, including fetal or neonatal death

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- Maternal death (individual component of composite maternal outcome)
- Fetal death (individual component of composite perinatal outcome)
- Neonatal death (individual component of composite perinatal outcome)

Important outcomes

Maternal

- Caesarean section (secondary outcome)

Perinatal

- Neonatal unit admission (individual component of composite perinatal outcome)

We assessed imprecision as 'not serious' if the confidence interval either did not cross the line of no effect (zero), or if it was within 0.75 to 1.25 (no appreciable benefit or harm) and the total cumulative study population was more than 300 participants and the total number of events was more than 30. We judged imprecision as 'serious' if only one of the above criteria was met, and very serious if none of the above criteria were met.

We assessed indirectness based on the presence of direct PICO (population, intervention, comparison, outcome), but this was 'not serious' for all studies included in this review.

To assess inconsistency, we used the I^2statistic to quantify heterogeneity amongst the trials in each analysis. We also considered the P value from the Chi^2 test to assess whether this heterogeneity was significant ($P < 0.1$). We judged inconsistency to be 'not serious' if I^2 was < 60% or $Chi^2 \geq 0.05$.

We would have assessed publication bias based on funnel plot asymmetry, but this was not required as there were less than 10 studies included in this review.

We resolved any disagreements by discussion with all authors.

Consumer involvement

We involved women with lived experience of hypertensive disorders of pregnancy to ensure the review addressed outcomes prioritised by them. We invited participants through the charity Action on Pre-eclampsia [50], and involvement activities included an online survey conducted in February 2025 (after electronic searches but prior to data extraction) and subsequent virtual interviews with three respondents.

Participants provided views on the perceived benefits and disadvantages of planned early birth versus expectant management (less mental stress, safety, lower risk of complications or later cardiovascular problems and a more controlled birth experience with greater choice versus additional medical interventions, fear, possible need for neonatal unit admission, and possible increased risk of developmental issues for the baby).

Participants highlighted the importance of including future health risks, mental health, birth trauma, breastfeeding, longer-term infant development, and shared decision-making around future pregnancies.

These insights were used to ensure the review evaluated clinical complications alongside women's experiences of care, if these outcomes were available.

A full report of the survey questions and methods is available in Supplementary material 9.

RESULTS

Description of studies

See Included studies, Excluded studies, Studies awaiting classification, and Ongoing studies.

Results of the search

Electronic searches for this review were performed on 18 June 2024 with the search strategy specified in Supplementary material 1. The searches were updated on 16 January 2026 and no new potentially eligible studies were identified.

Our database and trials register searches identified 9526 references. Following removal of 110 duplicates, we excluded 2555 records that were identified as clearly ineligible (i.e. not RCTs) by the Covidence automation tool. Two review authors then independently screened a total of 6861 references and selected 59 references for full-text assessment.

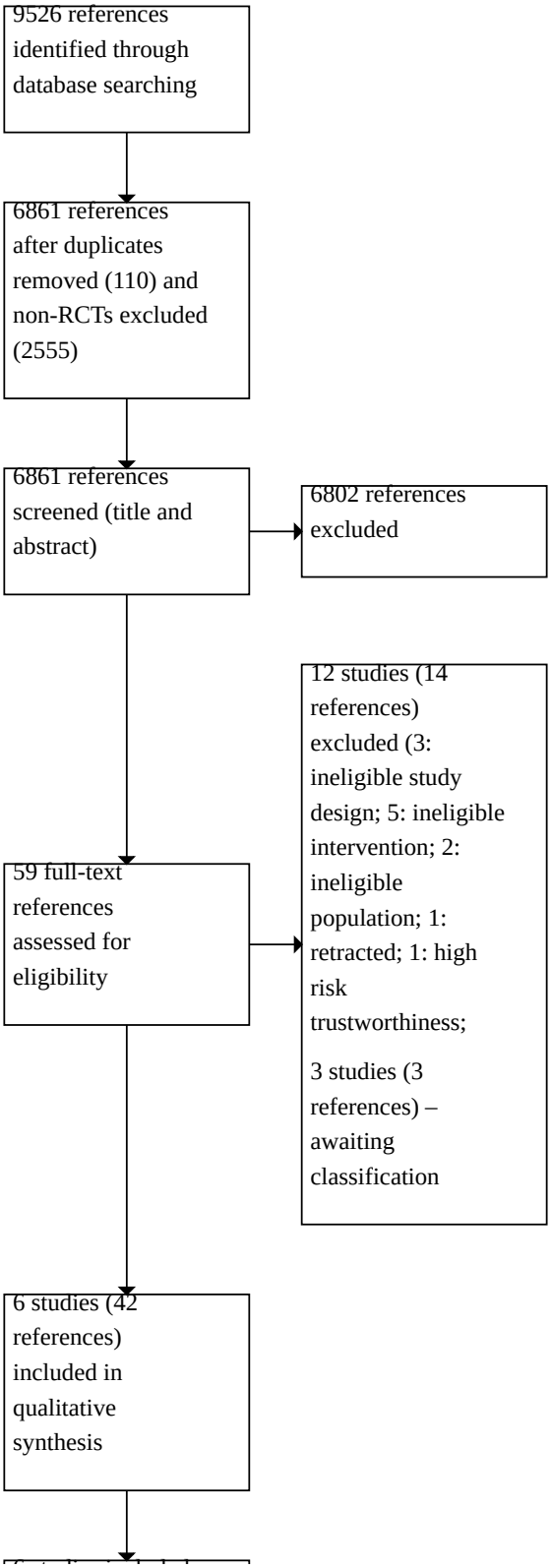
Of these full texts, we included six studies (42 references) (see Supplementary material 2). We excluded 12 studies (14 references) (see Supplementary material 3), and three studies (three references) are awaiting classification (see Supplementary material 4). The search yielded no ongoing studies.

We applied an assessment of trustworthiness to each potentially relevant study. We excluded studies that were not prospectively registered if they were conducted after 2010. In cases where information about registration or other information was required, we contacted the study investigators via email. We categorised these studies as awaiting classification until review authors received an adequate response and an eligibility decision could be made (See Supplementary material 4).

This updated review comprises six included studies, 12 excluded studies, three studies awaiting classification, and no ongoing studies. The PRISMA study flow diagram in Figure 1 shows the results of the search process.

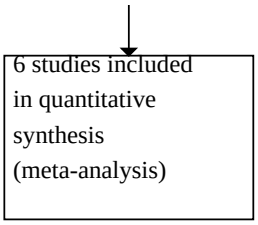
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Figure 1. Study flow diagram



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Figure 1. (Continued)



Included studies

The characteristics of included studies are summarised in Supplementary material 2 and Table 1.

We included six studies (involving 3491 women) in this review (Beardmore-Gray 2023 [51, 52, 53, 54, 55, 56, 57, 58]; Broekhuijsen 2015 [59, 60, 61, 62, 63, 64, 65, 66]; Chappell 2019 [67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79]; Koopmans 2009 [80, 81, 82, 83, 84, 85]; Magee 2024 [86, 87, 88, 89]; Martin 2014).

Design

All six of the included studies were randomised controlled trials, comparing planned early birth with expectant management for hypertensive disorders of pregnancy from 34 weeks to term. Five trials were large multicentre trials; one study was a randomised controlled trial conducted in a single hospital (Martin 2014).

Sample sizes

Beardmore-Gray 2023 enrolled 565 women, Broekhuijsen 2015 enrolled 703 women, Chappell 2019 enrolled 901 women, Koopmans 2009 enrolled 756 women, Magee 2024 enrolled 403 women and Martin 2014 enrolled 183 women.

Setting

Two of these trials were conducted in the Netherlands (Broekhuijsen 2015; Koopmans 2009), and two in the UK (Chappell 2019; Magee 2024). One trial was conducted in the USA (Martin 2014), and one trial was conducted in India and Zambia (Beardmore-Gray 2023).

Participants

The gestational age ranges of women eligible for the trials were: 34 to 37 weeks (Beardmore-Gray 2023; Broekhuijsen 2015; Chappell 2019; Martin 2014); 36 to 41 weeks (Koopmans 2009), and 36 to 38 weeks (Magee 2024).

The type of hypertensive disorder included varied between studies: Beardmore-Gray 2023, Chappell 2019, and Martin 2014 included pregnant women with pre-eclampsia only. Koopmans 2009 included pregnant women with gestational hypertension or pre-eclampsia. Broekhuijsen 2015 included women with gestational hypertension, mild pre-eclampsia, deteriorating chronic hypertension, or superimposed pre-eclampsia. Magee 2024 included women with chronic hypertension or gestational hypertension, excluding women if they had severe hypertension or new onset of pre-eclampsia.

All the studies that included women with pre-eclampsia excluded women with severe pre-eclampsia. Broekhuijsen 2015 and Koopmans 2009 defined this as women who had a diastolic blood pressure ≥ 110 mmHg despite antihypertensives, a systolic blood pressure ≥ 170 mmHg despite antihypertensives, or proteinuria ≥ 5 g per 24 hours, oliguria (< 500 mL in 24 hours), HELLP syndrome, pulmonary oedema or cyanosis. Martin 2014 excluded women who did not meet the American College of Obstetricians and Gynecologists (ACOG) 2002 classification for mild pre-eclampsia [90]. Beardmore-Gray 2023 and Chappell 2019 excluded women if a decision had already been made to deliver within the next 48 hours.

Other eligibility criteria varied across studies. Multiple pregnancies were excluded from Koopmans 2009, Magee 2024 and Martin 2014, but not from Beardmore-Gray 2023, Broekhuijsen 2015, or Chappell 2019. Beardmore-Gray 2023, Broekhuijsen 2015, Chappell 2019 and Magee 2024 had relatively broad eligibility criteria and included women with pre-existing or gestational diabetes, women with a previous caesarean section, and with a fetus in a non-cephalic position. These studies also included women whose babies had suspected fetal growth restriction or were suspected to be small-for-gestational age. Koopmans 2009 excluded women with pre-existing hypertension treated with antihypertensive drugs, diabetes mellitus, gestational diabetes needing insulin treatment, renal disease, heart disease, previous caesarean section, HIV seropositivity, fetal anomalies, suspected fetal growth restriction and abnormalities detected during fetal heart rate monitoring. Martin 2014 also excluded women with non-gestational diabetes, non-reassuring fetal assessment, intrauterine growth restriction, fetal anomalies, placenta praevia, or any other contraindication to conservative management such as premature preterm rupture of membranes, unexplained vaginal bleeding, or active labour.

