First trimester screening for early and late PE using maternal characteristics, biomarkers and placental volume

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Objective
To evaluate the feasibility of screening for preeclampsia in the first trimester based on maternal characteristics, medical history, biomarkers, and placental volume.

Methods
This is a prospective observational non-intervention cohort study in an unselected US population. Patients who presented for an ultrasound examination between 11 and 13+6 weeks’ gestation were included. The following parameters were assessed and were used to calculate the risk of preeclampsia: maternal characteristics (demographic, anthropometric, and medical history), maternal biomarkers (mean arterial pressure, uterine artery pulsatility index, placental growth factor, pregnancy-associated plasma protein A, and alpha-fetoprotein), and estimated placental volume (EPV). After delivery, medical records were searched for the diagnosis of preeclampsia. Detection rates (DR) for early-onset preeclampsia (EOPE, <34 weeks’ gestation) and later-onset preeclampsia (LOPE, >34 weeks’ gestation) for 5% and 10% false positive rates (FPR) using various combinations of markers were calculated.

Results
We screened 1288 patients out of whom 1068 (82.99%) were available for analysis. 46 (4.3%) developed preeclampsia, with 13 (1.22%) having EOPE and 33 (3.09%) having LOPE. Using an algorithm that included all the studied parameters, the DR of EOPE for either 5% or 10% FPR was 85%. This performance was achieved by using maternal characteristics and biomarkers and was not improved by the addition of EPV. The best DRs for LOPE were 25% and 48% for 5% and 10%, respectively. These were based on maternal characteristics only and were not improved by adding biomarkers or PV. The detection rates for all PE diagnosed prior to 37 weeks’ gestation were 48% and 72% for 5% and 10% FPR respectively. The detection rate for 5% FPR was achieved with maternal characteristics and maternal serum biochemistries with no improvement in performance with the addition of other biomarkers or EPV. The detection rate at 10% FPR was achieved using maternal characteristics, all biomarkers, and EPV. The detection rates for preeclampsia at >37 weeks’ gestation were 24% and 43%, respectively. These were based on maternal characteristics alone and were not improved by the addition of biomarkers.

Conclusion
Screening for preeclampsia at 11-13+6 weeks’ gestation using maternal characteristics and biomarkers is associated with a high detection rate for a low false positive rate. Screening for late onset preeclampsia yields a much poorer performance.