First trimester screening for early and late preeclampsia based on maternal characteristics, biophysical parameters and angiogenic factors

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Objective
To develop the best first trimester screening model for the prediction of preeclampsia (PE) based on combination of maternal characteristics with biophysical parameters and angiogenic factors in a low-risk Mediterranean population.

Methods
A nested case-control study drawn from a prospective first trimester cohort of singleton pregnancies (2007-2012). Logistic regression-based predictive models were developed for the prediction of early and late PE, using as a cut-off the 34th week of gestation of delivery. The model included the a priori risk (maternal characteristics), mean arterial pressure (MAP) and uterine artery (UtA) Doppler (11-13 weeks), and the measurement of the angiogenic factors (8-11 weeks), placental growth factor (PlGF) and soluble Fms-like tyrosine kinase-1 (sFlt-1), normalized by logarithmic transformation.

Results
Of the 9,462 enrolled participants, 57 (0.6%) developed early PE and 246 (2.6%) late PE. For early PE, significant contributions were black ethnicity, chronic hypertension, renal disease, nulliparous women or multiparous women with previous PE, together with MAP, UtA Doppler, PlGF and sFlt-1. A model including these predictors achieved detection rates (DR) of 88% and 91% for 5% and 10% false positive rates (FPR), respectively (AUC: 0.98 [95%CI: 0.97-0.99]), and PlGF improved it by 11%. For late PE, significant contributions were provided by white ethnicity, chronic hypertension, nulliparous women or multiparous women with previous PE, smoking status, together with MAP, UtA Doppler, PlGF and sFlt-1. The model including these factors achieved DR of 68% and 76% at 5% and 10% of FPR, respectively (AUC: 0.87 [95%CI: 0.84-0.90]), and PlGF/sFlt-1 improved it by 20%.

Conclusion
The best model for first trimester screening for PE in a Mediterranean population was achieved combining maternal characteristics, MAP, UtA Doppler and angiogenic factors. Angiogenic factors substantially improved the prediction early and late PE.