Interventions

All six trials compared an intervention group who had planned early birth with a comparison group who received expectant management. The timing of the intervention varied between trials, as described below.

- Planned early birth via induction of labour (or caesarean section if indicated) between 34 and 36^{+6} weeks' gestation, compared to expectant management until 37 weeks, when birth was recommended (or sooner if a maternal or fetal indication arose): Beardmore-Gray 2023 and Chappell 2019 offered birth within 48 hours of randomisation, Broekhuijsen 2015 offered birth within 24 hours of randomisation and Martin 2014 offered birth within 12 hours of randomisation.
- Planned early birth via induction of labour (or caesarean section if indicated), within 24 hours of randomisation, between 36^{+0}

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and 41^{+0} weeks' gestation, compared to expectant management until 41 weeks, when induction of labour was routinely offered (or sooner if complications arose): Koopmans 2009.

- Planned early birth via induction of labour (or caesarean section if indicated) at 38^{+0} to 38^{+3} weeks' gestation, compared to usual care at term: Magee 2024.

Labour was induced according to local protocol at the study sites. Typically, this included cervical ripening with intracervical or intravaginal prostaglandins, a balloon catheter, or vaginal or oral misoprostol, followed by amniotomy and oxytocin infusion. Beardmore-Gray 2023 was the only trial conducted in two low-income countries. In these settings, vaginal misoprostol and a Foley catheter were the most commonly used induction methods, compared to the trials conducted in high-income countries where prostaglandin gel or pessary was most commonly used.

Women in the expectant management group were monitored according to local protocol and current clinical practice. Typically, this consisted of regular monitoring of both maternal and fetal condition, including frequent maternal blood pressure checks, screening of urine for protein (in women without pre-eclampsia), assessing for signs of disease progression with severe features of pre-eclampsia, maternal assessment of fetal movements, electronic fetal heart rate monitoring and ultrasound examination.

Women allocated to expectant management in Martin 2014 were admitted to hospital and monitored, in line with guidelines for pre-eclampsia management at the time. Women allocated to expectant management in Magee 2024 were monitored as outpatients, in line with current UK guidelines for the management of women with chronic or gestational hypertension (unless they developed a complication indicating hospital admission). For women allocated to expectant management in Beardmore-Gray 2023, Broekhuijsen 2015, Chappell 2019 and Koopmans 2009, this was either as an inpatient or an outpatient depending on local site guidelines, type of hypertensive disorder and severity of the condition.

Outcomes

Six trials reported a composite outcome for maternal mortality and morbidity (Beardmore-Gray 2023; Broekhuijsen 2015; Chappell 2019; Koopmans 2009; Magee 2024; Martin 2014). The composite maternal outcome reported in Beardmore-Gray 2023, Chappell 2019 and Magee 2024 was defined according to the fullPIERS [91] or miniPIERS (Beardmore-Gray 2023) model [92], based on a Delphi consensus and aligned with an international core outcomes set for pregnancy hypertension [39], and is defined as the critical composite maternal outcome in this review. Broekhuijsen 2015 and Koopmans 2009 reported a similar maternal composite which included maternal mortality, individual maternal morbidity outcomes and progression to severe disease. The primary maternal outcome reported by Martin 2014 was a composite of maternal morbidity, mortality and progression to severe disease, as defined by ACOG 2002 criteria [90]. The primary perinatal outcome differed between trials. Beardmore-Gray 2023 and Chappell 2019 reported a composite of perinatal mortality and neonatal unit admission, Magee 2024 reported neonatal unit admission for four or more hours, and Broekhuijsen 2015 reported neonatal respiratory distress syndrome. Koopmans 2009 and Martin 2014 did not report a primary perinatal outcome.

In addition, all of these trials reported maternal and perinatal mortality and morbidity outcomes individually. Where definitions differ between trials, these are included as footnotes in the analyses.

Funding sources

All included studies were funded by noncommercial grants. Two trials were funded by ZonMw, the Netherlands Organisation for Health Research and Development (Broekhuijsen 2015; Koopmans 2009). Martin 2014 was funded through the University of Mississippi Medical Centre. Beardmore-Gray 2023 was funded by the UK Medical Research Council. Chappell 2019 and Magee 2024 were funded by the UK National Institute of Health Research (NIHR) Health Technology Assessment Programme.

Declarations of interest

Chappell 2019 and Beardmore-Gray 2023 declared conflicts of interest as outlined in Supplementary material 2.

None of the other study authors declared any conflicts of interest.

Excluded studies

Details of the excluded studies are provided in Supplementary material 3.

We excluded 12 studies for the following reasons.

- Ineligible study design: Chatzakis 2022 [93]; Goadsby, 2025 [94, 95]; Drug and Therapeutics Bulletin Team, 2020 [96]
- Ineligible intervention: Cluver 2023 [97]; Ernawati, 2016 [98]; Jangra 2023 [99]; Osoti, 2018 [100, 101]; Peguero 2021 [102]; Metz 2024 [103]
- Ineligible patient population: Lees, 2020 [104]
- Retracted: Hamed 2014 [105] [106].
- High risk after applying trustworthiness criteria: Singh 2023 [107]

We categorised three studies as awaiting classification. Two of these studies were identified as high risk after applying trustworthiness criteria (Bhageerathy 2016 [108]; Majeed 2014 [109]). We contacted the corresponding author of Bhageerathy 2016 on three separate occasions (31 October 2024, 3 December 2024, 4 February 2025) to request further information but did not receive any response. We contacted the corresponding author and a co-author of Majeed 2014 on three separate occasions (1 November 2024, 3 December 2024, 4 February 2025) but did not receive any response. One of these studies appeared to be ongoing on the basis of a trial registration (Krishnamurthy 2022 [110]). We contacted the study authors via email on one occasion to request further information, with no response to date. See Supplementary material 4.

Ongoing studies

We did not find any ongoing studies. The previous version of this review identified one ongoing study (Chappell 2019), which closed to recruitment in 2018 and has subsequently been included in this updated review.

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Risk of bias in included studies

All included studies were assessed as low risk in each of the trustworthiness domains as described in Supplementary material 8.

The risk of bias assessment is summarised in Supplementary material 5, Supplementary Figure 2, and Supplementary Figure 3.

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Figure 2. Risk of bias graph



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Figure 2. (Continued)

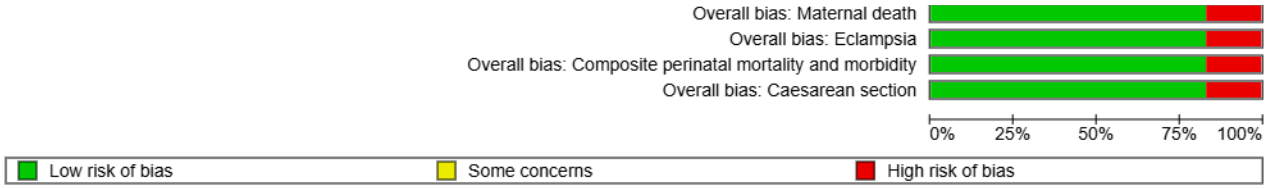
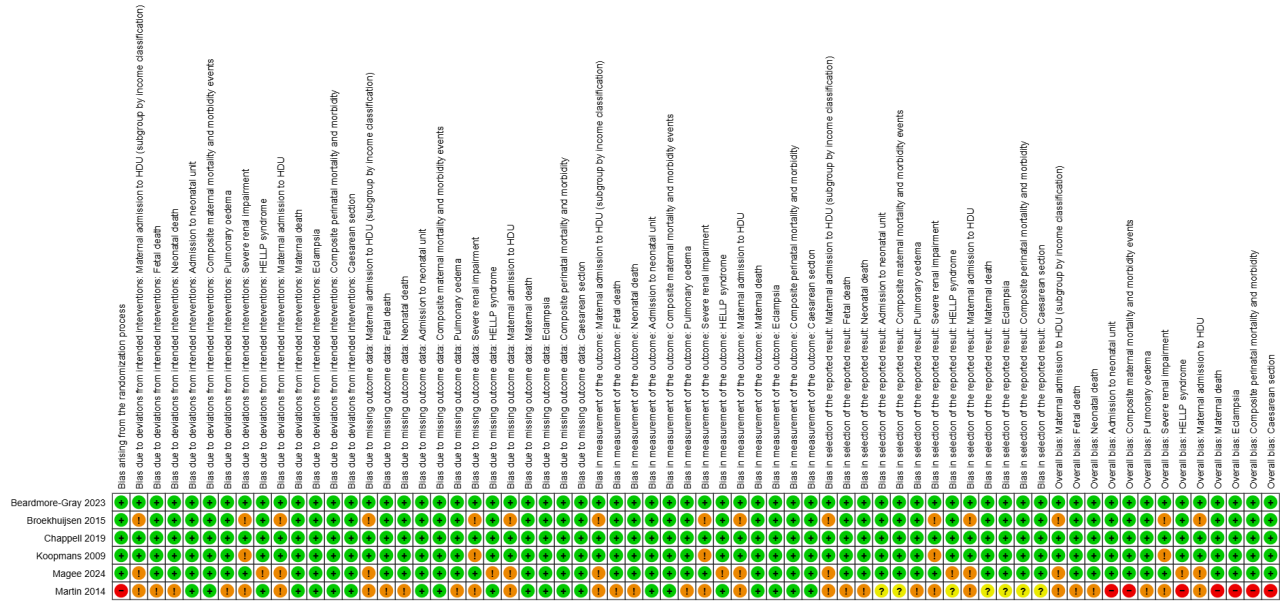


Figure 3. Risk of bias summary



We summarised the risk of bias judgements across different studies for each of the domains for each of the following prespecified critical and important outcomes.

