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A good reason to keep in mind: predicting adverse outcomes in small for gestational age fetuses using the cerebroplacental ratio

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Introduction

Fetal growth restriction (FGR) is associated with **adverse neonatal outcomes**, such as higher morbidity, mortality, and neurodevelopmental delays. However, the main clinical challenge lies in **distinguishing** truly growth-restricted **fetuses at risk of adverse outcomes** from those who are merely constitutionally small. Prenatal assessment is based on estimated fetal weight and fetoplacental Doppler assessment. One of those Doppler parameters is the **Cerebroplacental ratio (CPR)**, which can be used as an indirect marker of **cerebrovascular redistribution** in response to fetal hypoxemia.

Objectives

To assess whether **CPR** is individually a good indicator of **adverse obstetric, perinatal and neonatal outcomes** in fetuses with an estimated fetal weight (EFW) or abdominal circumference (AC) <10th Percentile, regardless of other parameters of fetal assessment.

Methods

A **retrospective** study was conducted in a group of **singleton** pregnancies with **cephalic** presentation who had a diagnosis of **late FGR (≥32 weeks of pregnancy) or SGA** as per last ultrasound, between 2022 and 2024. Newborns delivered through **elective cesarean section** were **excluded**. Cases were divided into 2 groups: **Group 1 - normal CPR**; **Group 2 – abnormal CPR** (<5th Percentile). **Obstetric outcomes** (rate of urgent cesarean delivery in general, and cesarean for fetal distress) and **neonatal outcomes** (5min APGAR <7, need for resuscitation, neonatal morbidity, and admission to Neonatal Intensive Care Unit - NICU) were evaluated both individually **and as a composite adverse perinatal outcome (CAPO)**. The same analysis was conducted in a **subgroup that only included FGR cases**. Sensitivity, specificity and Predictive Values for CPR as a predictor of any adverse perinatal outcomes were calculated.

Results

	Group 1 (n = 106)	Group 2 (n = 21)	p-value
Maternal Age (years)	31,3 ± 6,0	34,0 ± 4,9	0,037
Parity (Nulliparous / Multiparous)	60 (56,5%) / 46 (43,4%)	9 (42,9%) / 12 (57,1%)	0,339
Mean Birth Weight (g)	2416,2 ± 340,6	1851,5 ± 3272,8	< 0,001
Development of Hypertensive Disease of Pregnancy	8 (7,5%)	4 (19,0%)	0,037
High-risk for FGR (at least 1 risk factor)	61 (57,5%)	14 (66,7%)	0,112

Table 1. Description of the study groups

	Total cohort (n=127)	FGR Subgroup (n=54)
Sensitivity	34,9%	57,7%
Specificity	92,9%	78,6%
Positive Predictive Value	71,4%	71,4%
Negative Predictive Value	73,6%	66,7%

