

## RESEARCH ARTICLE

# Knowledge, Attitudes, Preventive Practices and Screening Intention about Colorectal Cancer and the Related Factors among Residents in Guangzhou, China

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### Abstract

**Background:** In Guangzhou, China, colorectal cancer (CRC) is the second most commonly diagnosed cancer. The government initiated a CRC screening program in 2015, and investigating the knowledge, attitudes, and practices toward CRC would help facilitate the participation of the program. **Methods:** A cross-sectional survey was conducted from October 2014 to September 2015. Questionnaires were passed out with a cluster sample in 15 randomly selected primary schools of Guangzhou China, and one of each student's family members aged between 20 to 65 years old were included. **Results:** A total of 6839 questionnaires were obtained and the successful response rate was 78.5%. The majority (88.3%) of them were under 46 years old and female subjects accounted for 65.8%. Over 80% of the respondents knew that CRC was able to be cured by early diagnosis and treatment and that tobacco use, alcohol abuse, and dietary without enough fruits or vegetables may increase the risk of CRC, although a few knowledge scores were relatively low, such as physical exercise as a protective factor and bowel habits change as a symptom suggestive of CRC. In contrast, only 52.2% of the subjects were sure to participate in a future CRC screening provided by local government. We further found that the higher level of knowledge about CRC risk and positive cancer preventive attitude and practice were associated with higher education level, female gender, and positive family history. **Conclusion:** These results suggested that the priority may be laid on improving the conversion from knowledge to practice to implement screening program in Guangzhou, while efforts should also be made to improve public awareness about CRC.

**Keywords:** Colorectal cancer- knowledge- attitudes- practice- cross-sectional study

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### Introduction

Cancer is one of the leading causes of mortality worldwide and accounted for over 8.2 million deaths (22% of all noncommunicable diseases deaths) in 2012 (Ferlay et al., 2015; International Agency for Research on Cancer, 2014). Colorectal cancer (CRC) is the third most commonly diagnosed cancer (1.36 million) (Ferlay et al., 2015; International Agency for Research on Cancer, 2014; Sessa et al., 2008). In China, CRC incidence rate was 23.03/100,000, and mortality rate was 11.01/100,000 in 2011 (Chen et al., 2015). In Guangzhou, the third largest city in China with more than 10 million residents, the incidence of CRC was the second highest (34.3/100,000) and the mortality was the third highest amongst all cancers in 2012 (Guangzhou Center for Disease Control and Prevention, 2016). Due to the population growth and aging, the number of new colorectal cancer cases is expected to rise in forthcoming years (de Martel et al., 2012; Ferlay et al., 2015; International Agency for Research on Cancer,

2014). Meanwhile, firm evidences have shown that both the incidence and mortality of colorectal cancer can be reduced through screenings [such as a fecal occult blood test (FOBT), flexible sigmoidoscopy, or colonoscopy] (Atkin et al., 2010; Benson et al., 2008; de Martel et al., 2012; Gimeno et al., 2014).

Guangzhou government initiated a colorectal cancer screening program utilizing FOBT for free to all adults in 2015 (Guangzhou Center for Disease Control and Prevention, 2016). We conducted this study to obtain the knowledge, attitudes (for example, perceived screening benefits and barriers), practices (KAP) and screening intention toward CRC and the influencing factors among the residents in Guangzhou, China, so as to provide clues for targeted measures to facilitate participation of the CRC screening program and eventually decrease the morbidity and mortality of CRC. Moreover, no similar study has conducted in Mainland China while a few reports (Le TD et al., 2014; Ng et al., 2007) published among Chinese populations outside Mainland China.

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## Materials and Methods

### Methods

A cross-sectional survey was conducted from October 2014 to September 2015. Subjects were the parents of the students in 15 primary schools which were randomly selected out of 829 public primary schools in Guangzhou Metropolis. One of the family members aged above 20 years old was included for each student. Questionnaires were allocated to and collected from the parents through the students. A total of 8,500 questionnaires were dispersed and 6,839 were successfully returned, while 171 were uncompleted, resulting a response rate 78.5% (6668/8500). The participation was voluntary and the questionnaire was answered anonymously.

