

Predictive model for shoulder dystocia in pregnancies complicated by maternal diabetes

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Introduction

- Maternal diabetes is an important risk factor for shoulder dystocia (SD)
- Accurate predictors for shoulder dystocia may improve counseling, management, and outcomes in high-risk pregnancies
- Predictors based on a 33-36 week growth ultrasound could prove to be clinically impactful

Methods

- This study evaluates 33-36 weeks ultrasound findings and a prenatal algorithm that would predict shoulder dystocia prior to delivery in diabetic mothers
- This is a cross-sectional case-control study of 63 diabetic mothers who developed SD (study group) and 91 diabetic mothers without SD (control group) who delivered vaginally at a single medical center between January 2013 and December 2021
- Maternal and neonatal characteristics were obtained along with ultrasound biometry performed at 33-36 weeks
- Logistic regression models for SD prediction were developed based on biometric predictors: ratio of Head Circumference (HC) over Abdominal Circumference (AC) (HC/AC) and HC over Estimated Fetal Weight (EFW) (HC/EFW in mm/grams)
- A prediction model was developed

RESULTS

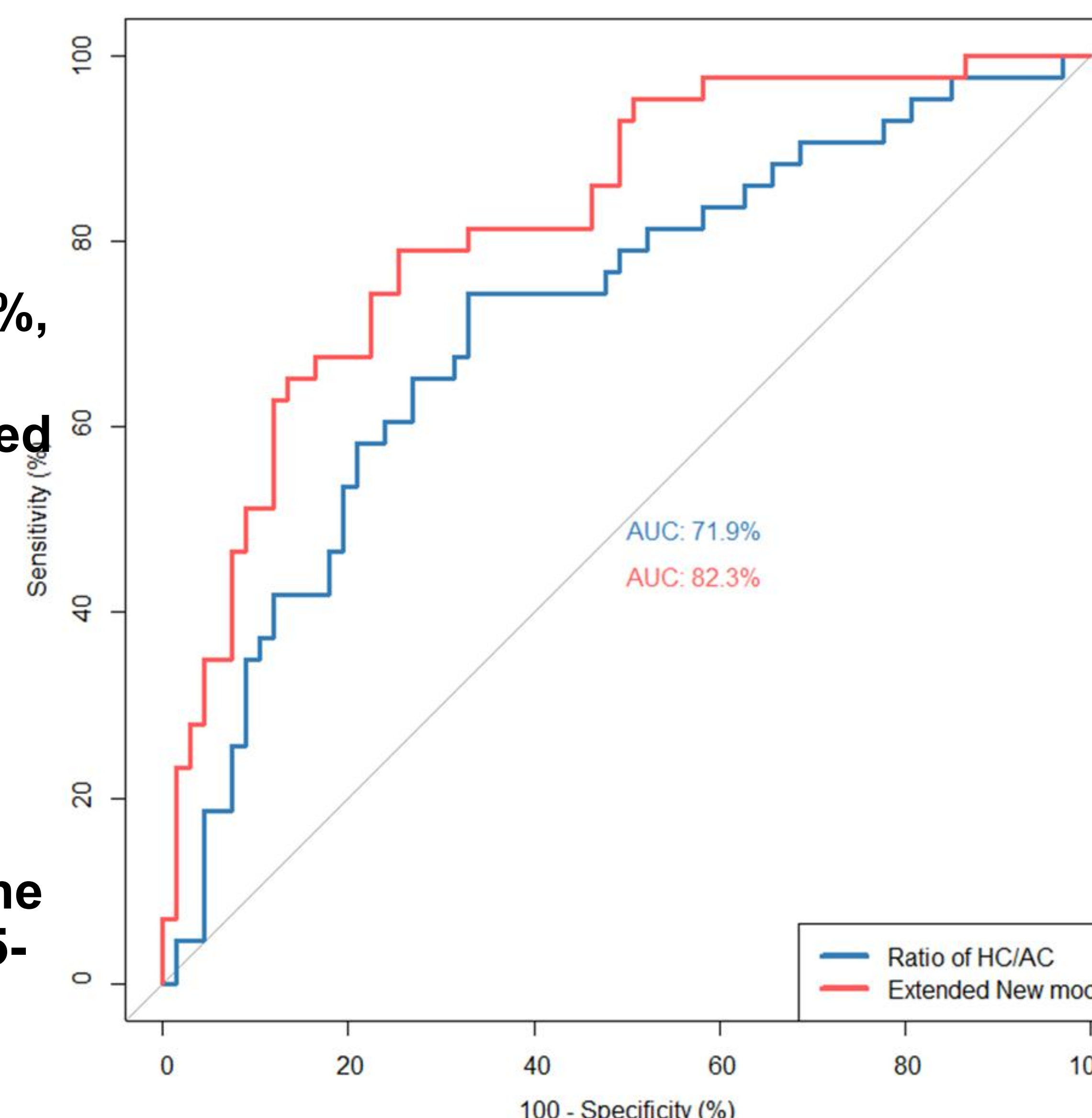
Ultrasound at 33-36 weeks revealed significant differences in derived ratios between SD and control groups:

- The HC/AC ratio was lower in the shoulder dystocia compared to controls ($p = 0.001$)
- HC/EFW ratio was higher in cases ($p = 0.002$)

• **HC/AC Ratio Model:** Achieved an AUC of 0.719 (95% CI: 0.650-0.789). At an HC/AC cutoff of 1.00, sensitivity was 74.4%, specificity 53.8%, PPV 51.6%, and NPV 76.1%.

• **HC/EFW Ratio Model:** Yielded an AUC of 0.682 (95% CI: 0.610-0.754), indicating moderate predictive ability.

• **Extended Model:** Incorporating HC/AC ratio, maternal BMI, health insurance type, and gestational age improved the AUC to 0.821 (95% CI: 0.765-0.879), demonstrating enhanced accuracy with clinical covariates



HC/AC < 1 is a quick screening tool for detection of SD in diabetic mothers based ultrasound at 33-36 weeks

Extended model offers enhanced accuracy

Discussion

- Our results indicate that most maternal characteristics alone were not able to predict shoulder dystocia in diabetic mothers accurately
- On the other hand, HC/AC < 1 at 33-36 weeks provides a quick screening tool in diabetic mothers
- Maternal race non-Hispanic Black was associated with shoulder dystocia (p -value 0.037), which is consistent with previously detected racial and ethnic disparities in diabetes management, as non-Hispanic Black women are disproportionately affected by poor glycemic control, with 15 times the odds of having an A1C $\geq 6.5\%$ compared to non-Hispanic White women (Britton et al PMID: 29757070)

Limitations of the Study

- Because of the low incidence of shoulder dystocia, a cross-sectional design was followed, which represents a limitation on the ability to generalize conclusions
- A larger sample size may provide additional information regarding potential risk factors that were not detected by our sample size
- This study focused on diabetic mothers. Different etiologies for shoulder dystocia such as labor mechanics may be less predicted by HC/AC ratio