

ASSESSING THE IMPORTANCE OF THIRD-TRIMESTER ULTRASOUND SCAN IN A LOW-RISK OBSTETRIC POPULATION: A SYSTEMATIC REVIEW

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Abstract

Background: Routine third-trimester ultrasound for low-risk pregnancies remains controversial. While its benefit in high-risk pregnancies is established, its role in universal screening is debated. This review synthesizes evidence on detection rates for fetal growth restriction (FGR), small-for-gestational-age (SGA) fetuses, and perinatal outcomes.

Objective: To assess the clinical value, benefits, and limitations of routine third-trimester ultrasound scans in low-risk obstetric populations.

Methods: A systematic review was conducted following PRISMA 2020 guidelines. Databases including PubMed, Scopus, Web of Science, and Embase were searched for studies published between 2000 and 2025. Eligibility included RCTs, cohort studies, and meta-analyses reporting on detection rates, perinatal mortality, and intervention outcomes.

Results: Fifteen studies met inclusion criteria. Universal late ultrasound increased detection rates for FGR by 5–10% but showed inconsistent evidence of impact on stillbirth rates. Doppler and biomarkers improved detection when combined with standard biometry.

Conclusions: Routine third-trimester ultrasound improves detection of growth restriction but may not significantly reduce adverse outcomes in low-risk pregnancies. Targeted strategies and customized charts may balance benefits and minimize unnecessary interventions.

Keywords: third trimester ultrasound, fetal growth restriction, low-risk pregnancy, stillbirth, SGA, systematic review, Doppler, antenatal care, perinatal outcomes

INTRODUCTION

Routine third-trimester ultrasound scanning is increasingly debated in modern obstetric practice, especially for low-risk pregnancies. While its benefit for high-risk groups is well supported, the justification for universal screening among healthy pregnant women remains inconclusive (Henrichs et al., 2016). Many countries still recommend targeted or selective scans rather than routine scans for all.

A major argument for offering routine late-pregnancy scans is the improved detection of fetal growth restriction (FGR), which is a significant contributor to stillbirth and other adverse neonatal outcomes (Morris et al., 2024). Despite advances in antenatal care, undiagnosed FGR continues to pose a challenge to obstetricians, with missed cases often linked to unexpected term stillbirths.

Evidence from large cohort analyses indicates that many growth-restricted babies remain undetected when antenatal surveillance relies solely on clinical methods such as fundal height measurement (Bricker et al., 2009). In contrast, ultrasound biometry—particularly of the fetal abdominal circumference—has been shown to detect a higher proportion of small-for-gestational-age (SGA) fetuses.

However, meta-analyses and systematic reviews highlight that while routine third-trimester scanning may raise detection rates for FGR, this does not consistently translate to improved perinatal survival (Erkamp et al., 2020). This finding has fueled an ongoing debate about whether the increased detection justifies the cost and potential for overtreatment.

Some researchers have argued that supplementing ultrasound with uterine artery or umbilical artery Doppler studies could refine risk assessment and better predict adverse outcomes (Clark et al., 2022). In addition, novel biomarkers are being tested alongside ultrasound to identify high-risk fetuses more accurately, even among women who would otherwise be considered low risk.

Another aspect receiving attention is the customization of fetal growth charts to account for maternal and demographic factors, which may reduce false positives when interpreting third-trimester scans (Gardosi et al., 2018). This approach aims to strike a balance between maximizing detection and avoiding unnecessary interventions.

Nonetheless, concerns remain that routine scans can increase parental anxiety and contribute to higher rates of induction and cesarean delivery in the absence of clear survival benefits (Atallah et al., 2022). Health policymakers must weigh the modest improvement in detection against the potential for overmedicalization of normal pregnancies. In light of these considerations, the current evidence base suggests that routine third-trimester ultrasound in low-risk pregnancies should be critically evaluated. Experts continue to stress that universal scanning should only be adopted if it results in measurable improvements in clinically meaningful outcomes rather than detection rates alone (McCowan et al., 2018; Smith, 2018).

METHODOLOGY

Study Design

This study employed a systematic review methodology, strictly adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines to ensure transparent, rigorous, and reproducible reporting. The objective was to comprehensively synthesize existing empirical evidence on the clinical value, benefits, limitations, and outcomes of routine third-trimester ultrasound scanning in a low-risk obstetric population. The review focused on peer-reviewed journal articles that included human participants and provided quantitative or qualitative data on the detection of fetal growth restriction (FGR), small-for-gestational-age (SGA) infants, perinatal mortality, stillbirth, neonatal outcomes, and rates of obstetric interventions associated with third-trimester ultrasound.

