# Association between adverse neonatal outcome and maternal haemodynamics and biomarkers in SGA and FGR

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**Objective.** We aimed to assess whether maternal biomarkers or haemodynamics were associated with composite adverse neonatal outcome in small for gestational age (SGA) and foetal growth restriction (FGR).

**Materials and Methods.** Participants were 18 years or older, pregnant with a singleton non-anomalous SGA foetus (AC or EFW < 10$^{th}$ percentile or 50 percentiles lower than a previous ultrasound). Maternal haemodynamics and biomarkers were assessed at the time of inclusion. Composite adverse neonatal outcome included foetal/neonatal mortality, poor condition at birth, need for respiratory support, cardiovascular abnormality, brain injury syndromes, sepsis and retinopathy of prematurity requiring treatment.

Biomarkers (sFlt, PlGF, sFlt/PlGF) and haemodynamic variables were reported as modified z-scores using published (Roche®, USCOM®, and Arteriograph®) or unpublished (Vicorder®) normal ranges. Differences between groups were evaluated using the Wilcoxon-Mann-Whitney test and the Dunn's test for adjusted multiple comparisons. Univariate analysis demonstrated significant predictors which were then included in the multivariable logistic model with potential confounders.

**Results.** 359 participants with paired maternal haemodynamic and biomarker assessments were included. Mean arterial pressure, sFlt-1 and PlGF were all significantly associated with adverse outcome at univariate analysis. In the multivariable model EFW at inclusion, UCR at inclusion and sFlt-1 z-score remained significant. This model gives an AUC of 0.79 [0.73; 0.86] with a sensitivity of 73.1%, specificity of 75.1% and 74.7% accuracy (using the probability cut-off based on the maximum Youden Index).

**Conclusions.** In SGA and FGR foetuses, UCR and EFW at inclusion and sFlt-1 are associated with composite adverse neonatal outcome.