Critical outcomes

- Maternal composite outcome
- Perinatal composite outcome
- Maternal death
- Fetal death
- Neonatal death

Important maternal outcomes

- Caesarean section (secondary outcome)
- Maternal admission to high dependency unit (secondary outcome)
- Eclampsia (individual component of composite maternal outcome)
- Pulmonary oedema (individual component of composite maternal outcome)
- Severe renal impairment (individual component of composite maternal outcome)
- HELLP syndrome (individual component of composite maternal outcome)

Important perinatal outcomes

- Neonatal unit admission (individual component of composite perinatal outcome)

Detailed risk of bias assessments with supporting judgements were recorded using the RoB 2 tool and are available upon reasonable request.

We assessed five out of the six included trials to be at low risk of bias in each domain for all outcomes assessed (Beardmore-Gray 2023; Broekhuijsen 2015; Chappell 2019; Koopmans 2009; Magee 2024).

We judged the following outcomes to be at high risk of bias in Martin 2014 due to insufficient information regarding the allocation sequence (leading to a judgement of 'high risk of bias') and selection of reported results (leading to a judgement of 'some concerns' due to lack of a published protocol).

- Maternal death
- Eclampsia
- HELLP syndrome
- Caesarean section
- Neonatal unit admission

We therefore judged Martin 2014 to be at high risk of bias overall. We included this trial as it was assessed as low risk when

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trustworthiness criteria were applied, and the study authors co-operated fully in providing additional information when asked.

Synthesis of results

All analyses are available in Supplementary material 6 and a summary of the subgroup analyses is available in Table 2 and Table 3.

Planned early birth versus expectant management

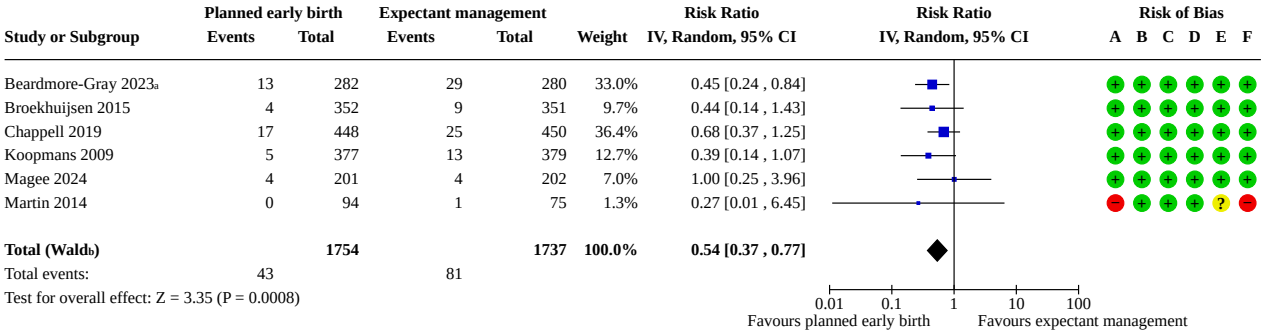
See Summary of findings 1. We included six trials, involving 3491 women.

Critical outcomes

Composite maternal outcome

Planned early birth results in a reduction in composite maternal mortality and morbidity (RR 0.54, 95% CI 0.37 to 0.77; I^2 = 0%; 6 studies, 3491 participants; high-certainty evidence; Figure 4), resulting in 21 fewer per 1000 women experiencing an adverse outcome (from 29 fewer to 11 fewer) (Analysis 1.1). Six RCTs contributed to the pooled effect (Beardmore-Gray 2023; Broekhuijsen 2015; Chappell 2019; Koopmans 2009; Magee 2024; Martin 2014).

Figure 4. Forest plot (1.1 Composite maternal mortality and morbidity events)



Heterogeneity: Tau² (DL$_c$) = 0.00; Chi² = 2.44, df = 5 (P = 0.79); I² = 0%

Footnotes

[a]For all included trials, this was calculated based on number of reported events

[b]CI calculated by Wald-type method.

[c]Tau² calculated by DerSimonian and Laird method.

Risk of bias legend

(A) Bias arising from the randomization process

(B) Bias due to deviations from intended interventions

(C) Bias due to missing outcome data

(D) Bias in measurement of the outcome

(E) Bias in selection of the reported result

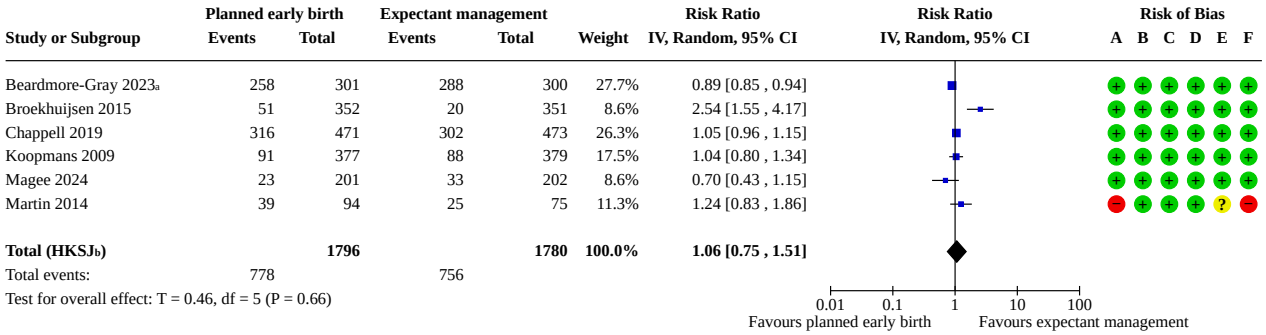
(F) Overall bias

Composite perinatal outcome

The evidence is very uncertain about the effect of planned early birth on composite perinatal mortality and morbidity (RR 1.06, 95% CI 0.75 to 1.51; I^2 = 83%; 6 studies, 3576 participants; very low-certainty evidence; Figure 5), resulting in 25 more per 1000 infants experiencing the composite outcome (from 106 fewer to 217 more) (Analysis 1.2). Six RCTs contributed to the pooled effect (Beardmore-Gray 2023; Broekhuijsen 2015; Chappell 2019; Koopmans 2009; Magee 2024; Martin 2014).

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Figure 5. Forest plot (1.2 Composite perinatal mortality and morbidity)



Heterogeneity: Tau² (DL[c]) = 0.03; Chi² = 28.70, df = 5 (P < 0.0001); I² = 83%

Footnotes

[a]For all included trials, this was calculated based on number of reported events
[b]CI calculated by Hartung-Knapp-Sidik-Jonkman (HKSJ) method.
[c]Tau² calculated by DerSimonian and Laird method.

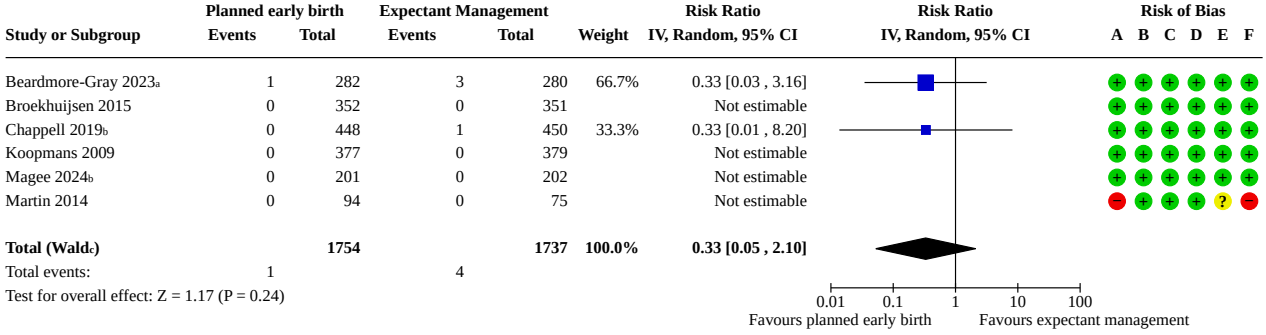
Risk of bias legend

(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Maternal death (individual component of composite maternal outcome)

The evidence is very uncertain about the effect of planned early birth on maternal death (RR 0.33, 95% CI 0.05 to 2.10; I^2 = 0%; 6 studies, 3491 participants; low-certainty evidence; Figure 6), resulting in two fewer per 1000 women dying (from two fewer to three more) (Analysis 1.3). Six studies reported this outcome (Beardmore-Gray 2023; Broekhuijsen 2015; Chappell 2019; Koopmans 2009; Magee 2024; Martin 2014), but only Beardmore-Gray 2023 and Chappell 2019 contributed to the pooled effect as there were no maternal deaths reported in the other four studies. A forest plot is shown in Figure 6.

Figure 6. Forest plot (1.3 Maternal death)



Heterogeneity: Tau² (DL[d]) = 0.00; Chi² = 0.00, df = 1 (P = 1.00); I² = 0%

Footnotes

[a]Defined as maternal death occurring before primary discharge from hospital
[b]Defined as maternal death occurring within six weeks of pregnancy or if later, attributable to complications of pre-eclampsia
[c]CI calculated by Wald-type method.
[d]Tau² calculated by DerSimonian and Laird method.

