



An early GDM risk prediction model for women with advanced age

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OBJECTIVES

Advanced maternal age (AMA; ≥ 35 years) has been increasing for decades, contributing to many adverse pregnancy outcomes, especially gestational diabetes mellitus (GDM). This study aimed to establish a simple-to-use prediction model using data routinely collected at registration to enable early risk recognition and prevention of GDM in women with AMA.

RESULTS

1. Patients and data

A total of 1904 women were eligible and randomly divided in a 7:3 ratio into a training set ($n = 1333$, 243GDM [18.3%]) and a validation set ($n = 571$, 110GDM [19.3%]).

2. Development of the prediction model

Five variables were finally selected and entered into our GDM prediction model according to their clinical importance and statistical significance, including fasting plasma glucose (< 4.4 mmol/L, 4.4-5.1 mmol/L, ≥ 5.1 mmol/L), triglyceride (≤ 1.14 mmol/L, 1.14-1.59 mmol/L, > 1.59 mmol/L), mean arterial pressure (≤ 88 mmHg or not), Age (≥ 40 years or not), and previous GDM history (multipara without GDM, multipara with GDM and primipara).

3. Validation of the prediction model

The model had an area under the ROC curve (AUC) of 0.717 (95%CI: 0.682-0.753) in the training set and 0.702 (95%CI: 0.645-0.758) in the validation set. The Hosmer–Lemeshow test statistic shows that the model has good calibration ($p = 0.97$ in the deprivation set and 0.66 in the testing set).

4. Comparison of performance of the new model with other risk prediction models

Compared to the four published GDM prediction models, our model had the best discrimination ability according to the ROC analysis.

Figure 1 Flowchart of the selection process and analysis process of the survey.

