Systematic Review of <14 weeks risk score prediction models using maternal characteristics with and without biomarkers for the prediction of GDM

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GDM is associated with adverse maternal and fetal complications. By the time GDM is diagnosed, continuous exposure to the hyperglycaemic intrauterine environment can have adverse effects on the fetus. Hence, early pregnancy prediction of GDM is important.

The aim was to evaluate whether <14 weeks risk score prediction models including maternal characteristics with and without biomarkers can accurately predict GDM in early pregnancy.

Cohort or observational studies involving pregnant women without prior diagnosis of diabetes were reviewed. Databases, Cochrane systematic reviews, grey literature, and reference lists were searched for relevant studies till July 2021. Two authors extracted data and assessed quality independently. The primary outcome of the review was to assess the predictive performance of the risk prediction models with maternal characteristics with and without biomarkers <14 weeks in terms of the area under the receiver operating characteristic curve (auROC), for different populations. In view of the high heterogeneity between studies, pooled analyses of the data were not done.

Thirty-one out of 111 articles (Original search N=4500) were included. 18 studies reported results for prediction models with only maternal characteristics. 27 studies used regression-based techniques for prediction. Sample size in these studies ranged from 43 to 1,160,933. The studies were from USA, UK, Europe, China, South Korea, South Africa, and Australia. Despite >90% of GDM is estimated to occur in South and Southeast Asia no studies were found. Predictive value of auROC ranged from 0.59 to 0.88 for models with only maternal characteristics and from 0.65 to 0.94 when biomarkers were included. The auROC also varied based on the population. Age, ethnicity, BMI, family history of diabetes, and prior GDM were the 5 most common maternal characteristics used. Addition of systolic BP seems to improve the performance. Triglycerides, PAPP-A, and lipocalin-2 in combination with the other common maternal characteristics have the highest predictive performance.

A wide range of prediction performances of the models was observed. More research needs to be done using artificial intelligence-based approaches for building and improving prediction models. Such approach could also help in reducing the amount of glucose tolerance testing in pregnancy, especially in resource-constrained settings.