Risk of bias legend

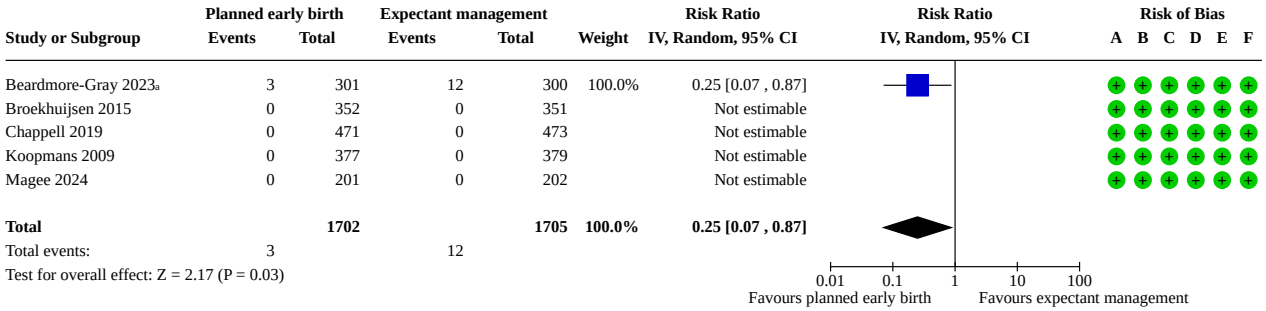
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

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Fetal death (individual component of composite perinatal outcome)

Planned early birth likely results in a large reduction in fetal death (stillbirth) (RR 0.25, 95% CI 0.07 to 0.87; I^2 not applicable; 5 studies, 3407 participants; moderate-certainty evidence; Figure 7), resulting in five fewer per 1000 infants being stillborn (from seven fewer to one fewer) (Analysis 1.4). Five studies reported this outcome (Beardmore-Gray 2023; Broekhuijsen 2015; Chappell 2019; Koopmans 2009; Magee 2024), but only one study reported any events (Beardmore-Gray 2023). Zero events were recorded in studies conducted in high-income countries, highlighting the disparity in outcomes between different income settings.

Figure 7. Forest plot (1.26 Fetal death)



Footnotes

[a]Defined as antepartum or intrapartum stillbirth; there were n=0 antepartum stillbirths in the planned early delivery group and n=3 intrapartum stillbirths in the planned early delivery group. Tl

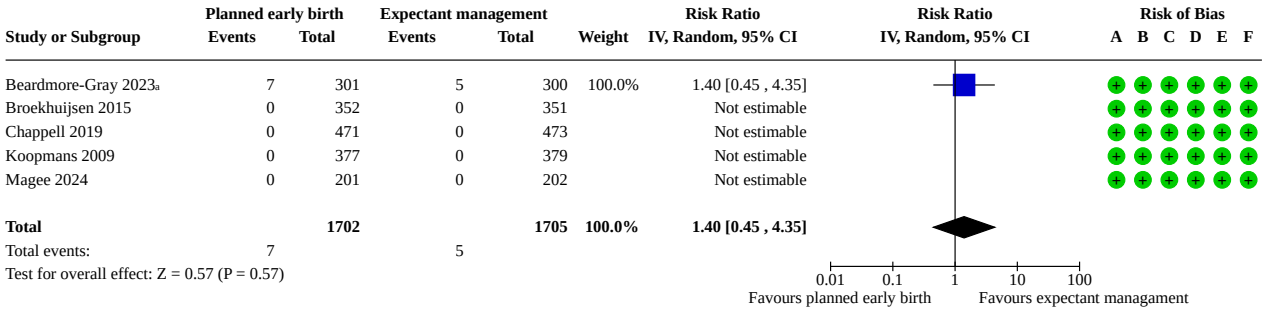
Risk of bias legend

(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Neonatal death (individual component of composite perinatal outcome)

The evidence is very uncertain about the effect of planned early birth on neonatal death (RR 1.40, 95% CI 0.45 to 4.35; I^2 not applicable; 5 studies, 3407 participants; low-certainty evidence; Figure 8), resulting in one more per 1000 infants dying (from two fewer to 10 more) (Analysis 1.5). Five studies reported this outcome (Beardmore-Gray 2023; Broekhuijsen 2015; Chappell 2019; Koopmans 2009; Magee 2024) but only one study reported any events (Beardmore-Gray 2023). Zero events were recorded in studies conducted in high-income countries, highlighting the disparity in outcomes between different income settings.

Figure 8. Forest plot (1.27 Neonatal death)



Footnotes

[a]Not including deaths secondary to congenital anomalies (n=1 in planned delivery group and n=1 in expectant management group)

Risk of bias legend

(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

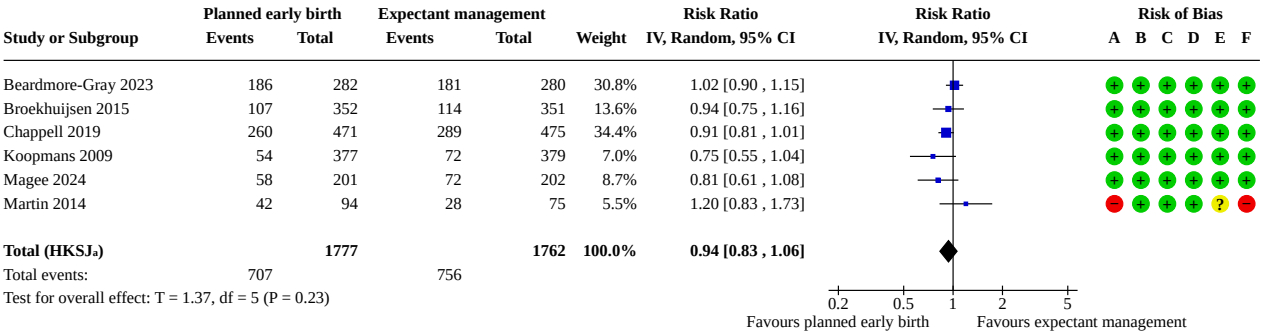
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Important maternal outcomes

Caesarean section (secondary outcome)

Planned early birth results in little to no difference in caesarean section (RR 0.94, 95% CI 0.83 to 1.06; I^2 = 25%; 6 studies, 3539 participants; high-certainty evidence; Figure 9), resulting in 26 fewer per 1000 women undergoing caesarean section (from 73 fewer to 26 more) (Analysis 1.6). Six RCTs contributed to the pooled effect (Beardmore-Gray 2023; Broekhuijsen 2015; Chappell 2019; Koopmans 2009; Magee 2024; Martin 2014).

Figure 9. Forest plot (1.8 Caesarean section)



Heterogeneity: Tau² (DLb) = 0.00; Chi² = 6.67, df = 5 (P = 0.25); I² = 25%

Footnotes

aCI calculated by Hartung-Knapp-Sidik-Jonkman (HKSJ) method.

bTau² calculated by DerSimonian and Laird method.

Risk of bias legend

(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Maternal admission to high dependency unit (secondary outcome)

Planned early birth results in a reduction in maternal admission to a high dependency unit (HDU) (RR 0.75, 95% CI 0.62 to 0.91; I^2 = 0%; 3 studies, 2217 participants) resulting in 42 fewer per 1000 women being admitted to HDU (from 64 fewer to 15 fewer) (Analysis 1.7). Three RCTs contributed to the pooled effect (Beardmore-Gray 2023; Chappell 2019; Koopmans 2009).

Eclampsia (individual component of composite maternal outcome)

The evidence is very uncertain about the effect of planned early birth on eclampsia (RR 0.56, 95% CI 0.21 to 1.46; I^2 = 0%; 6 studies, 3491 participants), resulting in three fewer per 1000 women experiencing eclampsia (from five fewer to three more) (Analysis 1.8). Six studies reported this outcome (Beardmore-Gray 2023; Broekhuijsen 2015; Chappell 2019; Koopmans 2009; Magee 2024; Martin 2014), but only three studies contributed to the pooled effect (Beardmore-Gray 2023; Chappell 2019; Martin 2014).

Pulmonary oedema (individual component of composite maternal outcome)

The evidence is very uncertain about the effect of planned early birth on pulmonary oedema (RR 0.48, 95% CI 0.11 to 1.99; I^2 = 0%; 5 studies, 3323 participants), resulting in two fewer per 1000 women experiencing pulmonary oedema (from three fewer to four more) (Analysis 1.9). Five studies reported this outcome (Beardmore-Gray 2023; Broekhuijsen 2015; Chappell 2019; Koopmans 2009; Magee 2024), but only four studies contributed to the pooled effect (Beardmore-Gray 2023; Chappell 2019; Koopmans 2009; Magee 2024).

Severe renal impairment (individual component of composite maternal outcome)

The evidence is very uncertain about the effect of planned early birth on severe renal impairment (RR 1.04, 95% CI 0.43 to 2.50; I^2 = 0%; 3 studies, 1668 participants), resulting in 0 fewer per 1000 women experiencing severe renal impairment (from 7 fewer to 18 more) (Analysis 1.10). Three RCTs contributed to the pooled effect (Beardmore-Gray 2023; Chappell 2019; Magee 2024).

HELLP syndrome (individual component of composite maternal outcome)

Planned early birth probably results in a reduction in HELLP syndrome (RR 0.54, 95% CI 0.29 to 1.02; I^2 = 0%; 5 studies, 3086 participants), resulting in eight fewer per 1000 women experiencing HELLP syndrome (from 13 fewer to 0 fewer) (Analysis 1.11). Five studies reported this outcome (Beardmore-Gray 2023; Broekhuijsen 2015; Chappell 2019; Koopmans 2009; Martin 2014), but only four studies contributed to the pooled effect (Beardmore-Gray 2023; Broekhuijsen 2015; Chappell 2019; Koopmans 2009).

