

Validation of the Fetal Medicine Foundation 4.0 algorithm for preeclampsia screening at 11-14 weeks' gestation adapted to a Mexican population

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Objective

To test the performance of the Fetal Medicine Foundation (FMF) 4.0 algorithm for pre-eclampsia (PE) screening at 11-14 weeks' gestation adapted to the target population.

Methods

A cohort study in singleton pregnancies attending at a Fetal Medicine Centre in Mexico City for routine first trimester combined test. Maternal characteristics were measured according to FMF definitions. Gestational age was established by crown-rump length. Mean arterial pressure (MAP), uterine artery mean pulsatility index (UtAmPI) and pregnancy-associated plasma protein A (PAPP-A) were measured according to FMF standardization. The value of each marker was transformed into multiples of the median (MoM) calculated from reference values of the target population. The outcome was defined as delivering with or without PE (International Society of Hypertension criteria), according to the competing risks approach. Exclusion criteria were pregnancies with birth defects, and any termination of pregnancy < 24 weeks' gestation. A standalone program was coded with the Bayesian FMF 4.0 algorithm using the log10MoM markers of the target population. The algorithm configuration was centered at < 37 weeks.

Results

A total of 1230 pregnancies were included, with 60 (4.9%, CI95 3.7 - 6.1) deliveries with PE. The MoM distributions in non-affected were of 0.987 for MAP, 1.037 for UtAmPI, and 0.954 for PAPP-A. Amongst the markers, the regression line of MAP MoM to gestational age at delivery with PE showed the best fit-as-expected. The area under the receiver operator characteristic curve was 0.791 (CI95, 0.745 - 0.837) for overall PE, and 0.770 (CI95, 0.699 - 0.842) for preterm PE. At 10% of false positive rate (FPR), the cut-off point was 1 in 66, with a detection rate (DR) of 47% (34 - 59) for overall PE, and 37% (22 - 52) for preterm PE. A fixed cut-off of 1 in 100 resulted in a DR of 57% (44 - 69) with 15% of FPR for overall PE, and a DR of 63% (48 - 78) with 24% of FPR for preterm PE. At a fixed DR of 70%, the cut-off point was 1 in 199 for overall PE, and 1 in 153 for preterm PE, with both FPR of 32%.

Conclusion

It is feasible to adapt the FMF 4.0 algorithm to the target population. The MoM calculated from the target population showed distributions as close as expected for both outcome groups. The cut-off point can be selected according to the desired performance of the test.

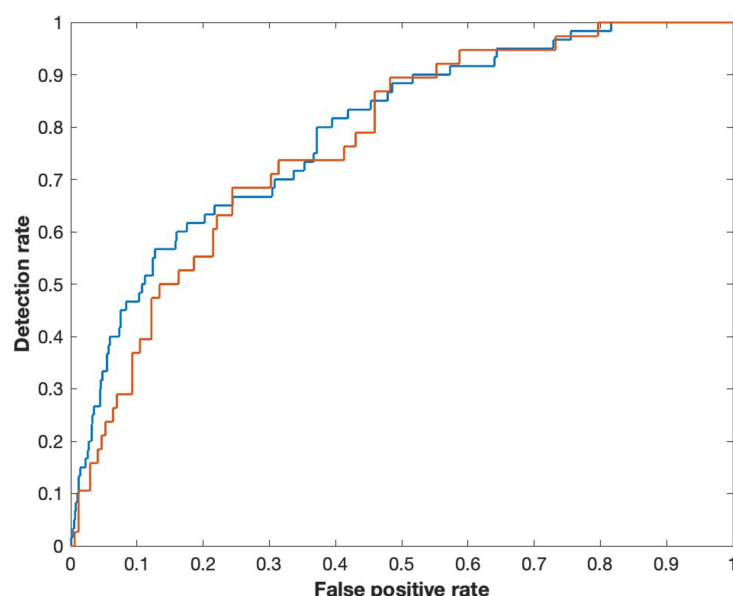


Figure 1. Receiver-operator characteristic curves of the Fetal Medicine Foundation 4.0 algorithm adapted to the target population (Mexico) for overall pre-eclampsia (blue) and preterm pre-eclampsia (red). The model was centered at 37 weeks.