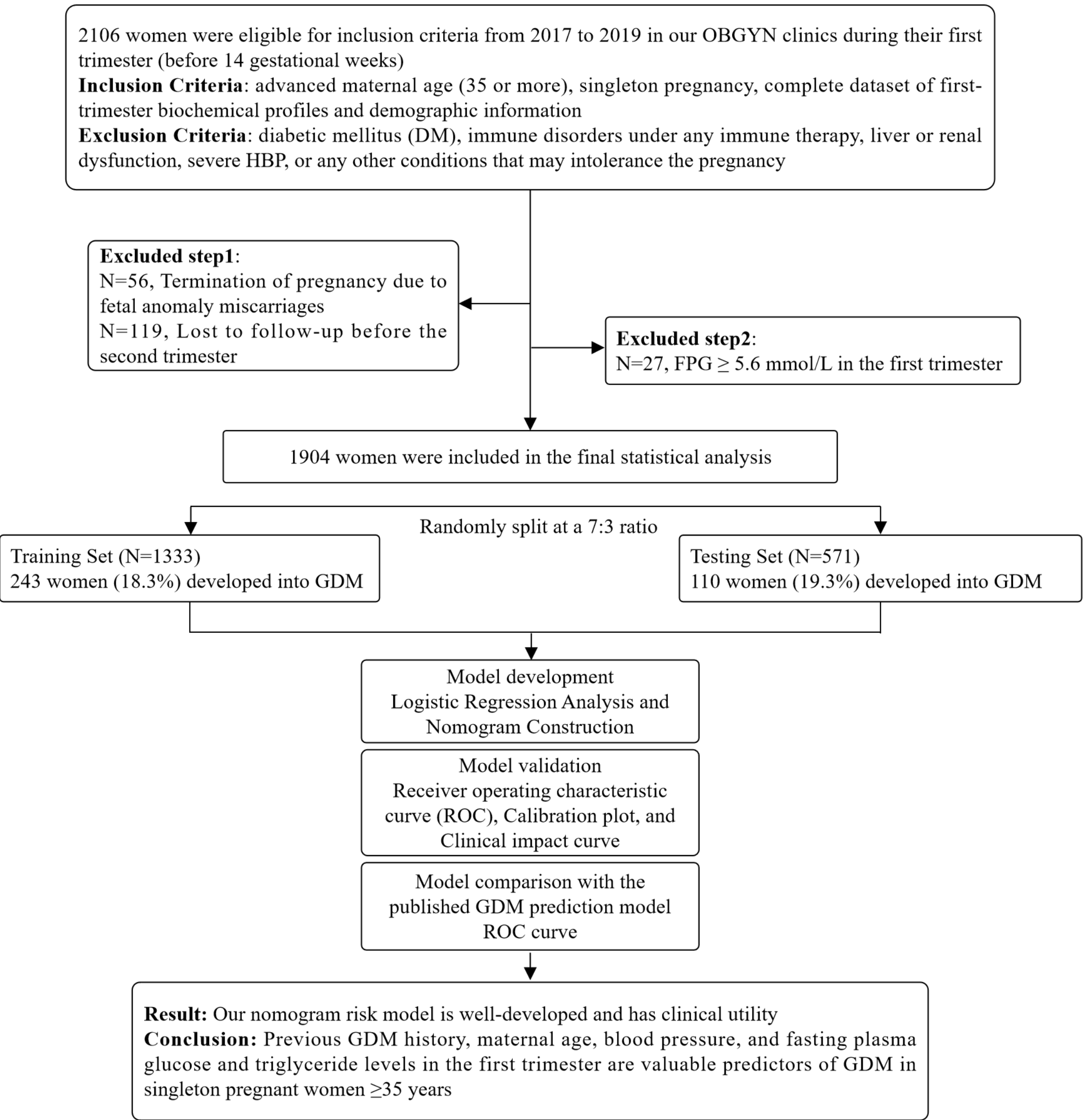


Figure 3 ROC curves of the novel prediction model in comparison to three published prediction models: Harrison, Naylor, Van Leeuwen, and Teede.

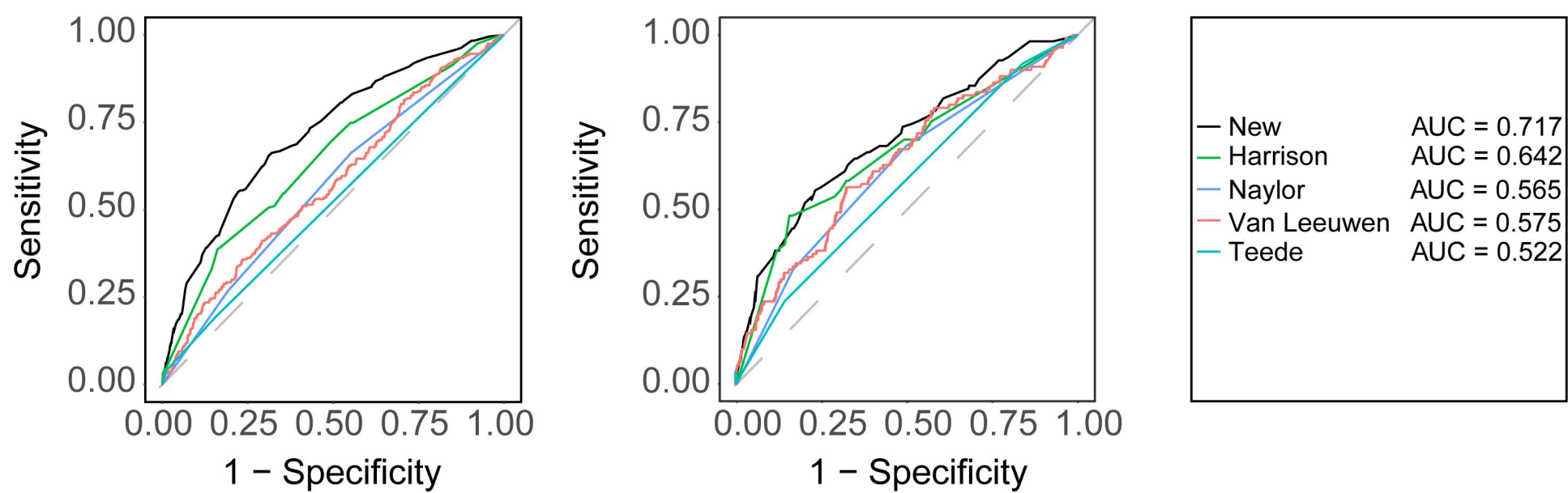
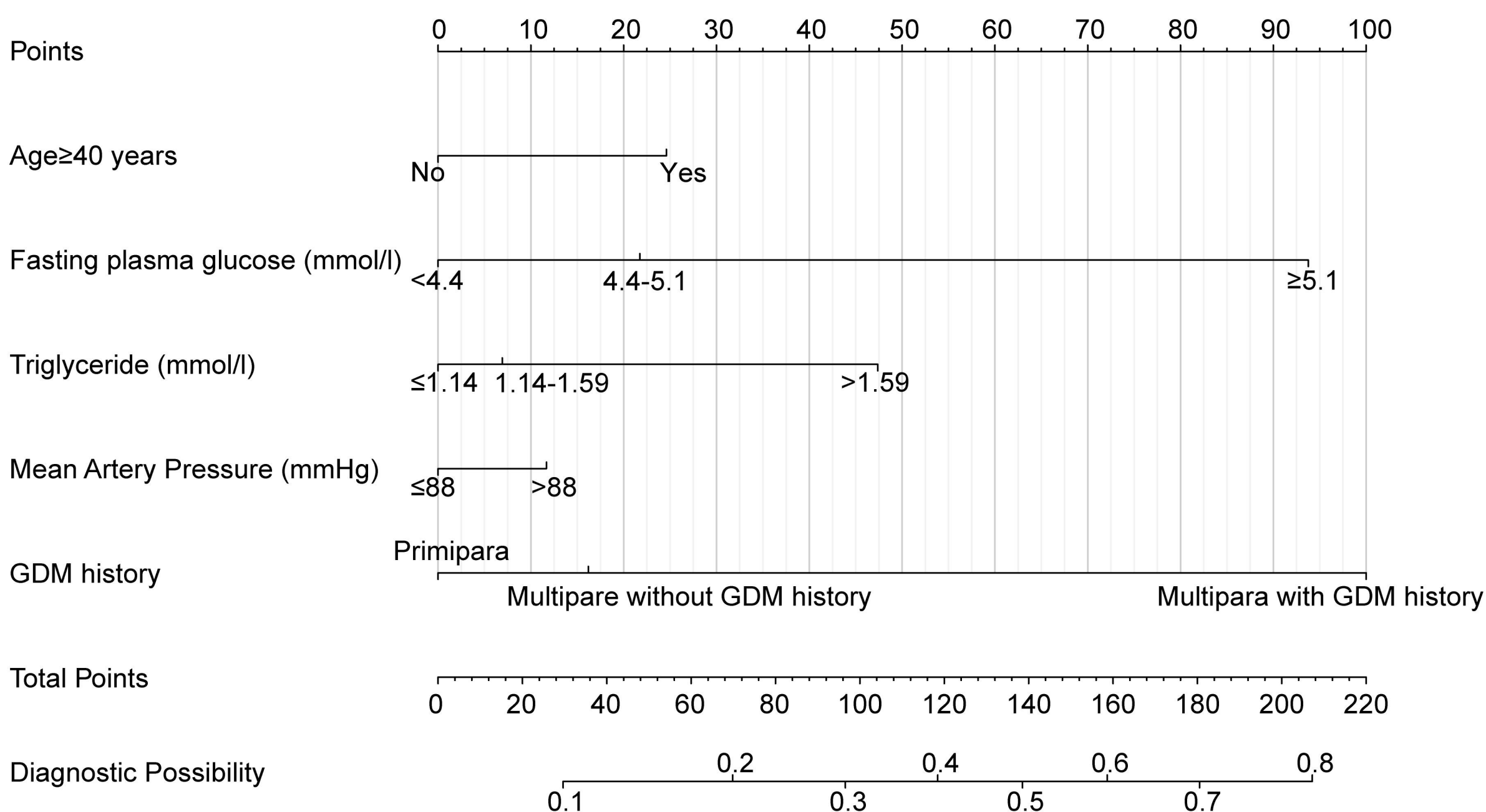