Important perinatal outcomes

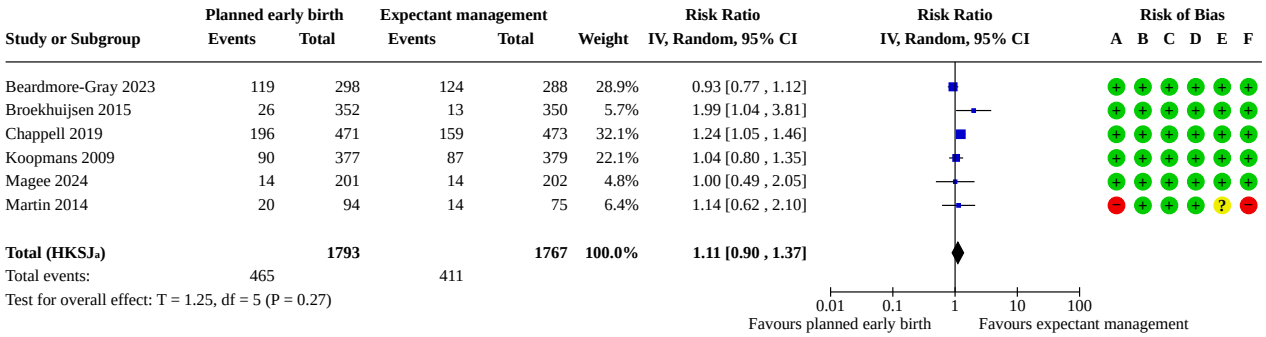
Neonatal unit admission (individual component of composite perinatal outcome)

Planned early birth likely results in little to no difference in admission to neonatal unit admission (RR 1.11, 95% CI 0.90 to 1.37;

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I^2 = 41%; 6 studies, 3560 participants; moderate-certainty evidence; Figure 10), resulting in 26 more per 1000 infants being admitted to the neonatal unit (from 23 fewer to 86 more) (Analysis 1.28). Six RCTs contributed to the pooled effect (Beardmore-Gray 2023; Broekhuijsen 2015; Chappell 2019; Koopmans 2009; Magee 2024; Martin 2014).

Figure 10. Forest plot (1.28 Admission to neonatal unit)



Footnotes

[a]CI calculated by Hartung-Knapp-Sidik-Jonkman (HKSJ) method.

[b]Tau² calculated by DerSimonian and Laird method.

Risk of bias legend

(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Additional maternal and perinatal outcomes

Analyses for additional maternal and perinatal outcomes are presented in Supplementary material 11.

Health resource use data

Four studies reported economic outcomes (Beardmore-Gray 2023; Broekhuijsen 2015; Chappell 2019; Magee 2024). A narrative summary of the results is provided below, due to the different types of analyses performed.

Beardmore-Gray 2023 performed a cost-utility analysis which found that the average costs (in US dollars, USD) of planned early birth (n = 282) were USD 1748 versus USD 1856 for expectant management (n = 280) with a mean cost difference of USD −105 (USD −340 to USD 130) (unpublished data provided by the authors).

Broekhuijsen 2015 performed a trial-based cost-effectiveness analysis. Costs were estimated from a healthcare perspective until maternal and neonatal discharge. This analysis found that the average cost in Euros (EUR) of immediate birth (n = 352) was EUR 10 245 versus EUR 9563 for expectant monitoring (n = 351), with an average difference of EUR 682 (7%) (95% CI EUR −618 to EUR 2126).

Chappell 2019 calculated a comparative difference in costs (in pounds sterling, GBP) based on data from maternal and infant inpatient care and mode of birth. They reported lower total maternal and infant costs in the planned early birth group compared with the expectant management group, with an adjusted cost saving of GBP 1478 (95% CI GBP 2354 to GBP 605; P = 0.00094).

Magee 2024 performed a cost-consequence analysis (in pounds sterling, GBP) from a National Health Service (NHS) perspective, comparing intervention and control management strategies. Overall, their analysis found that planned early birth (compared to usual care) was associated with lower absolute rates of resource use and costs (mean, SD): GBP 6659.57 (SD 1871.63) for the planned early birth group and GBP 7067.37 (SD 2359.80) for the usual care group.

Subgroup analyses

For maternal outcomes, there was a significant difference identified between our prespecified subgroups for the following outcome:

1. Caesarean section: significant difference (P = 0.0002; I^2 = 93%) in the occurrence of this outcome between trials with a mean GA at randomisation 34 to 35^{+6} weeks (RR 0.97, 95% CI 0.84 to 1.10) compared to those with a mean GA at randomisation ≥ 36 weeks (RR 0.78, 95% CI 0.50 to 1.23). See Analysis 1.72.

For perinatal outcomes, there were significant differences identified between prespecified subgroups for some outcomes.

1. Neonatal unit admission: significant difference in the occurrence of this outcome (P = 0.03; I^2 = 78%) between trials conducted in high-income countries (RR 1.19, 95% CI 0.99 to 1.43) compared to low- and middle-income countries (RR 0.93, 95% CI 0.77 to 1.12). See Analysis 1.80.
2. Respiratory distress syndrome: significant difference in the occurrence of this outcome (P = 0.02; I^2 = 83%) between trials including women with pre-eclampsia only (RR 0.93, 95% CI 0.57 to 1.53) compared to a mixture of HDP (RR 3.32, 95% CI 1.35 to 8.18), see Analysis 1.82, and between trials conducted in high-income countries (RR 3.32, 95% CI 1.35 to 8.18) compared to low-

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and middle-income countries (RR 0.93, 95% CI 0.57 to 1.53); test for subgroup differences: P = 0.02; I^2 = 83%, see Analysis 1.83.

3. Need for respiratory support: significant difference in the occurrence of this outcome (P = 0.08; I^2 = 68.4 %) between trials including women with pre-eclampsia only (RR 0.95, 95% CI 0.83 to 1.09) compared to a mixture of HDP (RR 0.14, 95% CI 0.02 to 1.16), see Analysis 1.85, and between trials with a mean GA at randomisation 34 to 35^{+6} weeks (RR 0.95, 95% CI 0.83 to 1.09) compared to those with a mean GA at randomisation ≥ 36 weeks (RR 0.14, 95% CI 0.02 to 1.16); test for subgroup differences: P = 0.08; I^2 = 68.4%, see Analysis 1.87.

Equity assessment

In this updated review we have included a study by Beardmore-Gray 2023 which took place in low-income (Zambia) and lower-middle income (India) countries. The inclusion of these data enhances the generalisability of the review findings to clinicians working in lower-income settings, as well as highlighting the vast disparity between maternal and perinatal outcomes between high-income and low-income settings, which contribute 92% of global maternal deaths.

DISCUSSION

Summary of main results

We included six trials with a total of 3491 women with hypertensive disorders of pregnancy (HDP).

Fewer women experienced an adverse maternal outcome (as defined by the composite outcome of maternal mortality and morbidity) when they were allocated to planned early birth from 34 weeks' gestation onwards. There was no difference in rates of caesarean section between women allocated to planned early birth compared to expectant management. Evidence also suggests no clear difference in maternal death between the two management groups, mainly due to small event numbers.

Overall, it is very uncertain whether planned early birth results in more infants experiencing an adverse outcome or not. Planned early birth likely results in fewer stillbirths and likely results in little to no difference in neonatal unit admission. The impact of planned early birth on neonatal death is uncertain.

Planned early birth also resulted in fewer women being admitted to the high dependency unit (HDU) and probably results in a reduction in HELLP (haemolysis, elevated liver enzymes, low platelets) syndrome.

There was no clear difference in eclampsia, pulmonary oedema, severe renal impairment, or other additional maternal outcomes reported by the included studies, mainly due to small event numbers.

There was no clear difference in any of the other additional perinatal outcomes reported by the included studies, mainly due to small event numbers.

Limitations of the evidence included in the review

We considered all the trials included in this review to be low risk when assessed for trustworthiness. We considered five out of the six trials to be at low risk of bias, and these were large, well-designed, randomised controlled trials. We judged one trial to be at high risk of bias due to a lack of information regarding concealment of the allocation (randomisation) sequence and the lack of a published protocol. However, this trial was initiated in 2002, prior to widespread use of web-based randomisation platforms and before publication of a prespecified trial protocol was a mandatory aspect of trial governance. Baseline characteristics and clinical outcomes reported in this trial did not suggest any issues with the randomisation process. Overall, this trial contributed a small number of participants (n = 169) to our analysis.

Due to the nature of the intervention, no studies attempted to blind participants or clinicians to group allocation. We did not downgrade studies for this; however, women and staff would have been aware of the intervention and this may have affected aspects of care and decision-making. Where we downgraded the evidence from high to either moderate, low, or very low, it was mostly because the confidence intervals were wide, crossing both the line of no effect and appreciable benefit or harm, or because event numbers were low (less than 30).

As indicated in Certainty of the evidence assessment, the threshold for suggested appreciable benefit for the relative effect was 0.75, and the threshold for suggested appreciable harm was 1.25. Where the confidence interval crossed these thresholds, we downgraded the certainty of evidence by one, two, or three levels depending on the width of the confidence interval and included reasons for imprecision judgements in the footnotes of Summary of findings 1.

The studies included in this review addressed the objective, which was to determine the risks and benefits of expectant management versus planned early birth for the hypertensive disorders of pregnancy after 34 weeks' gestation. The management of pre-eclampsia diagnosed before 34 weeks is described in another Cochrane review [26].

In the previous version of this review, the two largest trials contributing the majority of evidence included a heterogeneous population of women with gestational hypertension, pre-eclampsia, and fewer women with chronic hypertension. Also, in the previous version of this review, most of the women included came from the Netherlands, with smaller numbers from India, the USA and Saudi Arabia. In this updated review, we included three trials that have been completed since the publication of the previous review. Chappell 2019 is the largest timing-of-birth trial for women with pre-eclampsia completed to date, contributing 898 women to this review. Beardmore-Gray 2023 also contributed a large number of women (n = 562) with late preterm pre-eclampsia to this review, and was the only trial evaluating planned early birth conducted in a low and lower-middle income country (Zambia and India). Magee 2024 was the only trial evaluating planned early birth for women with gestational or chronic hypertension without pre-eclampsia, contributing 403 women to this review. The inclusion of these trials further increases the generalisability of our findings, and the applicability across varied global settings.

In this review, we synthesised results from trials including women with different types of hypertensive disorders, in different settings, and with varied timing of the intervention (planned early birth). The recommended timing of birth varies depending on whether there is a diagnosis of chronic hypertension, gestational hypertension or pre-eclampsia and the findings outlined by this review should be interpreted accordingly.