Table 2. Sensitivity, spceficity and predictive values of CPR <P5

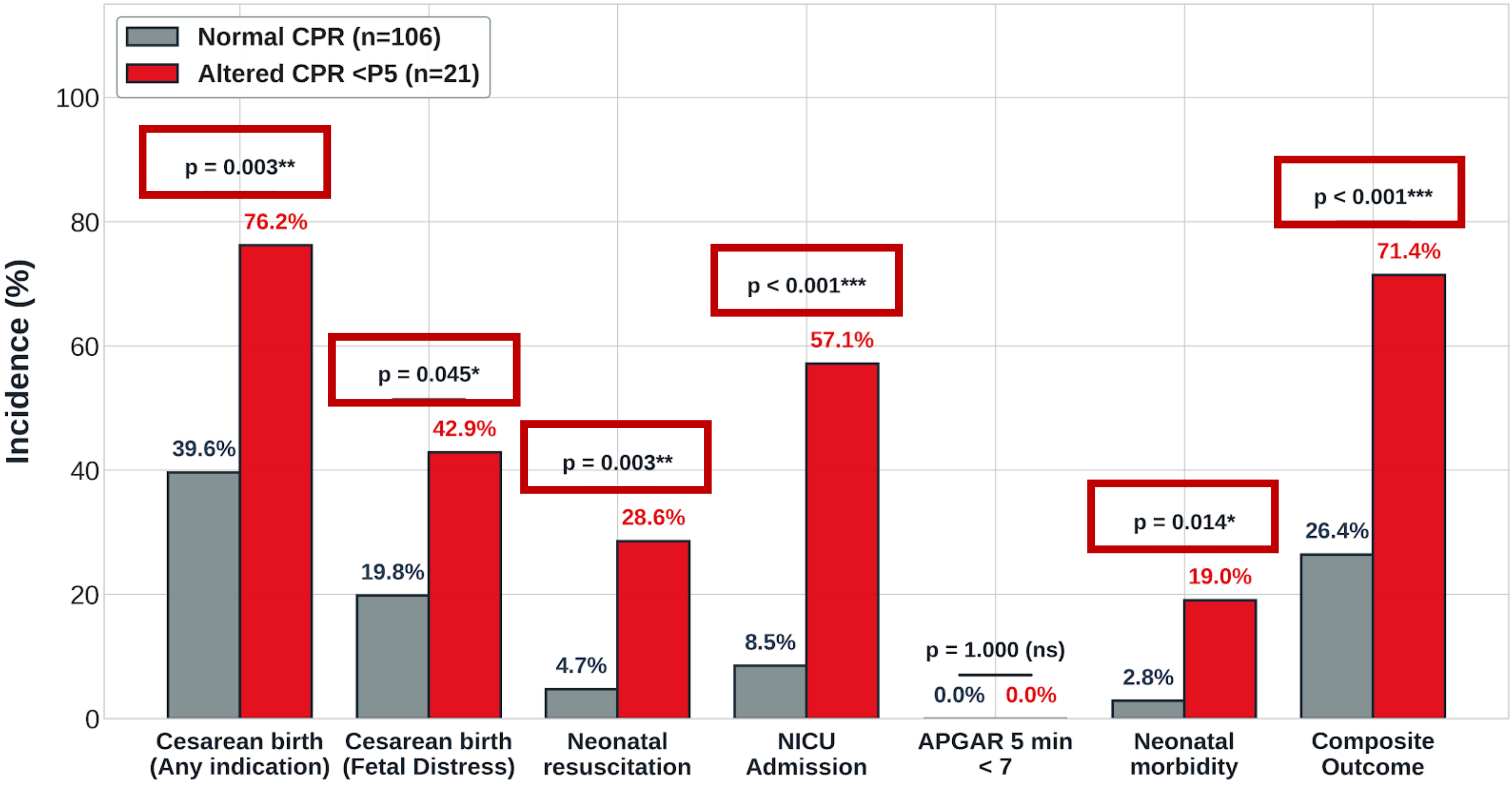


Figure 1. Outcomes by CPR status

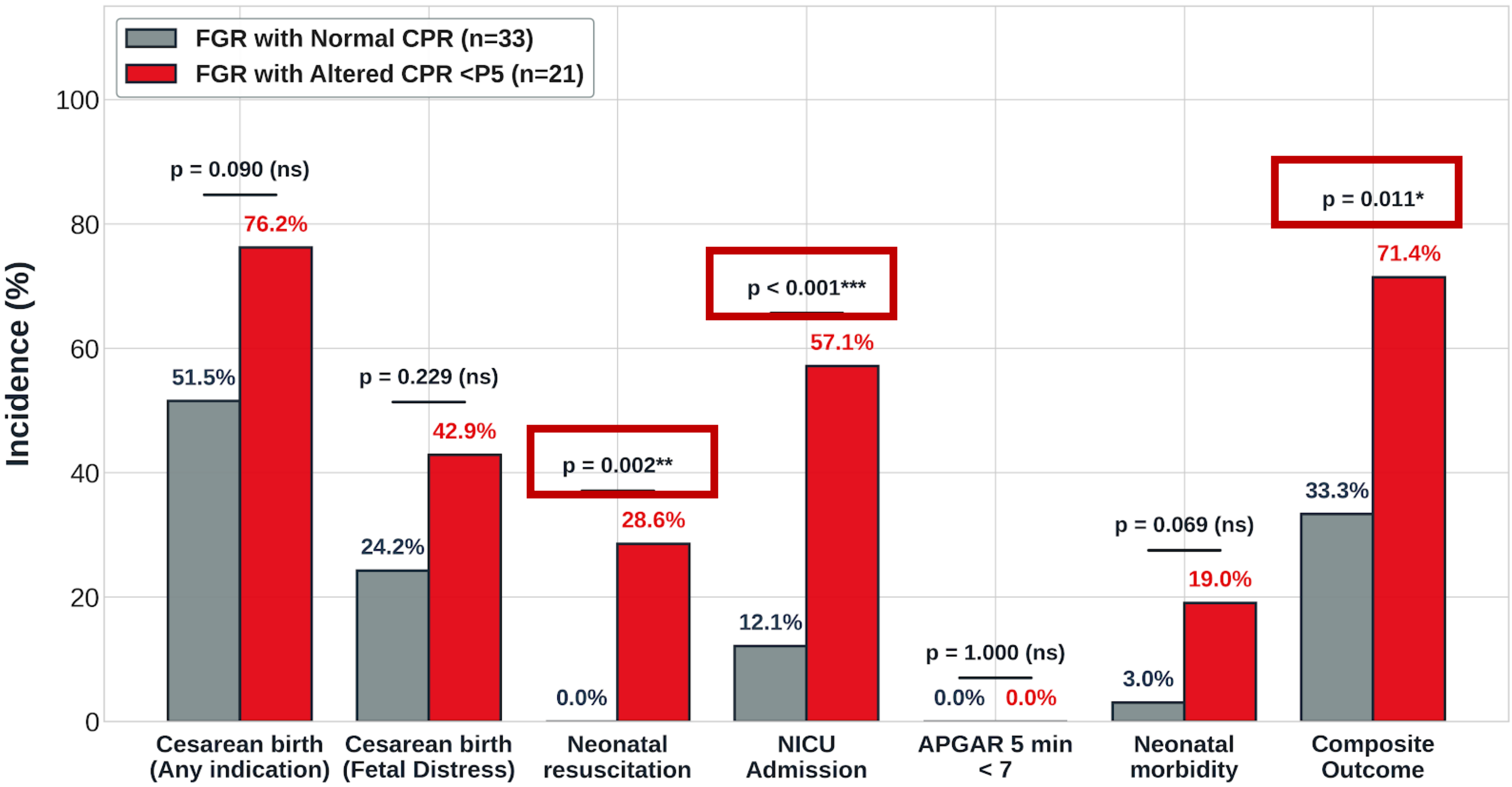


Figure 2. Outcomes by CPR status in the FGR subgroup

Conclusion

- An abnormal **CPR** was found to be associated with **worse obstetric and neonatal outcomes**; it was also associated with some neonatal **adverse outcomes** (NICU admission, neonatal resuscitation, CAPO) in the **FGR subgroup Analysis**
- CPR had **high specificity** for **adverse perinatal outcomes**, especially in the **original cohort** (in which the study was blind to the diagnosis of FGR)
- Results suggest **ICP** to be a **good predictor of adverse perinatal outcomes**, playing an **important role in fetal surveillance**
- Maternal biometry (particularly BMI) should have been assessed as it significantly influences fetal weight
- Sample size was not enough to draw conclusions on neonatal mortality, as it is now a rare event; association with neurodevelopment outcomes should also be studied, as the complications of FGR are often only visible later in life