A Novel Risk Calculator to Predict Sub-Optimal Outcomes Among Pregnant and Postpartum Women with HV

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BACKGROUND

- OBJECTIVE: To develop and validate a novel risk calculator to predict treatment failure and disengagement from care among pregnant and postpartum women living with HIV (PPWH).
- PPWH experience differential treatment success. Numerous risk factors for poor treatment outcomes and loss to follow-up have been identified by our team and others, but no tool currently exists to assess a PPWH's cumulative risk of disengagement from care or treatment failure with a quantifiable score during the peripartum period.

METHODS

- Combined outcome of missed visit (≥30 days) or treatment failure (elevated VL ≥400 copies/ml)
- Derivation dataset: N=1331 PPWH in the Mother-Infant Visit Adherence and Treatment Engagement (MOTIVATE) trial in southwestern Kenya
- Validation dataset: N=817 PPWH in the Opt4Mamas study in southwestern Kenya
- Risk calculator development and validation methods:
  - Multiple imputation with chained equations was used to address missing values.
  - Least absolute shrinkage and selection operator (LASSO) logistic regression procedures selected the most predictive variables from a list of 16 candidate factors based on prior research, including psychosocial, demographic, and clinical factors.
  - Predictors with nonzero coefficients in the LASSO regression model were selected for calculating predicted risk of the outcome.
  - Backward selection with the imputed dataset was used to identify a final concise calibrated model.
  - Model calibration and discrimination were assessed.

This novel risk calculator predicts **cumulative risk** of *disengagement from care or treatment failure among pregnant and postpartum women living with HIV* (PPWH) **–** both newly diagnosed and those diagnosed prior to pregnancy – **using a** quantifiable score and risk groups (minor, moderate, or critical).

RESULTS

- Two parsimonious models were developed and validated using 9 risk factors for newly diagnosed PPWH and 14 risk factors for known positive PPWH (Table 1).

Table 1. Factors included in two versions of the risk calculator for unique sub-populations of PPWH

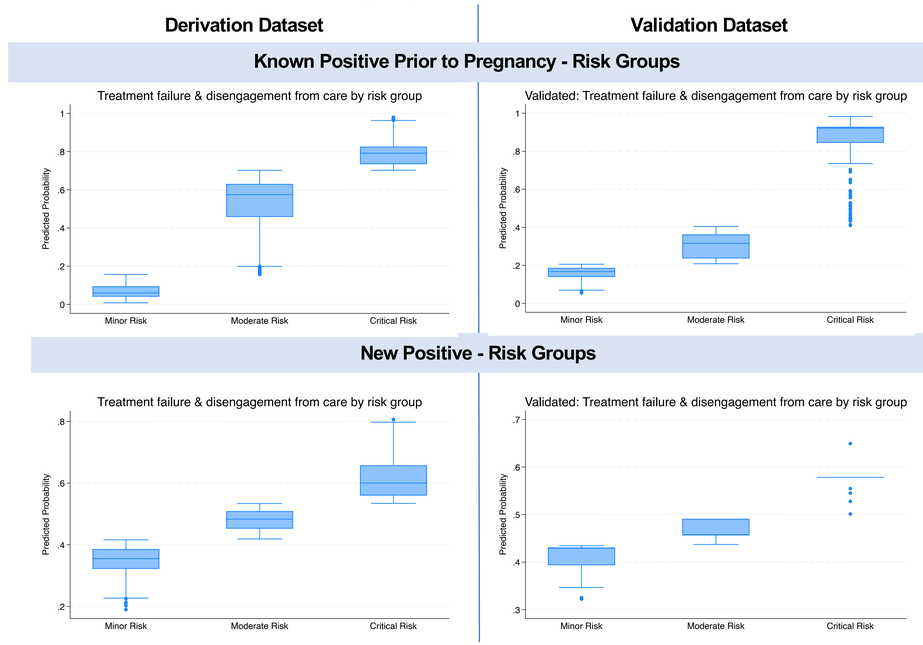
Risk Factor	Inclusion in Final Risk Calculator	
	New HIV Diagnosis	Known HIV Positive
First pregnancy	✓	
>25 weeks gestational age at first prenatal visit	✓	
< 26 years of age	✓	✓
Not married	✓	✓
Anticipated HIV stigma [1-3]	✓	✓
Internalized HIV stigma [4]	✓	✓
Low male partner support [5, 6]	✓	✓
Food insecurity [7]	✓	✓
Intimate partner violence [5, 6]	✓	✓
Depression symptoms [8, 9]		✓
No HIV status disclosure		✓
History of missed clinic visit (>14 days)		✓
History of elevated of viral load ≥400 copies/ml		✓
Baseline viral load ≥400 copies/ml		✓
2nd or 3rd line ART regimen		✓
Poor self-reported baseline ART adherence		✓

- Overall performance of the development and validation models:

Known positive PPWH:
- C-statistic by bootstrap cross validation >0.8
- Brier scores = 0.16

Newly diagnosed PPWH:
- C-statistic by bootstrap cross validation <0.7
- Brier scores = 0.13

Figures 1- 4. Probability of treatment failure/disengagement from care by risk group in final models



CONCLUSIONS

- This study developed and validated a novel risk calculator capable of predicting treatment failure and disengagement from care among both newly diagnosed and known HIV positive pregnant and postpartum women with HIV using two large longitudinal datasets in southwestern Kenya. The known positive models performed better than the newly diagnosed models.
- The risk calculator has the potential to be used in research and clinical care to identify PPWH at greatest need of interventions and enhanced support to achieve treatment success.

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