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There remain challenges when considering hypertensive disorders of pregnancy together. The underlying pathophysiology of pre-eclampsia is distinct, with maternal endothelial dysfunction leading to multiorgan complications and potentially severe maternal and fetal outcomes, and women with pre-eclampsia may benefit more from a planned early birth, at an earlier gestation, given the high risk nature of this condition.

Given the potential for heterogeneity, we carried out subgroup analyses as described in the Methods.

There were no significant differences identified in the composite maternal or perinatal outcomes based on type of hypertensive disorder when evaluated at a trial level. Two trials included women with gestational hypertension and pre-eclampsia (Broekhuijsen 2015; Koopmans 2009). This is a heterogeneous population, and individual participant data would improve our ability to detect differences in outcomes according to specific type of hypertensive disorder. However, an individual participant data meta-analysis (IPD-MA) including these two trials evaluated outcomes for women with pre-eclampsia only [30], and found similar findings to those in this review. The IPD-MA found that planned early birth for women with late preterm pre-eclampsia significantly reduced the risk of maternal mortality and morbidity, and reduced the risk of babies being born small-for-gestational age, but increased short-term respiratory morbidity.

The variation in reporting of perinatal outcomes is a further limitation of the evidence presented in this review, with some trials reporting more objective measures of neonatal morbidity (e.g. neonatal unit admission or need for respiratory support) and others reporting respiratory distress syndrome, which relies more on clinical judgement. The heterogeneity of perinatal outcomes between trials, as well as variations in clinical practice over time, varied use of antenatal corticosteroids, and neonatal unit admission criteria make it difficult to interpret the short-term impact of late preterm birth on the infant, compounded by a lack of longer-term follow up.

Due to the known discrepancies in maternal and perinatal mortality between high-income and low- and middle-income countries, we performed a prespecified subgroup analysis for all critical and important outcomes based on income classification. For the composite maternal outcome, there was no significant difference between subgroups in this analysis (P = 0.48), with planned early birth conferring significant maternal benefit in both high-income countries and low- and lower-middle-income countries. For the composite perinatal outcome, the test for subgroup differences did not suggest a difference between high-income and low- and lower-middle-income countries (P = 0.16).

There was no significant difference (P = 0.39) in the composite perinatal outcome between trials that had a mean gestational age at randomisation between 34 and 35 weeks and 6 days (35^{+6}) (RR 1.14, 95% CI 0.63 to 2.06) and those that had a mean gestational age at randomisation ≥ 36 weeks (RR 0.91, 95% 0.08 to 9.91). It is important to note that trials with a later mean gestational age at randomisation included mostly women with gestational or chronic hypertension.

A notable improvement to the evidence included in this updated review is the increased reporting of both economic measures and women's experiences. However, this was done inconsistently and using different methods, making it difficult to draw direct comparisons. Future work should focus on developing more consistent measures of these important outcomes. Additionally, our consumer involvement group pointed to the critical importance of assessing the psychological impact of hypertensive disorders on women, as well as their longer-term health outcomes, and this is something which future research must incorporate.

Limitations of the review processes

The assessment of risk of bias involves subjective judgements. This potential limitation was minimised by following the procedures in the *Cochrane Handbook for Systematic Reviews of Interventions* [36], with review authors independently assessing studies and resolving any disagreement through discussion, and if required, involving a third assessor in the decision.

Agreements and disagreements with other studies or reviews

The updated version of this review shows that planned early birth for hypertensive disorders of pregnancy is associated with less severe maternal adverse outcomes. Planned early birth likely results in fewer stillbirths and likely results in little to no difference in neonatal unit admission.

The inclusion of new evidence in this review increases the generalisability and certainty of this evidence, compared to the previous review [25], with the important inclusion of data from low- and middle-income countries, and a higher proportion of women with pre-eclampsia, which is the most high-risk of the hypertensive disorders of pregnancy, and more data on infant outcomes.

Reassuringly, there was no increased risk of caesarean section associated with planned early birth, which is consistent with other recent reviews evaluating induction of labour [27, 28, 29], and specifically planned early birth for pre-eclampsia from 34 weeks' gestation [30].

International guidelines recommend specific gestational ages for birth based on hypertensive condition [4]. Currently, women with pre-eclampsia are recommended to deliver by 37 weeks, or sooner if there are severe features present. Women with gestational or chronic hypertension are recommended to deliver by 40 weeks, or sooner if there are severe features present or pre-eclampsia develops.

This updated review supports current practice and provides reassuring evidence that planned early birth from 34 weeks' onwards reduces maternal complications without increasing the risk of caesarean section and likely results in little to no difference in neonatal unit admission, with a large reduction in the risk of stillbirth.

Clinicians may therefore feel more justified in offering late preterm birth, from 34 weeks' onwards, rather than continuation of pregnancy, with the exact timing of birth depending on the type of hypertensive disorder.

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AUTHORS' CONCLUSIONS

Implications for practice

For women with hypertensive disorders of pregnancy (HDP) beyond 34 weeks' gestation, planned early birth is associated with a lower risk of maternal complications, and probably a reduced risk of fetal death (stillbirth), with no increased risk of caesarean section and probably no clear differences in the rate of neonatal unit admission or short-term neonatal morbidity.

It is important that the timing of delivery takes into account the woman's preferences, the type of hypertensive disorder and the presence or absence of severe features. For example, women with pre-eclampsia may choose an earlier birth, from 34 weeks onwards, due to the higher risk of complications associated with this type of hypertensive disorder. Similarly, if there are severe features present such as uncontrollable severe hypertension, abnormal maternal kidney or liver function, evidence of fetal compromise or severe maternal symptoms, then birth should be expedited. All women with pre-eclampsia should be offered a planned early birth no later than 37 weeks. Women who have gestational hypertension or chronic hypertension without signs of complications may choose to continue with careful monitoring and consider planned early birth from 39 weeks onwards.

Further information is needed to establish the longer-term infant outcomes associated with late preterm birth and longer-term maternal cardiovascular health.

Equity-related implications for practice

Planned birth is an important intervention irrespective of the clinical setting. However, given the clear perinatal benefit associated with planned early birth in low-income countries, clinicians and policy-makers should focus resources on timely detection, referral, and implementation of planned early birth in low income countries in order to address the current discrepancies in maternal and perinatal outcomes.

Implications for research

Further research is needed to assess the psychological impact of HDP on women, their experiences of care, and how best to provide decision support around the timing of birth, such that women are able to make informed and autonomous decisions.

Whilst planned early birth reduces the risk of short-term maternal morbidity, there is a lack of longer-term follow-up data, and future studies should evaluate longer-term health outcomes for women and whether planned early birth affects these.

Further consensus is required regarding the most meaningful outcome measures of short-term neonatal morbidity to collect, as well as the benefits and risks of antenatal corticosteroids at late preterm gestations for HDP.

Further evidence is also needed regarding the longer-term infant outcomes following planned early birth in the context of hypertensive disorders of pregnancy.

SUPPLEMENTARY MATERIALS

Supplementary materials are available with the online version of this article: 10.1002/14651858.CD009273.pub3.

Supplementary material 1 Search strategies

Supplementary material 2 Characteristics of included studies

Supplementary material 3 Characteristics of excluded studies

Supplementary material 4 Characteristics of studies awaiting classification

Supplementary material 5 Risk of bias

Supplementary material 6 Analyses

Supplementary material 7 Data package

Supplementary material 8 Cochrane Pregnancy and Childbirth Trustworthiness Screening Tool: Domains and Methods

Supplementary material 9 Consumer involvement methods and survey

Supplementary material 10 Outcome definitions

Supplementary material 11 Additional maternal and perinatal outcomes

ADDITIONAL INFORMATION

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Editorial and peer-reviewer contributions

The following people conducted the editorial process for this article:

- Sign-off Editor (final editorial decision): Professor Philippa Middleton: SAHMRI, Adelaide University, Stillbirth Centre for Research Excellence;
- Managing Editor (collated peer-reviewer comments, provided editorial guidance to authors, and edited the article): Marwah Anas El-Wegoud, Cochrane Central Editorial Service;
- Editorial Assistant (selected peer reviewers, conducted editorial policy checks, and supported editorial team): Lisa Wydrzynski, Cochrane Central Editorial Service;
- Copy Editor (copy editing and production): Andrea Takeda, Cochrane Central Production Service;
- Peer-reviewers (provided comments and recommended an editorial decision): Clare Miles, Evidence Production and Methods Directorate (methods review); Jo Platt, Central Editorial Information Specialist (search review); Mustafa Salman, Royal College Of Surgeons In Ireland, Bahrain (patient and public review).

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Contributions of authors

CC and ABG reviewed and updated the protocol.
ABG, CFT and CC performed study selection, data extraction, risk of bias and trustworthiness assessments.
ABG and CR conducted the analyses, prepared the summary of findings table, and drafted the review.
CC and ABG provided clinical perspectives to the review.

All authors approved the final version to be published, and agreed to be accountable for all aspects of the review update.

Declarations of interest

ABG is an author of an included study in this review (Beardmore-Gray 2023). All decisions relating to this study (assessment for inclusion/exclusion, risk of bias and data extraction) were carried out by the other members of the review team who are not directly involved in the study.
CR: none known.
CFT: none known.
CC: none known.

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- King's Health Partners Centre for Translational Medicine, UK

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- Academy of Medical Sciences, UK

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Registration and protocol

The original review and review protocol can be accessed via the following links.

- Protocol (2011) [38]: doi.org/10.1002/14651858.CD009273
- Original review (2017)[25]: doi.org/10.1002/14651858.CD009273.pub2

Data, code and other materials

As part of the published Cochrane review, the following is made available for download for users of the Cochrane Library: Full search strategies for each database; full citations of each unique report for all studies included, ongoing or awaiting classification, or excluded at the full text screen, in the final review; study data, including study information, study arms, and study results or test data; consensus risk of bias assessments; and analysis data, including overall estimates and settings, subgroup estimates, and individual data rows. Appropriate permissions have been obtained for such use. Analyses and data management were conducted within Cochrane's authoring tool, RevMan, using the inbuilt computation methods. Template data extraction forms from Covidence are available from the authors on reasonable request.