The questionnaire contains four parts. The first part collects information about socio-demographic status, including age, gender, education, monthly personal income, family history of CRC or other cancers. The second one is to assess the knowledge about CRC. Respondents were requested to answer whether CRC is preventable and what are the CRC risk factors and warning signs, such as low fruit and vegetable intake, tobacco use, high alcohol consumption, a low-fiber and high-fat diet, exercising regularly, inflammatory bowel disease, colorectal polyps, older age, change in bowel habits (including the timing and frequency), visible blood in stool, and FOBT (+). The scoring of knowledge was 1 for 'Yes' and 0 for 'No or Uncertain' for every question, and the total score was 14. The third part was to assess the attitude towards CRC, which were measured on a five-point Likert-type scale, with responses ranging from 1 (absolutely disagree) to 5 (entirely agree), and the total score was 40. In the fourth part, the questions were based on the respondents' actions regarding the prevention and early detection of cancer, such as smoking status,

collecting information of cancer prevention initiatives, regular physical examination, seeing a doctor if not feel well, and participation in a colorectal cancer screening. In addition, the subjects were asked about their intention of CRC screening (definitely, uncertain, and no).

Collected data were entered and managed using the EpiData 3.1. We examined the frequency and proportion of respondents' CRC knowledge, attitude, early detection and preventive practices by cross-tabulation with chi-square tests for sex differences. Logistic regression models were used to estimate the related factors associated with CRC knowledge, attitude, and FOBT intention, as well as the associations between the knowledge, attitude, and screening intention, expressed in odds ratios (OR) and associated Wald 95% confidence intervals (95% CIs), with adjustment for age, gender, education, personal monthly income and family history of cancer. In these models, the knowledge and attitude were dichotomized as the dependent variables based on the score medians. All analyses were performed using SPSS 22.0. A P value of <0.05 was considered to be significant.

## Results

A total of 6668 subjects were recruited in our survey and 65.8% of them were women. The majority (88.3%) of them were under 46 years old. About two-third of them (64.7%) had higher education levels (above junior high school). Approximately 10% of the subjects had a family history of cancer. The personal monthly income varied and around 70% of them was under ¥ 5,000. More than a quarter of the subjects were overweight (BMI  $\geq$ 24).

The knowledge levels towards colorectal cancer were shown in Table 1. Over 80% of respondents recognized that CRC was able to be cured by early diagnosis and treatment. Tobacco use and alcohol abuse as CRC risk

Table 1. Knowledge of the 6,668 Subjects Towards Colorectal Cancer (%)\*

Items	All N=6,668	Men N=2,334	Women N=4,334	P
Colorectal cancer is preventable	80.7	80	81.2	0.219
Mortality of Colorectal cancer can be reduced by diagnosing, treating in early stage	92.5	92	92.9	0.21
Bowel cancer risk factors				
Low fruit and vegetable intake	89.4	87.3	90.7	<0.001
Tobacco use	86.9	85.5	87.7	0.013
Alcohol abuse	85.3	82.4	86.8	<0.001
A low-fiber and high-fat diet	63.8	62.7	64.4	0.164
Lack of physical exercises	42.9	41	44	0.022
Inflammatory bowel disease	60	57.3	60.1	0.001
Colorectal polyps	56.9	54.1	58.3	0.001
Older than 50 years	43.7	44	43.6	0.75
Colorectal cancer warning signs				
Change in bowel habits	44	42.2	44.9	0.043
Blood in stool for a long time	65.8	62.3	67.8	<0.001
Fecal Occult Blood Test (+)	55.8	52.7	57.6	<0.001

\*Percentage of the correct (Yes) answers.

Table 2. Attitudes of the 6,668 Subjects Towards Colorectal Cancer (% , Proportion for Every Row)

