External validation of multivariable risk prediction models for incident colorectal cancer using China Kadoorie Biobank

Abstract

Background

In China, colorectal cancer (CRC) is the fifth most common incident cancer in men and the third most common in women. CRC screening uptake in China is low and rates of incident CRC have been increasing over the last few decades. Risk prediction models based on lifestyle patterns and risk factor exposure could be used in China to guide screening decisions and to identify those at highest risk of developing CRC. The aim of this study was to compare and externally validate risk scores, in a large contemporary prospective study of Chinese adults.

Methods

A systematic literature review to June 2021 was conducted to identify published risk prediction models for incident CRC in all global populations. Models were evaluated using data from 512,415 adults without previous bowel cancer using data from the prospective China Kadoorie Biobank. Participants were recruited in 2004-2008 and followed-up for incident cancer to January 2018 through linkage to national cancer registries. Model discrimination was assessed using the area under the operating characteristic curve (AUC) and evaluated separately for incident colorectal cancer, colon cancer, and rectal cancer.

Results

After 10 years of follow up, there were 3490 incident cases of CRC (2430 colon, 2058 rectal). Five risk models for incident CRC were identified in the literature that met the inclusion criteria, two of which (Chen and Guo) were developed in Chinese populations. All models incorporated participant age, and all included either sex or BMI. In men, model performance varied ranged from 0.594 (Driver model) to 0.674 (Betes model). All models performed worse in women than in men. Compared to CRC, models performed better for colon cancer (AUCs between 0.603 and 0.677 in men and 0.599 and 0.667 in women) but performed worse for rectal cancer (AUCs between 0.576 and 0.665 in men and 0.564 and 0.653 in women).

Conclusions

Several risk models based on lifestyle information have variable discrimination in a Chinese population. The models developed using a Chinese cohort did not perform better in CKB than those developed in other populations. The best performing model incorporated only age, sex, and BMI. This model could be extended to incorporate other lifestyle or genetic information to further improve its performance in a Chinese population. Future modelling studies would be needed to estimate the potential cost-effectiveness of implementing stratified risk-based CRC screening.

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