All data available in Supplementary material 7.

What's new

Date	Event	Description
21 May 2026	New citation required and conclusions have changed	We have updated the review (previously published in 2017). We have included 6 studies involving a total of 3491 randomised women. The conclusions have changed since the last review. For women with hypertensive disorders of pregnancy beyond 34 weeks' gestation, planned early delivery is associated with a lower risk of maternal complications, and a reduced risk of fetal death (stillbirth), with no increased risk of caesarean section and no clear differences in the rate of neonatal unit admission or short-term neonatal morbidity.
21 May 2026	New search has been performed	A new search was conducted on 18 June 2024 and the review was updated. This new version includes 6 trials with 3491 women. The searches were repeated on 16 January 2026 and no new potentially eligbile studies were identified.

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History

Protocol first published: Issue 8, 2011
Review first published: Issue 1, 2017

Date	Event	Description
14 January 2014	Amended	For clarification, the gestational age in the title has been changed from "at or near term" to "from 34 weeks to term".
12 December 2012	Amended	This scope of this protocol has been expanded to incorporate all hypertensive disorders of pregnancy and not just pre-eclampsia. The methods section (Assessment of reporting biases/Subgroup analysis and investigation of heterogeneity) has been updated to incorporate the Cochrane Pregnancy and Childbirth Groups' updated standard methods text. A new co-author (C M Koopmans) has joined the review team.

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ADDITIONAL TABLES

Table 1. Overview of included studies and synthesis table

Study ID	Country	Participants	Pre-eclampsia Yes/No	Gestational hypertension Yes/No	Chronic hypertension Yes/No	Intervention	Comparator	Gestational age range	Outcomes
Beardmore-Gray 2023	Zambia and India (low and lower-middle income)	Women with pre-eclampsia, without an immediate indication for delivery	Yes	No	No	Planned early birth	Expectant management	34–37 weeks	• Maternal death • Eclampsia • Pulmonary oedema • Severe renal impairment • HELLP syndrome • Caesarean section • Maternal HDU admission • Cerebrovascular event • Retinal detachment • Cortical blindness • Liver haematoma or rupture • Maternal hepatic dysfunction • Intubation and ventilation (not for childbirth) • Placental abruption • Postpartum haemorrhage • Severe hypertension • Assisted vaginal delivery • Maternal admission to intensive care unit • Fetal death • Neonatal death • Neonatal unit admission • Necrotising enterocolitis • Respiratory distress syndrome • Need for respiratory support • Need for supplementary oxygen • Small-for-gestational age • Neonatal seizures • Apgar score < 7 at 5 minutes • Surfactant use • Early neonatal sepsis • Maternal length of stay • Neonatal length of stay

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Table 1. Overview of included studies and synthesis table *(Continued)*

									• Duration of neonatal unit admission
Broekhuijsen 2015	The Netherlands (high income)	Women with gestational hypertension, pre-eclampsia, deteriorating pre-existing hypertension, or superimposed pre-eclampsia, without severe features	Yes	Yes	Yes	Planned early birth	Expectant management	34–37 weeks	• Maternal death • Eclampsia • Pulmonary oedema • HELLP syndrome • Caesarean section • Thromboembolic disease • Placental abruption • Assisted vaginal delivery • Fetal death • Neonatal death • Neonatal unit admission • Grade III or IV intraventricular or intracerebral haemorrhage • Necrotising enterocolitis • Respiratory distress syndrome • Neonatal seizures • Apgar score < 7 at 5 minutes • Cord blood pH < 7.1
Chappell 2019	UK (high income)	Women with pre-eclampsia, without an immediate indication for delivery	Yes	No	No	Planned early birth	Expectant management	34–37 weeks	• Maternal death • Eclampsia • Pulmonary oedema • Severe renal impairment • Severe renal impairment • Caesarean section • Maternal HDU admission • Cerebrovascular event • Retinal detachment • Cortical blindness • Liver haematoma or rupture • Maternal hepatic dysfunction • Thromboembolic disease • Intubation and ventilation (not for childbirth) • Placental abruption • Postpartum haemorrhage • Severe hypertension

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Table 1. Overview of included studies and synthesis table *(Continued)*

									• Assisted vaginal delivery • Maternal admission to intensive care unit • Fetal death • Neonatal death • Neonatal unit admission • Grade III or IV intraventricular or intracerebral haemorrhage • Necrotising enterocolitis • Need for respiratory support • Need for supplementary oxygen • Small-for-gestational age • Neonatal seizures • Apgar score < 7 at 5 minutes • Cord blood pH < 7.1 • Early neonatal sepsis • Duration of neonatal unit admission
Koopmans 2009	The Netherlands (high income)	Women with gestational hypertension or mild pre-eclampsia	Yes	Yes	No	Planned early birth	Expectant management	36–41 weeks	• Maternal death • Eclampsia • Pulmonary oedema • Severe renal impairment • Caesarean section • Maternal HDU admission • Thromboembolic disease • Placental abruption • Postpartum haemorrhage • Severe hypertension • Assisted vaginal delivery • Maternal admission to intensive care unit • Fetal death • Neonatal death • Neonatal unit admission • Apgar score < 7 at 5 minutes • Cord blood pH < 7.1 • Early neonatal sepsis • Duration of neonatal unit admission

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Table 1. Overview of included studies and synthesis table *(Continued)*

Magee 2024	UK (high income)	Women with gestational hypertension or chronic hypertension	No	Yes	Yes	Planned early birth	Expectant management	36–38 weeks	• Maternal death • Eclampsia • Pulmonary oedema • Severe renal impairment • Caesarean section • Cerebrovascular event • Retinal detachment • Cortical blindness • Liver failure • Liver haematoma or rupture • Maternal hepatic dysfunction • Disseminated intravascular coagulopathy • Placental abruption • Postpartum haemorrhage • Severe hypertension • Assisted vaginal delivery • Maternal admission to intensive care unit • Fetal death • Neonatal death • Neonatal unit admission • Need for respiratory support • Need for supplemental oxygen • Small-for-gestational age • Apgar score < 7 at 5 minutes • Early neonatal sepsis
Martin 2014	USA (high income)	Women with pre-eclampsia, without severe features	Yes	No	No	Planned early birth	Expectant management	34–37 weeks	• Maternal death • Eclampsia • Severe renal impairment • HELLP syndrome • Caesarean section • Maternal hepatic dysfunction • Severe hypertension • Neonatal unit admission • Small-for-gestational age • Maternal length of stay • Duration of neonatal unit admission

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Abbreviations: HDU: high dependency unit; HELLP syndrome: haemolysis, elevated liver enzymes and low platelets syndrome

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Table 2. Summary of subgroup analyses for maternal outcomes

Outcome	Subgroup	Pooled effect	Test for subgroup differences
Composite maternal mortality and morbidity events	Condition: pre-eclampsia	RR 0.55 (95% CI 0.36 to 0.85)	P = 0.53; I^2 = 0%
	Condition: gestational hypertension or chronic hypertension	RR 1.00 (95% CI 0.25 to 3.96)	
	Condition: pre-eclampsia, gestational hypertension or chronic hypertension	RR 0.41 (95% CI 0.19 to 0.89)	
	High income countries	RR 0.59 (95% CI 0.38 to 0.92)	P = 0.48; I^2 = 0%
	Low and middle income countries	RR 0.45 (95% CI 0.24 to 0.84)	
	Mean GA at randomisation 34 to 35.9 weeks	RR 0.54 (95% CI 0.36 to 0.80)	P = 0.94; I^2 = 0%
	Mean GA at randomisation ≥ 36.0 weeks	RR 0.56 (95% CI 0.22 to 1.38)	
Maternal death	Condition: pre-eclampsia	RR 0.33 (95% CI 0.05 to 2.10)	Not applicable
	Condition: gestational hypertension or chronic hypertension	Not estimable	
	Condition: pre-eclampsia, gestational hypertension or chronic hypertension	Not estimable	
	High income countries	RR 0.33 (95% CI 0.01 to 8.20)	P = 1.00; I^2 = 0%
	Low and middle income countries	RR 0.33 (95% CI 0.03 to 3.16)	
	Mean GA at randomisation 34 to 35.9 weeks	RR 0.33 (95% CI 0.05 to 2.10)	Not applicable
	Mean GA at randomisation ≥ 36.0 weeks	Not estimable	
Eclampsia	Condition: pre-eclampsia	RR 0.56 (95% CI 0.21 to 1.46)	Not applicable
	Condition: gestational hypertension or chronic hypertension	Not estimable	
	Condition: pre-eclampsia, gestational hypertension or chronic hypertension	Not estimable	
	High income countries	RR 0.63 (95% CI 0.16 to 2.41)	P = 0.81; I^2 = 0%
	Low and middle income countries	RR 0.50 (95% CI 0.13 to 1.97)	
	Mean GA at randomisation 34 to 35.9 weeks	RR 0.56 (95% CI 0.21 to 1.46)	Not applicable
	Mean GA at randomisation ≥ 36.0 weeks	Not estimable	
Pulmonary oedema	Condition: pre-eclampsia	RR 0.35 (95% CI 0.05 to 2.31)	P = 0.43; I^2 = 0%
	Condition: gestational hypertension or chronic hypertension	RR 3.01 (95% CI 0.12 to 73.57)	

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Table 2. Summary of subgroup analyses for maternal outcomes *(Continued)*