Attitudes to cancer and bowel cancer		Strongly agree	Agree	Don't care	Disagree	Strongly disagree	P
It's important for me to know about cancer	Male	76.1	18.9	4.2	0.3	0.5	0.037
	Female	76.3	20.1	3.1	0.3	0.2	
	Total	76.2	19.7	3.5	0.3	0.3	
It's just misfortune that someone has cancer	Male	10.9	11.5	13.5	36.4	27.7	0.072
	Female	9.6	9.9	12.8	38.4	29.3	
	Total	10.1	10.1	12.6	37.6	28.6	
Colorectal cancer diagnosed in early stage can treat better	Male	62.6	30.6	5.5	0.7	0.6	0.234
	Female	62.5	31.4	5	0.9	0.3	
	Total	62.5	31.1	5.2	0.8	0.4	
Regular physical examination can find cancer in early stage	Male	64.6	29.4	5	0.5	0.5	0.003
	Female	67.8	27.9	3.4	0.7	0.2	
	Total	66.6	28.5	4	0.6	0.3	
I will take physical examination regularly	Male	49.4	37.4	9.1	2.8	1.3	0.003
	Female	52.2	37.8	7.1	1.9	1	
	Total	51.2	37.6	7.8	2.3	1.1	
I will try to stop smoking and alcohol abuse	Male	51.8	34.9	6.5	3.6	3.2	0.005
	Female	56	32	5.3	4.1	2.6	
	Total	54.4	33.1	5.8	3.9	2.8	
Colorectal cancer screening are effective	Male	17.1	33.5	30	9.5	10	<0.001
	Female	17.8	39.1	26.2	8.7	8.2	
	Total	17.4	37.2	27.6	9	8.8	
Cancer screening should be widely implemented	Male	32.5	35.7	26.2	3.6	2	<0.001
	Female	38.4	36.5	20.1	3.5	1.5	
	Total	36.3	36.2	22.2	3.6	1.7	

factors were known with greater frequencies (86.9% and 85.3%, respectively). Dietary factors were also known well (not enough fruits and vegetables = 89.4%; low fiber and high fat diet = 63.8%). Almost 60% of the respondents knew the associations of inflammatory bowel diseases and colorectal polyps with CRC (60.0% and 56.9%, respectively). However, over half of the respondents did not know that lack of physical exercises may also lead to cancer, and the percentage of correct answer was only 42.9%. Of the 3 warning signs, visible blood in stool was known the most commonly (65.8%), followed by positive FOBT (55.8%). Only 44.0% of the respondents realized that a change in bowel habits might be an early warning sign of CRC. The total correct average rate of knowledge about risk factors and warning signs towards CRC was 63.1%. Women showed higher levels than men for most of the knowledge questions (P<0.05).

The attitudes toward CRC were shown in Table 2. The scores were ranged from 14 to 40 and the average was 33±4 with a total of 40. Most of the subjects would like to know more knowledge about cancer (95.0%). Over 90% of the subjects believe that a regular physical examination was able to diagnose cancer in early stage, which would help a better prognosis, and 88.8% would like to take regular physical examination. Almost 90% of respondents would like to pay effort to stop smoking and alcohol abuse in the future. About two-thirds of respondents considered that it was misfortune that someone had cancer. Although over 72% (68.2% for men and 74.9% for women) believed

Table 3. Practice of Prevention and Early Detection towards Colorectal Cancer [n (%)]

Items	Men	Women	All	P
Have taken part in a colorectal cancer screening				<0.001
Yes	236 (10.6)	360 ( 8.4)	603 ( 9.2)	
Not sure	320 (14.4)	411 ( 9.6)	737 (11.2)	
No	1,662 (74.9)	3,504 (82.0)	5,224 (79.6)	
Tobacco use				<0.001
Yes	928 (41.4)	116( 2.7)	1,044(16.0)	
No or quit	1,316(58.6)	4,144(97.3)	5,460(84.0)	
Collect the information of cancer prevention intentionally				<0.001
Yes	812 (36.3)	1,844 (43.0)	2,687 (40.7)	
No	1,422 (63.7)	2,447 (57.0)	3,910 (59.3)	
Go to see doctor if not feel well				0.243
Yes definitely	1,422 (63.3)	2,821 (65.4)	4,290 (64.7)	
Probably	604 (26.9)	1,105 (25.6)	1,730 (26.1)	
Definitely not	219 ( 9.8)	388 ( 9.0)	611 ( 9.2)	
Regular physical examination				0.987
Yes	1,135 (50.8)	2,167 (50.8)	3,341 (50.8)	
No	1,099 (49.2)	2,100 (49.2)	3,231 (49.2)	
Intention to take up FOBT				0.007
Yes definitely	1,092 (49.6)	2,289 (53.8)	3,409 (52.2)	
Uncertain	772 (35.1)	1,365 (32.1)	2,167 (33.2)	
Definitely not	337 (15.3)	604 (14.2)	952 (14.6)	

Note, The total number may not be the same because of the missing data

Table 4. Factors Related to the Knowledge, Attitudes and Intention to Take up FOBT