Table 1 Univariable and multivariable analysis in training set.

Characteristics	Univariate analysis			Multiple variate analysis		
	OR	95%CI	p-value	OR	95%CI	p-value
Age ≥ 40 years (category)	1.58	1.11-2.24	0.013	1.64	1.13-2.39	0.009*
Previous GDM history			<0.001			<0.001 *
Primipara	1			1		
Multipara without GDM	0.78	0.58-1.03	0.082	0.72	0.53-0.98	0.035*
Multipara with GDM	4.45	1.81-11.0	0.001	5.43	2.18-13.52	<0.001 *
Mean Artery Pressure (> 88 mmHg) (category)	1.818	1.37-2.41	<0.001	1.27	0.93-1.72	0.13
FPG (category)			<0.001			<0.001 *
< 4.4 mmol/L	1			1		
4.4-5.1 mmol/L	1.651	1.15-2.36	0.006	1.55	1.08-2.34	0.019
≥ 5.1 mmol/L	6.689	4.08-10.96	<0.001	6.63	3.96-11.10	<0.001 *
Triglyceride (category)			<0.001			<0.001 *
≤ 1.14 mmol/L	1			1		
1.14-1.59 mmol/L	1.17	0.80-1.72	0.422	1.15	0.77-1.71	0.491
> 1.59 mmol/L	2.56	1.82-3.65	<0.001	2.60	1.80-3.77	<0.001 *

Note: Comparisons Student's t-test or chi-square test. Abbreviations: GDM, gestational diabetes mellitus; FPG, fasting plasma glucose; OR, odds ratio; CI, confidence interval. * $p < 0.05$.

Figure 2 Nomogram for predicting GDM in the first trimester.



CONCLUSIONS

This study provides women with advanced age with a simple, reliable, and economic nomogram for the early prediction of GDM risk in the first trimester.

METHODS

1. Patients and data

We used data from a prospective cohort at the Obstetrics and Gynecology Hospital of Fudan University (Shanghai, China) from October 2017 to September 2021.

2. Development of the prediction model

Univariate analysis was performed to identify statistically significant predictors. Multivariate logistic regression analysis was used to construct the GDM risk prediction model.

3. Validation of the prediction model

Receiver operating characteristic (ROC) analysis and calibration were used to assess the accuracy of the model.

4. Comparison with other published models

Four published prediction tools were also tested by ROC curves in the current population.

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