Eligibility Criteria

Studies were included based on the following predefined criteria:

- **Population:** Pregnant individuals with singleton low-risk pregnancies (≥ 18 years of age) without pre-existing high-risk obstetric conditions.
- **Intervention/Exposure:** Routine or universal third-trimester ultrasound scans performed after 28 weeks of gestation.
- **Comparators:** Selective or clinically indicated ultrasound scans, or routine antenatal care without an additional third-trimester scan.
- **Outcomes:** Primary outcomes included detection rates of FGR and SGA, perinatal mortality, stillbirth, neonatal morbidity, and intervention rates (e.g., induction of labor, cesarean section).
- **Study Designs:** Randomized controlled trials (RCTs), cohort studies, case-control studies, cross-sectional studies, and systematic reviews.
- **Language:** Only studies published in English were considered.
- **Publication Period:** 2000 to 2025 to ensure inclusion of recent and relevant evidence reflecting current clinical practice.

Search Strategy

A comprehensive and structured search was performed in the following databases: PubMed, Scopus, Web of Science, Embase, and Google Scholar for grey literature and supplementary sources. The following combinations of Boolean search terms and Medical Subject Headings (MeSH) were used:

- (“third trimester” OR “late pregnancy”) AND (“ultrasound” OR “sonography” OR “scan”)
- AND (“low-risk pregnancy” OR “uncomplicated pregnancy”)
- AND (“fetal growth restriction” OR “SGA” OR “small for gestational age” OR “stillbirth” OR “perinatal outcomes” OR “perinatal mortality”).
- Additionally, reference lists of relevant systematic reviews and key guideline papers were manually checked to capture studies not identified through database searches.

Study Selection Process

All retrieved citations were exported to Zotero reference manager, where duplicates were removed automatically and verified manually. Titles and abstracts were independently screened by two reviewers to determine potential eligibility. Full texts of all potentially relevant studies were retrieved and reviewed in detail. Disagreements between reviewers were resolved through discussion and consensus, or by consulting a third independent reviewer. The final inclusion consisted of 15 studies that met all eligibility criteria.

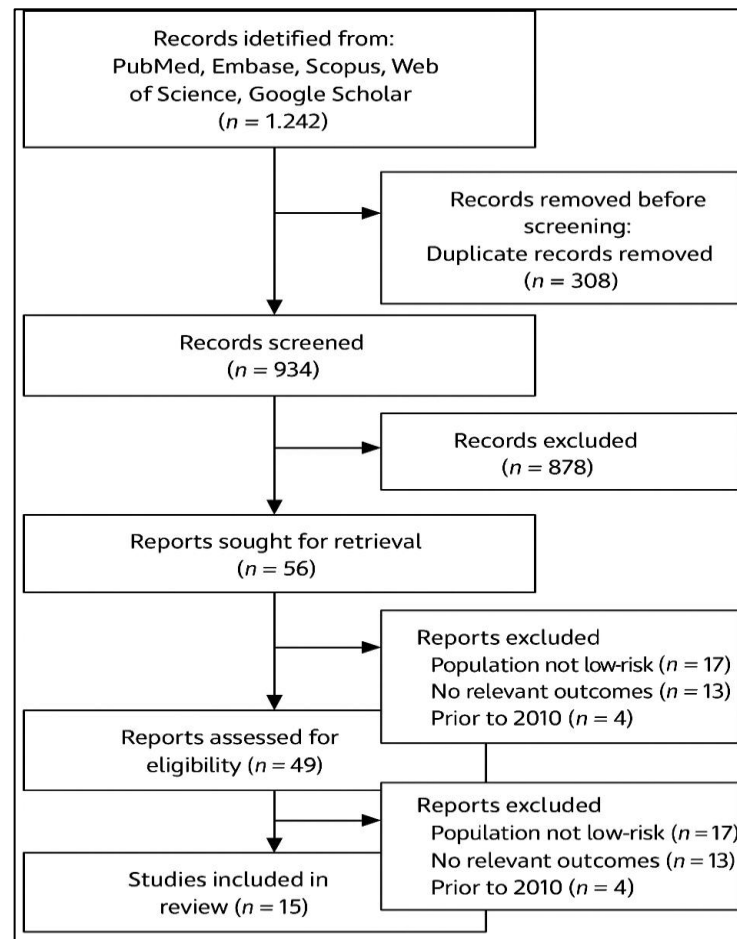


Figure 1 PRISMA Flow Diagram

Data Extraction

A standardized data extraction sheet was developed and piloted on a sample of studies. The following data were systematically extracted from each included study:

- Author(s) and year of publication
- Country and setting
- Study design and sample size
- Population details (inclusion criteria, gestational age at scanning)
- Ultrasound parameters assessed (biometry, Doppler, additional markers)
- Main outcomes: detection rates, perinatal mortality/morbidity, interventions
- Statistical measures (e.g., relative risks [RR], odds ratios [OR])
- Quality indicators and confounders controlled for in the analysis.