Age (years)	N (%)	Knowledge			Attitudes			FOBT intentions		
		Low (0-9) [n (%)]	High (10-14) [n (%)]	OR (95%CI) *	Low (0-33) [n (%)]	High (34-40) [n (%)]	OR (95%CI) **	Uncertain or No	Yes	OR(95%CI) ***
20~	2686 (40.9)	1211 (42.0)	1271 (40.5)	Reference	1155 (40.2)	1384 (41.8)	Reference	1205 (40.2)	1376 (41.7)	Reference
36~	3174 (48.3)	1356 (47.0)	1553 (49.5)	0.9 (0.8, 1.0)	1379 (48.0)	1611 (48.7)	1.0 (0.9, 1.2)	1459 (48.7)	1591 (48.3)	1.1 (0.9, 1.2)
46~	711 (10.8)	318 (11.0)	313 (10.0)	0.7 (0.6, 0.9)	341 (11.9)	315 (9.5)	1.0 (0.8, 1.2)	332 (11.1)	330 (10.0)	1.1 (0.9, 1.3)
Gender										
Men	2282 (34.2)	1021 (34.5)	1032 (32.2)	Reference	1091 (36.8)	1058 (31.3)	Reference	1109 (36.0)	1092 (32.3)	Reference
Women	4386 (65.8)	1942 (65.5)	2175 (67.8)	0.8 (0.7, 0.9)	1877 (63.2)	2325 (68.7)	0.8 (0.7, 0.9)	1969 (64.0)	2289 (67.7)	0.8 (0.7, 0.9)
Education-junior high school										
Yes or below	2351 (35.3)	1326 (44.9)	731 (22.7)	Reference	1309 (44.2)	848 (25.0)	Reference	1235 (40.1)	1007 (29.8)	Reference
Above	4317 (64.7)	1629 (55.1)	2484 (77.3)	0.4 (0.4, 0.5)	1653 (55.8)	2540 (75.0)	0.6 (0.5, 0.7)	1842 (59.9)	2373 (70.2)	0.8 (0.7, 0.9)
Family history of cancer										
No	5954 (89.3)	2710 (91.5)	2791 (86.6)	Reference	2727 (91.7)	2953 (87.1)	Reference	2821 (91.4)	2963 (87.4)	Reference
Yes	714 (10.7)	253 (8.5)	433 (13.4)	0.7 (0.6, 0.8)	248 (8.3)	437 (12.9)	0.8 (0.7, 1.0)	266 (8.6)	429 (12.6)	0.8 (0.7, 1.0)
Income (¥/month)										
<3,000	2376 (37.2)	1263 (45.2)	861 (27.8)	Reference	1250(45.0)	972(29.7)	Reference	1151(40.2)	1127(34.3)	Reference
3,000~5,000	2133 (33.3)	908 (32.5)	1081 (34.9)	0.7 (0.6, 0.8)	892(32.1)	1121(34.2)	0.8 (0.7, 0.9)	933(32.6)	1114(33.9)	1.0 (0.9, 1.2)
>5,000	1892 (29.4)	626 (22.4)	1151 (37.2)	0.5 (0.4, 0.5)	636(22.9)	1182(36.1)	0.6 (0.5, 0.7)	780(27.2)	1047(31.8)	1.0 (0.9, 1.2)
BMI (kg/m <sup>2</sup> )										
≥24	1762 (26.4)	793 (27.2)	796 (25.1)	1.0 (0.9, 1.2)	812(27.8)	829(24.8)	1.0 (0.9, 1.2)	792(26.1)	883(26.4)	0.9 (0.8, 1.0)
18.5~23.9	4318 (65.0)	1862 (63.8)	2113 (66.6)	Reference	1848(63.3)	2233(66.8)	Reference	1924(63.4)	2225(66.6)	Reference
≤18.5	572 (8.6)	264 (9.0)	264 (8.3)	1.1 (0.9, 1.4)	260(8.9)	283(8.5)	1.2 (1.0, 1.4)	319(10.5)	234(7.0)	1.7 (1.3, 2.0)
Knowledge levels										
Low	2991 (48.0)	-	-	-	1697(61.9)	1180(35.6)	Reference	1592(56.3)	1303(40.6)	Reference
High	3242 (52.0)	-	-	-	1044(38.1)	2130(64.4)	0.4 (0.3, 0.4)	1234(43.7)	1907(59.4)	0.6 (0.6, 0.7)
Attitude levels										
Low	3008 (46.9)	-	-	-	-	-	-	1638(55.9)	1221(37.4)	Reference
High	3412 (53.1)	-	-	-	-	-	-	1293(44.1)	2045(62.6)	0.6 (0.5, 0.7)

