

Clinical Utility of the Umbilicocerebral Ratio (UCR) in Perinatal Outcomes: A Systematic Review

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Introduction

- Fetal Doppler is essential in high-risk pregnancies.
- CPR is widely used, but UCR has shown superior predictive value.

- Formula:

$$UCR = \frac{PI_{Umbilical}}{PI_{MCA}}$$

- Interpretation:
- UCR < 1.0 → normal prognosis, brain sparing.
- UCR > 1.0 → ↑ placental resistance, risk of hypoxia.
- UCR > 1.5 → linked to asphyxia, preterm birth, NICU admission.

Objectives

- Evaluate UCR as predictor of adverse perinatal outcomes (asphyxia, low Apgar, preterm birth).
- Compare UCR with CPR in clinical utility.

Identification
Records identified (n = 28)
Records after duplicates removed (n = 21)

Screening
Records screened (n = 21)
Records excluded (n = 16)

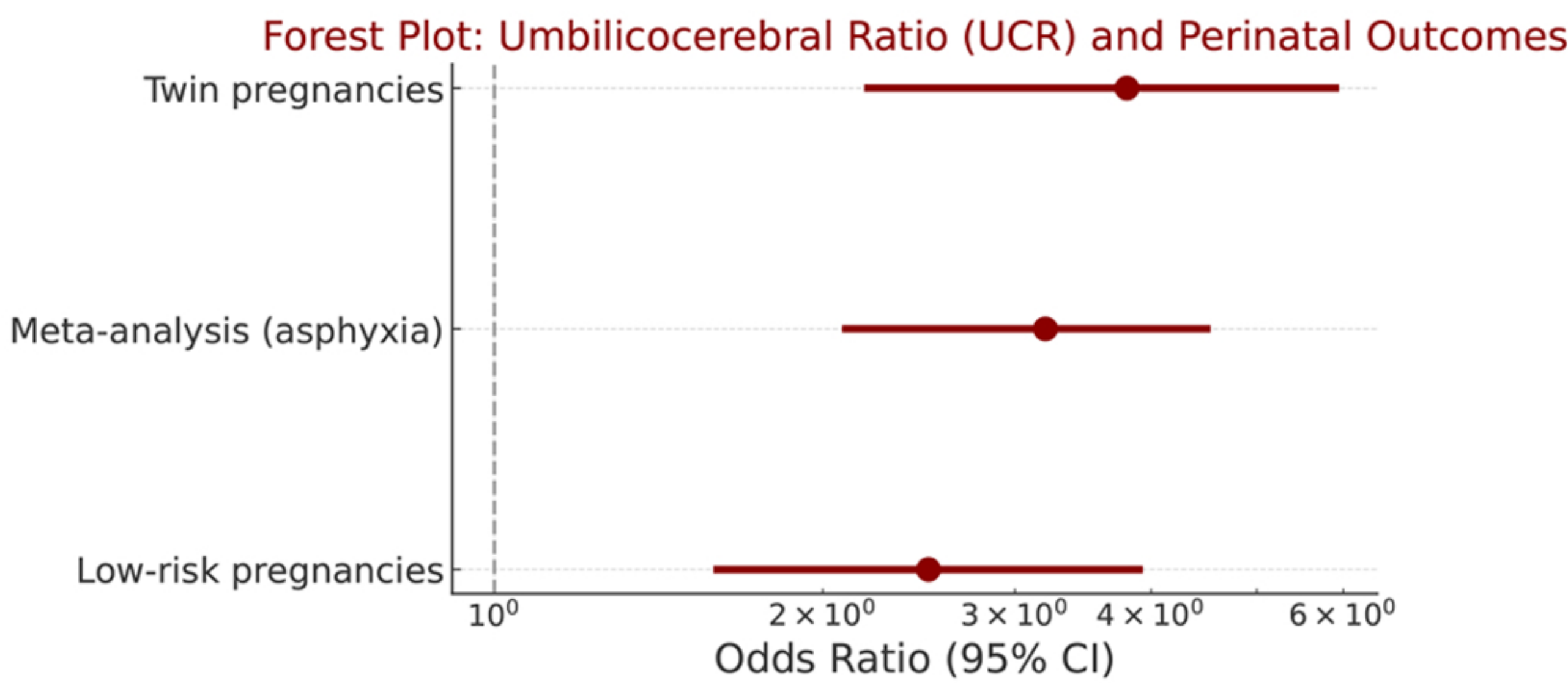
Included
Studies included in the review (n = 5)

Eligibility
Full-text articles assessed (n = 5)
Full-text articles excluded (n = 0)

PRISMA flow

Methods

- Systematic review (PRISMA).
- Databases: PubMed, ScienceDirect, Cochrane.
- Inclusion: ≥35 weeks, perinatal outcomes, UCR measurement.
- Exclusion: case reports, anomalies, animal studies.
- Quality assessment: Newcastle–Ottawa Scale & Cochrane Risk of Bias.



Results

- 5 studies included (n ≈ 4,250).
- Low-risk pregnancies: UCR predicted low Apgar ≤7 (OR 2.5).
- Meta-analysis: Elevated UCR ↑ risk of neonatal asphyxia (RR 3.2).
- Gestational diabetes: UCR better for preterm birth prediction (AUC 0.84 vs CPR 0.76).
- Twins: UCR associated with preterm birth <34 wks (OR 3.8).
- FGR: UCR superior to CPR for NICU admission & low birth weight.

Discussion

- UCR is a strong predictor of adverse outcomes.
- Shows higher sensitivity than CPR for asphyxia and low Apgar.
- Easy, reproducible, adaptable with percentiles and Z-scores.

Conclusion

- UCR is reliable and clinically useful in fetal surveillance.
- Supports integration into standardized Doppler protocols.
- Particularly valuable in high-risk pregnancies.

Keywords

Umbilicocerebral Ratio · Cerebroplacental Ratio
Fetal Doppler · Neonatal Asphyxia · Apgar Score
Perinatal Outcomes

References

- Khalil A, Morales-Roselló J, Morlando M, et al. Cerebroplacental ratio in the assessment of fetal wellbeing. Am J Obstet Gynecol. 2022;226(2S):S31-S45.
- Oros D, Ruiz-Martinez S, Staines-Urias E, et al. Umbilicocerebral ratio and perinatal outcomes in pregnancies at risk of placental insufficiency. Ultrasound Obstet Gynecol. 2021;57(4):558-566.
- Conde-Agudelo A, Villar J, Kennedy SH, et al. Predictive value of Doppler ultrasound in high-risk pregnancies. Cochrane Database Syst Rev. 2019;7(7):CD012903.
- Morales-Roselló J, Khalil A, Perales-Marin A, et al. Clinical applications of the umbilicocerebral ratio: a systematic review. J Matern Fetal Neonatal Med. 2022;35(15):2947-2955.
- Azzarone G, Dall'Asta A, Khalil A, et al. Prediction of perinatal outcomes using the cerebroplacental ratio and umbilicocerebral ratio: evidence from systematic reviews and meta-analyses. Ultrasound Obstet Gynecol. 2021;58(2):172-179.