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Systematic Review Offers Insights on Pre-eclampsia Prediction

Pre-eclampsia (PE) affects a significant percentage of pregnancies globally and leads to numerous foetal and maternal deaths each year. Early identification is crucial for effective monitoring and prevention. Aspirin prophylaxis for high-risk women can reduce PE rates and adverse outcomes. Healthcare providers often predict future health events for their patients using multiple factors. Developing and validating prediction models is essential, but they need external validation to ensure accuracy across different populations. A review recently published in *Ultrasound in Obstetrics and Gynecology* assesses existing prediction models for PE, aiming to determine their performance in various settings and populations.

Comprehensive Evaluation of Externally Validated Prediction Models for Pre-Eclampsia

This systematic review investigates externally validated prediction models for pre-eclampsia (PE), following the PICOTS framework: Population (pregnant women), Index prediction model (externally validated), Outcome (PE), Timing (prediction during pregnancy), and Setting (clinical). The search, covering databases like Ovid (MEDLINE, EMBASE, Emcare, MIDIRS), CINAHL, and grey literature via Google Scholar, targeted studies validating PE prediction models. Inclusion criteria encompassed validation studies for any-onset, early-onset, late-onset, and preterm PE, employing various study designs. The Prediction model Risk Of Bias ASsessment Tool (PROBAST) was utilised for methodological quality assessment, focusing on participants, predictors, outcomes, and analysis domains. Data extraction adhered to the CHecklist for critical Appraisal and data extraction in systematic Reviews of clinical prediction Modelling Studies (CHARMS). Models were considered distinct if they shared coefficients but used different input data. Descriptive synthesis and meta-analyses compared discrimination and calibration performance across models, utilising statistical measures such as area under the receiver-operating- characteristic curve (AUC) and calibration slope. The review aimed to comprehensively assess the validity and applicability of existing PE prediction models in clinical practice.

Importance of Validation for Clinical Utility and Generalisability

Pre-eclampsia (PE) is a condition that can be predicted and prevented. However, external validations and impact assessments are crucial before implementing risk prediction models in clinical practice. This systematic review identified the FMF model as the preferred choice due to its outstanding discrimination and calibration in predicting preterm PE, which was validated externally in multiple settings. While other prediction models exist, their external validation has been more limited. Most models, except the FMF model, demonstrated poor-to-good discrimination and calibration performance on external validation, with most validations conducted in high-income settings.

The FMF model, validated externally in various countries, demonstrates generalizability and reassures clinicians and health administrations regarding its performance. However, only a small fraction of any-onset PE models underwent multiple external validations, emphasising the importance of thorough validations to assess clinical utility and generalisability, especially with the increasing availability of electronic health data.

Balancing Biomarkers and Demographic Factors into Prediction Models

Maternal demographic and clinical characteristics were frequently used in prediction models, with biomarkers like UtA-PI and PAPP-A also common, particularly in any-, early-, and late-onset PE prediction. While specialised biomarkers can enhance prediction, their availability in low-resource settings is limited, raising feasibility concerns. Interestingly, models incorporating only maternal characteristics performed similarly or slightly better than those with additional biomarkers, indicating potential benefits in low-resource settings.

Despite the importance of maternal clinical characteristics in PE risk, the limited external validation in diverse settings and unstable model performance in predicting any-onset PE highlight the need for further research. Cost-effectiveness analyses suggest that models like the FMF model may be relatively cost-effective, supporting their implementation alongside other validated models. However, heterogeneity in predictors used and a lack of models in diverse settings remain challenges.

While the FMF model stands out for its performance, challenges remain in implementing prediction models for PE, particularly in low-resource settings. Future research should focus on validating feasible and cost-effective models in diverse populations to improve prediction accuracy and clinical utility.

Source: **Ultrasound Obstetrics & Gynecology**

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Published on : Tue, 7 May 2024