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Predicting risk for new-onset type 2 diabetes in Chinese people with coronary heart disease and impaired glucose tolerance

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Background and aims: China has the world's largest number (estimated 48.6 million) of people with impaired glucose tolerance (IGT). They are at high risk of progressing to type 2 diabetes (T2D) but little has been done to provide individualized T2D risk estimates for them which might inform the intensity of any preventative strategies they might require, e.g. routine or intensive lifestyle intervention or evidence-proved pharmacologic therapy. We sought to develop a T2D risk calculator for Chinese people with coronary heart disease (CHD) and IGT, using data from the Acarbose Cardiovascular Evaluation (ACE) trial which randomised 6522 Chinese CHD patients with IGT to acarbose or placebo with prospective ascertainment of new-onset diabetes.
Materials and methods: Model development was based on the 2920 placebo-treated participants with the requisite baseline data. Clinically relevant variables, and those showing a univariate association with incident diabetes (P<0.1), were entered into BASIC (clinically available variables only) and FULL (plus routinely-available laboratory results) logistic regression models. External validation of the final models was performed in an independent Luzhou prospective cohort of 1013 Chinese patients with IGT (with or without CHD) and followed for five years.
Results: Of the 2920 placebo-treated participants with CHD and IGT at baseline, 466 (16%) developed diabetes over median 5.0 years. Lower age, male sex, higher body mass index, and use of steroids, calcium channel blockers and thiazide diuretics were associated with higher risk of progression to diabetes. The BASIC model using these variables had moderate discrimination (C-statistic = 0.61). The FULL model, adding in fasting plasma glucose, 2 hour post load plasma glucose and HbA_{1c} showed acceptable discrimination (C-statistic = 0.76) (Table). External validation of the FULL model showed moderate discrimination (C-statistic = 0.66) for the Luzhou cohort.
Conclusion: In Chinese people with CHD and IGT, major predicators of new-onset diabetes include lower age, male sex, obesity, and drug treatment with steroids, calcium channel blockers or thiazide diuretics. A risk calculator utilising these clinical variables and measures of glycaemia can provide a simple tool to estimate T2D risk that could be used to facilitate decision-making when considering primary T2D prevention measures.

Five-year diabetes risk prediction models for Chinese people with coronary heart disease and impaired glucose tolerance (N=2920, 466 events)

Variable	BASIC Model		FULL Model	
	Odds Ratio (95% CI)	P value	Odds Ratio (95% CI)	P value
Age (*per* 10 years increase)	0.80 (0.70 - 0.92)	0.0012	0.78 (0.68 - 0.90)	<0.0001
Male (*vs.* female)	1.26 (1.00 - 1.61)	0.054	1.40 (1.09 - 1.81)	0.0087
Body mass index (*per* 1 kg/m2)	1.09 (1.06 - 1.13)	<0.0001	1.06 (1.02 - 1.10)	0.0013
Steroid treatment (*vs.* none)	3.00 (1.32 - 6.40)	0.0057	2.98 (1.24 - 6.78)	0.011
Calcium channel blocker treatment (*vs.* none)	1.22 (0.98 - 1.51)	0.067	1.25 (0.99 - 1.57)	0.061
Thiazide diuretic treatment (*vs.* none)	1.92 (1.16 - 3.06)	0.0079	1.74 (1.02 - 2.88)	0.036
Fasting plasma glucose (*per* 1 mmol/l increase)	…	…	2.07 (1.75 - 2.46)	<0.0001
2-hour plasma glucose (*per* 1 mmol/l increase)	…	…	1.64 (1.48 - 1.83)	<0.0001
HbA_{1c} (*per* 1 % increase)	…	…	1.83 (1.57 - 2.14)	<0.0001
C-statistic (95% CI)	0.61 (0.59 - 0.64)		0.76 (0.74 - 0.78)	
Hosmer-Lemeshow goodness of fit test (P-value)	0.67		0.26	

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