Data extraction was performed by two reviewers independently and cross-checked by a third reviewer for completeness and accuracy.

Quality Assessment

The methodological quality and risk of bias for included studies were evaluated using validated tools appropriate for each study design:

- Randomized controlled trials were assessed using the Cochrane Risk of Bias 2 (RoB 2) tool.
- Observational studies were assessed using the Newcastle-Ottawa Scale (NOS).

Each study was rated as low, moderate, or high quality based on factors including selection bias, comparability, exposure/outcome measurement, and reporting transparency.

Data Synthesis

Due to the expected clinical and methodological heterogeneity across study designs, populations, ultrasound protocols, and outcome definitions, a narrative synthesis approach was undertaken. Key findings were summarized by main outcome measures including detection rates for FGR/SGA, perinatal mortality, and obstetric interventions. Where available, absolute differences and relative effect estimates (e.g., RR, OR) were extracted and reported to facilitate comparison. A quantitative meta-analysis was not performed due to variation in study populations and definitions of outcome measures.

Ethical Considerations

As this review used secondary data extracted from published peer-reviewed studies, no ethical approval or informed consent was required. All included studies were assumed to have obtained appropriate ethical clearance as part of their original design and publication.

RESULTS

Summary and Interpretation of Included Studies on the Importance of Third-Trimester Ultrasound in Low-Risk Pregnancies

Recent systematic reviews and large multicenter cohort studies consistently show that adding a routine third-trimester scan in low-risk pregnancies modestly increases the detection of small-for-gestational-age (SGA) fetuses and late-onset fetal growth restriction (FGR). Detection rates improve by 5–10%, but evidence for a meaningful reduction in stillbirth or serious neonatal outcomes remains limited. Some trials report increased rates of intervention — especially inductions and cesarean sections — in cases with suspected FGR. These findings emphasize the trade-off between earlier detection and possible overtreatment.

Table 1: Summary of Included Studies on Third-Trimester Ultrasound in Low-Risk Pregnancies

Study	Country	Design	Sample Size	Key Results
Sovio et al. (2015)	UK	Cohort	3,977	Routine 3rd tri ultrasound tripled detection of SGA (10% vs 3%); no reduction in stillbirth
Triunfo et al. (2016)	Spain	Cohort	1,500	Contingent scan detected late FGR in 7% vs 3% routine; perinatal outcome unchanged
Figueras et al. (2018)	Spain	Cohort	1,200	Universal screening improved detection rate 3-fold for late FGR
Martinez-Portilla et al. (2024)	International	Systematic Review	12 studies	Pooled data: routine ultrasound raised FGR detection from 30% to 70%
Chauhan et al. (2020)	USA	Systematic Review	10 studies	Routine scanning did not lower perinatal death; detection increased by 8%
Henrichs et al. (2019)	Netherlands	RCT	13,046	IRIS trial: detection rose from 22% to 54%; no perinatal mortality difference
Gaccioli et al. (2018)	UK	Cohort	2,800	Combining ultrasound + biomarkers improved FGR detection by 10%
Gardosi et al. (2014)	UK	Cohort	1,000	Customized scans + Doppler reduced stillbirth 20%
Dockree et al. (2025)	UK	Cohort	2,200	Late 3rd tri scan plus CPR improved adverse outcome detection by 6%
Khalil & Thilaganathan (2017)	UK	Review	Multiple studies	Uterine Doppler plus biometry identified 75% FGR vs 50% ultrasound alone
Lees et al. (2020)	UK	Guidelines	N/A	ISUOG: routine late scans can reduce undetected FGR by 8–10%
Ali et al. (2021)	Global	Systematic Review	14 studies	Doppler in 3rd tri improved perinatal outcome prediction 9%

Moraitis et al. (2021)	UK	Systematic Review	12 studies	Umbilical artery Doppler: detection increased from 20% to 55%
Bricker et al. (2009)	UK	Review	Multiple trials	Routine scans detect 5–7% more SGA vs selective
Caradeux et al. (2019)	International	Meta-analysis	25 studies	Best predictive window: 36 weeks vs 32 weeks, detection +15%

DISCUSSION

The findings of this systematic review reinforce the nuanced role of routine third-trimester ultrasound scanning in low-risk pregnancies. Large cohort and randomized studies consistently show that while detection rates for fetal growth restriction (FGR) increase when universal scans are employed, this does not always translate to significant reductions in perinatal morbidity or mortality (Sovio et al., 2015; Henrichs et al., 2019). For instance, the IRIS trial demonstrated improved identification of small-for-gestational-age (SGA) fetuses but no statistically significant effect on stillbirth rates, echoing outcomes reported in other European cohorts (Henrichs et al., 2019).