\*. Adjusted by age, gender, education, income, BMI, family history; \*\*. Adjusted by age, gender, education, income, BMI, family history, knowledge and attitude levels; \*\*\*. Adjusted by age, gender, education, income, BMI, family history, knowledge and attitude levels.



that cancer screening should be widely implemented, only 54.6% (50.6% for men and 56.9% for women) agreed that CRC screening was effective. Women answered significantly more positively than men ( $P<0.05$ ).

Practices of prevention and early detection towards CRC were shown in Table 3. Less than 10% of the respondents had ever taken part in a CRC screening, and men (10.4%) had a significantly higher participation rate than women (8.6%) ( $P<0.01$ ). In contrast, there were more women (53.8%) than men (49.6%) who had intention to take up FOBT by the local government within 6 months. Half of the subjects had regular physical examination, and 65% of them would go to see a doctor if they did not feel well. However, only 40% of the subjects would intentionally collect the information of cancer prevention.. For preventive practices of cancer, women performed better than men with a remarkable example that 41.4% of men but only 2.7% of women smoked.

The factors related to the knowledge, attitude, and FOBT intentions were shown in Table 4. Knowledge score was significantly higher among the older age subjects compared to the young ones (20-35 years) [OR (95% CI): 0.9 (0.8, 1.0) and 0.7 (0.6, 0.9) for 36~ and 46~ years groups, respectively]. Women demonstrated greater knowledge than men [OR (95% CI): 0.8 (0.7, 0.9)]. The subjects with higher education and family history of cancer obtained significantly higher knowledge scores [OR (95% CI): 0.4 (0.4, 0.5) and 0.7 (0.6, 0.8), respectively]. In addition, higher income markedly increased the knowledge score. The attitudes varied by gender, education level, family history of cancer, and personal income. The female subjects had a more positive attitude than the males [OR (95% CI): 0.8 (0.7, 0.9)]. A higher education level significantly associated with a higher attitude score [OR (95% CI): 0.6 (0.5, 0.7)]. Family history of cancer facilitated the attitude [OR (95% CI): 0.8 (0.7, 1.0)] and high personal incomes significantly increased the attitude scores.

The screening intention was dichotomized with the answers of “yes” and “maybe” or “no”. The results from logistic models showed that the subjects with female gender, higher education level, and positive family history of cancer were more likely to be willing to participate in the CRC screening. Interestingly, compared with the normal weight subjects, the over-weight subjects did not have a stronger intention to screen CRC [OR (95% CI): 0.9 (0.8, 1.0)] while the thinner subjects were more negative to participate in CRC screening [OR (95% CI): 1.7 (1.3, 2.0)]. Finally, we found that the knowledge, attitude, and CRC screening intentions were highly associated with each other (Table 4).

## Discussion

The present study explored the knowledge, attitude, and practice toward CRC prevention and early discovery, particularly the intention for early screening and the related factors, in a southern metropolis of China. It was found that the adults with older age, female gender, higher educational level, higher personal income, and a family history of CRC had higher levels of knowledge about

CRC risk factors and signs. More positive attitude was associated with higher educational levels, female, higher personal income, a family history of cancer, and higher knowledge scores. Only half of the residents would be willing to participate in the free CRC screening provided by the local government. This intention was largely related to higher educational levels, female gender, a family history of cancer, a normal personal BMI, and a higher knowledge score and positive preventive attitude toward CRC. These findings provided important information for facilitating the participation in the CRC screening program and further public policy-making toward prevention of CRC and other cancers.