	Condition: pre-eclampsia, gestational hypertension or chronic hypertension	RR 0.20 (95% CI 0.01 to 4.17)	
	High income countries	RR 0.61 (95% CI 0.12 to 3.10)	P = 0.52; I^2 = 0%
	Low and middle income countries	RR 0.20 (95% CI 0.01 to 4.12)	
	Mean GA at randomisation 34 to 35.9 weeks	RR 0.35 (95% CI 0.05 to 2.31)	P = 0.65; I^2 = 0%
	Mean GA at randomisation ≥ 36.0 weeks	RR 0.74 (95% CI 0.05 to 10.52)	
Severe renal failure	Condition: pre-eclampsia	RR 0.94 (95% CI 0.36 to 2.41)	P = 0.56; I^2 = 0%
	Condition: gestational hypertension or chronic hypertension	RR 2.01 (95% CI 0.18 to 21.99)	
	Condition: pre-eclampsia, gestational hypertension or chronic hypertension	RR 1.04 (95% CI 0.43 to 2.50)	
	High income countries	RR 0.99 (95% CI 0.28 to 3.52)	P = 0.93; I^2 = 0%
	Low and middle income countries	RR 1.08 (95% CI 0.32 to 3.67)	
	Mean GA at randomisation 34 to 35.9 weeks	RR 0.94 (95% CI 0.36 to 2.41)	P = 0.56; I^2 = 0%
	Mean GA at randomisation ≥ 36.0 weeks	RR 2.01 (95% CI 0.18 to 21.99)	
HELLP syndrome	Condition: pre-eclampsia	RR 0.73 (95% CI 0.30 to 1.80)	P = 0.38; I^2 = 0%
	Condition: gestational hypertension or chronic hypertension	RR 0.41 (95% CI 0.17 to 1.00)	
	Condition: pre-eclampsia, gestational hypertension or chronic hypertension	RR 0.54 (95% CI 0.29 to 1.02)	
	High income countries	RR 0.53 (95% CI 0.28 to 1.01)	P = 0.66; I^2 = 0%
	Low and middle income countries	RR 0.99 (95% CI 0.06 to 15.80)	
	Mean GA at randomisation 34 to 35.9 weeks	RR 0.65 (95% CI 0.31 to 1.39)	P = 0.41; I^2 = 0%
	Mean GA at randomisation ≥ 36.0 weeks	RR 0.37 (95% CI 0.12 to 1.14)	
Caesarean section	Condition: pre-eclampsia	RR 0.98, 95% CI 0.76 to 1.26	P = 0.36; I^2 = 3.1%
	Condition: gestational hypertension or chronic hypertension	RR 0.81, 95% CI 0.61 to 1.08	
	Condition: pre-eclampsia, gestational hypertension or chronic hypertension	RR 0.87, 95% CI 0.24 to 3.20	
	High income countries	RR 0.90, 95% CI 0.80 to 1.03	P = 0.11; I^2 = 60%
	Low and middle income countries	RR 1.02, 95% CI 0.90 to 1.15	
	Mean GA at randomisation 34 to 35.9 weeks	RR 0.97, 95% CI 0.84 to 1.10	P = 0.0002; I^2 = 93%

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Table 2. Summary of subgroup analyses for maternal outcomes *(Continued)*

	Mean GA at randomisation ≥ 36.0 weeks	RR 0.78, 95% CI 0.50 to 1.23	
Maternal admission to HDU	Condition: pre-eclampsia	RR 0.75 (95% CI 0.57 to 0.97)	P = 0.55; I^2 = 0%
	Condition: gestational hypertension or chronic hypertension	Not estimable	
	Condition: pre-eclampsia, gestational hypertension or chronic hypertension	RR 0.94 (95% CI 0.46 to 1.92)	
	High income countries	RR 0.69 (95% CI 0.54 to 0.88)	P = 0.27; I^2 = 16.1%
	Low and middle income countries	RR 0.87 (95% CI 0.62 to 1.22)	
	Mean GA at randomisation 34 to 35.9 weeks	RR 0.75 (95% CI 0.57 to 0.97)	P = 0.55; I^2 = 0%
	Mean GA at randomisation ≥ 36.0 weeks	RR 0.94 (95% CI 0.46 to 1.92)	
Severe hypertension	Condition: pre-eclampsia	RR 0.68, 95% CI 0.13 to 3.44	P = 0.48; I^2 = 0%
	Condition: gestational hypertension or chronic hypertension	RR 0.90, 95% CI 0.48 to 1.68	
	Condition: pre-eclampsia, gestational hypertension or chronic hypertension	RR 0.58 (95% CI 0.41 to 0.82)	
	High income countries	RR 0.62, 95% CI 0.20 to 1.88	P = 0.66; I^2 = 0%
	Low and middle income countries	RR 0.73, 95% CI 0.59 to 0.91	
	Mean GA at randomisation 34 to 35.9 weeks	RR 0.68, 95% CI 0.13 to 3.44	P = 0.97; I^2 = 0%
	Mean GA at randomisation ≥ 36.0 weeks	RR 0.67, 95% CI 0.05 to 9.15	

Abbreviations: CI: confidence interval; GA: gestational age; HDU: high dependency unit; HELLP syndrome: haemolysis, eleveated liver enzymes and low platelets syndrome; RR: risk ratio

Table 3. Summary of subgroup analyses for perinatal outcomes

Outcome	Subgroup	Pooled effect	Test for subgroup differences
Composite perinatal mortality and morbidity	Condition: pre-eclampsia	RR 0.99, 95% CI 0.71 to 1.39	P = 0.23; I^2 = 32.1%
	Condition: gestational hypertension or chronic hypertension	RR 0.70 (95% CI 0.43 to 1.15)	
	Condition: pre-eclampsia, gestational hypertension or chronic hypertension	RR 1.58, 95% CI 0.01 to 460.59	
	High income countries	RR 1.16, 95% CI 0.70 to 1.92	P = 0.16; I^2 = 49.7%
	Low and middle income countries	RR 0.89 (95% CI 0.85 to 0.94)	
	Mean GA at randomisation 34 to 35.9 weeks	RR 1.14, 95% CI 0.63 to 2.06	P = 0.39; I^2 = 0%

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Table 3. Summary of subgroup analyses for perinatal outcomes *(Continued)*

	Mean GA at randomisation ≥ 36.0 weeks	RR 0.91, 95% CI 0.08 to 9.91	
Fetal death	Condition: pre-eclampsia	RR 0.25 (95% CI 0.07 to 0.87)	Not applicable
	Condition: gestational hypertension or chronic hypertension	Not estimable	
	Condition: pre-eclampsia, gestational hypertension or chronic hypertension	Not estimable	
	High income countries	Not estimable	Not applicable
	Low and middle income countries	RR 0.25 (95% CI 0.07 to 0.87)	
	Mean GA at randomisation 34 to 35.9 weeks	RR 0.25 (95% CI 0.07 to 0.87)	Not applicable
	Mean GA at randomisation ≥ 36.0 weeks	Not estimable	
Neonatal death	Condition: pre-eclampsia	RR 1.40 (95% CI 0.45 to 4.35)	Not applicable
	Condition: gestational hypertension or chronic hypertension	Not estimable	
	Condition: pre-eclampsia, gestational hypertension or chronic hypertension	Not estimable	
	High income countries	Not estimable	Not applicable
	Low and middle income countries	RR 1.40 (95% CI 0.45 to 4.35)	
	Mean GA at randomisation 34 to 35.9 weeks	RR 1.40 (95% CI 0.45 to 4.35)	Not applicable
	Mean GA at randomisation ≥ 36.0 weeks	Not estimable	
Admission to neonatal unit	Condition: pre-eclampsia	RR 1.08, 95% CI 0.71 to 1.65	P = 0.79; I^2 = 0%
	Condition: gestational hypertension or chronic hypertension	RR 1.00 (95% CI 0.49 to 2.05)	
	Condition: pre-eclampsia, gestational hypertension or chronic hypertension	RR 1.34, 95% CI 0.02 to 74.42	
	High income countries	RR 1.19, 95% CI 0.99 to 1.43	P = 0.03; I^2 = 78%
	Low and middle income countries	RR 0.93 (95% CI 0.77 to 1.12)	
	Mean GA at randomisation 34 to 35.9 weeks	RR 1.16, 95% CI 0.76 to 1.78	P = 0.39; I^2 = 0%
	Mean GA at randomisation ≥ 36.0 weeks	RR 1.04, 95% CI 0.90 to 1.19	
Respiratory distress	Condition: pre-eclampsia	RR 0.93 (95% CI 0.57 to 1.53)	P = 0.02; I^2 = 83%
	Condition: gestational hypertension or chronic hypertension	Not estimable	

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Table 3. Summary of subgroup analyses for perinatal outcomes *(Continued)*

	Condition: pre-eclampsia, gestational hypertension or chronic hypertension	RR 3.32 (95% CI 1.35 to 8.18)	
	High income countries	RR 3.32, 95% CI 1.35 to 8.18	P = 0.02; I^2 = 83%
	Low and middle income countries	RR 0.93 (95% CI 0.57 to 1.53)	
	Mean GA at randomisation 34 to 35.9 weeks	RR 1.66, 95% CI 0.48 to 5.74	P = 0.75; I^2 = 0%
	Mean GA at randomisation ≥ 36.0 weeks	RR 1.01, 95% CI 0.06 to 16.01	
Respiratory support	Condition: pre-eclampsia	RR 0.95, 95% CI 0.83 to 1.09	P = 0.08; I^2 = 68.4%
	Condition: gestational hypertension or chronic hypertension	RR 0.14 (95% CI 0.02 to 1.16)	
	Condition: pre-eclampsia, gestational hypertension or chronic hypertension	Not estimable	
	High income countries	RR 0.49, 95% CI 0.00 to 43,672.43)	P = 0.47; I^2 = 0%
	Low and middle income countries	RR 0.97, 95% CI 0.56 to 1.66	
	Mean GA at randomisation 34 to 35.9 weeks	RR 0.95, 95% CI 0.83 to 1.09	P = 0.08; I^2 = 68.4%
	Mean GA at randomisation ≥ 36.0 weeks	RR 0.14 (95% CI 0.02 to 1.16)	

Abbreviations: CI: confidence interval; GA: gestational age; RR: risk ratio

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