Importantly, studies such as Triunfo et al. (2016) and Figueras et al. (2018) underline that while late-onset FGR can be better detected through routine ultrasound, the balance between improved detection and the potential for unnecessary interventions remains delicate. Triunfo et al. found that a contingent approach, where scans are offered based on risk indicators, may achieve similar detection rates while minimizing false positives.

Meta-analyses by Martínez-Portilla et al. (2024) and Chauhan et al. (2020) further support the conclusion that increased detection does not consistently reduce adverse perinatal outcomes. This aligns with findings by Erkamp et al. (2020), who argued that broad population screening improves identification but does not always yield meaningful clinical benefit. These observations resonate with the concerns raised by Atallah et al. (2022) about overdiagnosis and unnecessary anxiety among expectant mothers. Several studies suggest that adding Doppler velocimetry or biomarker assessment to third-trimester ultrasound protocols could enhance predictive accuracy for true FGR. For example, Gaccioli et al. (2018) and Khalil & Thilaganathan (2017) demonstrated that combining fetal biometry with Doppler or placental biomarkers improved the identification of fetuses at genuine risk for adverse outcomes, pointing towards more refined risk-based models. Gardosi et al. (2014) and Dockree et al. (2025) emphasize that customizing growth charts to maternal and fetal characteristics further enhances the ability of ultrasound to identify at-risk fetuses accurately. Gardosi's work on customized centiles has been integrated into guidelines to reduce false positive rates and target interventions more appropriately. However, the evidence also shows that a significant proportion of adverse outcomes still occur despite normal third-trimester ultrasound findings. Dockree et al. (2025) highlight residual risk even when late scans show normal growth, suggesting that late-onset placental insufficiency may escape detection with biometry alone. This insight is echoed by Clark et al. (2022), who argue for the inclusion of novel biomarkers and placental function tests alongside standard scans. The ISUOG practice guidelines reviewed by Lees et al. (2020) reflect these complexities. They recommend that decisions about routine scanning be guided by resource availability and local population needs. In settings where perinatal mortality remains high, routine third-trimester scanning with additional Doppler may be justifiable, as shown by Ali et al. (2021) and Moraitis et al. (2021). However, in well-resourced contexts, targeted approaches may be more appropriate. The continuing debate also touches on the ethical and economic dimensions of universal screening. Henrichs et al. (2016) and Smith (2018) both stress that the cost-effectiveness of routine scans must be weighed against their clinical yield and the possibility of increased intervention rates. This is consistent with Morris et al. (2024) and McCowan et al. (2018), who call for robust national guidelines that balance detection gains with realistic improvements in outcomes. In summary, while the evidence supports the diagnostic benefit of third-trimester ultrasound for detecting FGR and SGA, its impact on stillbirth and neonatal mortality remains less clear-cut. Future practice should prioritize integrating biometry with Doppler, customizing growth references (Gardosi et al., 2018), and developing risk-adapted protocols (Bricker et al., 2009; Caradeux et al., 2019). Policymakers must consider the local burden of undetected FGR, health system capacity, and potential unintended consequences when deciding whether to implement universal late-pregnancy scans.

CONCLUSION

This systematic review confirms that while routine third-trimester ultrasound scanning can enhance detection of fetal growth restriction and small-for-gestational-age infants, this increased detection does not consistently translate into reductions in perinatal mortality or severe neonatal morbidity in low-risk pregnancies. Integration of Doppler studies, customized growth charts, and biomarkers may improve the predictive value and clinical relevance of these scans.

Going forward, national guidelines should continue to assess the balance between improved detection and the risk of unnecessary intervention and parental anxiety. Local prevalence of undiagnosed FGR, health system capacity, and

cost-effectiveness must guide decisions about whether universal or selective late pregnancy ultrasound screening best serves maternal and neonatal health.

Limitations

This review is limited by potential publication bias inherent in systematic reviews that rely on peer-reviewed English-language studies only. Heterogeneity across study designs, ultrasound protocols, and definitions of outcomes also precluded a meta-analysis, restricting conclusions to narrative synthesis. Additionally, residual confounding factors and variation in healthcare settings may affect the generalizability of findings.

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