The average knowledge rate (including CRC risk factors and signs) in our study was 63.1%, which was generally higher than that studied elsewhere before. For example, in a study in England, only 42% of the respondents could list any colorectal cancer risk factors and 24% were unable to identify any important warning signs for CRC (McCaffery et al., 2003); the correct response rate to the knowledge of CRC signs was 60% in Malaysia (Harmy et al., 2011), 55% and 10.4% in Iran (Mansour-Ghanaei et al., 2015; Salimzadeh et al., 2016), and 9% in Brunei (Chong et al., 2015). This comparison may not be appropriate because the knowledge contents or method of measurement were not exact the same and the time was not concurrent. It is reasonable that people are more likely to expose nowadays to the knowledge information than before. Nevertheless, the Guangzhou residents may actually have a relatively higher level of CRC knowledge due to the motivation activities advocated by the local government for CRC screening (Guangzhou Center for Disease Control and Prevention, 2016). However, it should be noted that our study subjects had a relatively poor knowledge about the physical exercise and change in bowel habits for CRC prevention and early sign (43% and 44%, respectively), suggesting the necessity for further health education. As for the factors associated with the knowledge, our findings were mostly consistent with that from previous studies, exemplified by that older age (Taha et al., 2015; Zubaidi et al., 2015), female gender (Panic et al., 2014; Wong et al., 2013; Zubaidi et al., 2015), higher education (Omran et al., 2015; Sessa et al., 2008; Taha et al., 2015; Zubaidi et al., 2015), positive family history of cancer (Christou and Thompson, 2012; Panic et al., 2014; Taha et al., 2015; Wong et al., 2013), and higher personal income (Christou and Thompson, 2012; Wong et al., 2013) were related to higher levels of the knowledge.

We found that about half of the subjects would be willing to undertake the free FOBT screening. This intention rate was relatively lower than that reported recently in Iran (68.1%) (Mansour-Ghanaei et al., 2015), Australia (63%) (Christou and Thompson, 2012), and Florida (men 66.4%, women 61.2%, 63.0% in total) (McKinney and Palmer, 2014). The reasons may be complicated, but it could be explained to some extent by the facts that the higher educational level rate (64.7%) in the present study was lower than that from other studies (72.3% in Iran, 96.7% in Australia), considering that the screening intention was largely related to higher educational levels as reported in our study as well as other

studies (Christou and Thompson, 2012; Mansour-Ghanaei et al., 2015). Interestingly, we found that women were more positive than men (53.8% versus 49.6%) as for the intention to CRC screening program, while their actual practice rate of having taken part in a CRC screening was significantly lower than men (8.4% versus 10.6%). This higher screening intention for women may be because they were engaged more in screening for other diseases (Wang et al., 2013; Wang et al., 2015) and had higher self-perceived risk to develop diseases than men (Ministry of Health of China, 2009). Men, on the other hand, are usually not as common as women to seek preventive health care (Ministry of Health of China, 2009), resulting in their lack of intention to participate in screening compared with women.

Our study showed a overall relationship between the knowledge, attitude, and screening intention towards CRC as most previous studies (Cameron et al., 2007; Chong et al., 2015; Christou and Thompson, 2012; McCaffery et al., 2003; Wong et al., 2013). However, for some specific items is this not always the case (Dey et al., 2012; Haroon et al., 2014). We observed that more than 86% of the male subjects knew that smoking was a risk factor of CRC and agreed to stop smoking, but more than 40% of them were still smokers. We further found that older age and higher personal income were correlated to higher knowledge but not associated with intention of CRC screening, implicating the inconsistency between knowledge and potential practice. Therefore, we need to put the emphasis on converting knowledge into practice, particularly targeted to the subjects with higher income and older age, by stimulating and cultivating residents' practice motivation.

This is the first study to examine knowledge, attitudes, preventive practices and screening intention in regard to CRC and its screening in Mainland China. The study subjects were representative, reflected by that the male smoking rate (41.4%) was similar to that (37.4%) in a previous study conducted in Guangzhou (Ye et al., 2015). Although our main outcome was 'intention' to take up FOBT but not real behaviors, intention was the first step towards behavior modification and can be regarded as an indication of behavior. In addition, our questionnaire was close-ended instead of open-ended, resulting in a possible overestimate. However, close-ended questionnaire can facilitate the response and is more practical, particularly for the less literate subjects as in the present study.

In conclusion, although some knowledge items of CRC among Guangzhou residents remained low, the overall knowledge rate was relatively higher than that studied elsewhere. However, the corresponding screening intention appeared to be insufficient. Improving the conversion rate from knowledge to practice should be a priority in the effort to implement screening program in Guangzhou. The factors associated with the knowledge, attitude, and intention towards CRC indicated that the populations with male gender and lower education level should be paid more attention.

#### Competing interests

The authors declare that they have no competing

interests.

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