Factors Associated With Colorectal Cancer Screening Via Immunochemical Fecal Occult Blood Test in an Average-Risk Population From a Multiethnic, Middle-Income Setting

Nur-Nadiatul-Asyikin Bujang, MBBS, MPH; Yu-Jie Lee, MBBS; Siti-Anis-Suraya Mohd-Zain, MBBS; Junita-Harizon Aris, MD, MFAMMED; Fitri-Amalina Md-Yusoff, MD; Zailiza Suli, MD, MPH; Muhammad-Radzi Abu-Hassan, MBBS, MRCP, M.MED; and Nirmala Bhoo-Pathy, MD, PhD

PURPOSE The Malaysian Ministry of Health had launched free opportunistic screening for colorectal cancer using immunochemical fecal occult blood test (iFOBT) targeting the average-risk individuals since 2014. This study aims to determine factors associated with colorectal cancer screening using iFOBT among the average-risk Malaysian population.

METHODS A cross-sectional study was conducted at five government-run health clinics in the state of Selangor. Adults with an average risk of colorectal cancer (age ≥ 50 years, asymptomatic, and no family history of colorectal cancer) were recruited using systematic random sampling. An interviewer-administered questionnaire adapted from the Cancer Awareness Measure and Health Belief Model was used.

RESULTS The median age of participants was 61 years (interquartile range, 56 to 66). Almost 60% of participants indicated their willingness to be screened. However, only 7.5% had undergone iFOBT. Good knowledge of risk factors of colorectal cancer, perceived susceptibility to the disease, and the doctor’s recommendation were associated with increased willingness to be screened: adjusted odds ratio (aOR), 1.66 (95% CI, 1.12 to 2.46); aOR, 1.70 (95% CI, 1.08 to 2.70); and aOR, 5.76 (95% CI, 2.13 to 15.57), respectively. Nevertheless, being elderly (aOR, 0.67; 95% CI, 0.45 to 0.99) and high negative perception toward the testing method (iFOBT) (aOR, 0.12; 95% CI, 0.05 to 0.30) were independently associated with lower willingness to be screened. Multivariable analysis within the average-risk individuals who were willing to be screened for colorectal cancer showed that the doctor’s recommendations remained as an important cue for positive action, whereas negative perception toward the test was a significant barrier to the actual uptake of iFOBT.

CONCLUSION The present findings must be factored in when tailoring colorectal cancer screening promotion activities in multiethnic, middle-income settings.

JCO Global Oncol 7:333-341. © 2021 by American Society of Clinical Oncology

INTRODUCTION Colorectal cancer has been reported as the second most common cancer in men and women in Malaysia in 2018. A well-recognized challenge to cancer control in the nation is that most of the patients with colorectal cancer tended to present at advanced stage of the disease. Although the Malaysian Ministry of Health had launched free opportunistic screening for colorectal cancer using immunochemical fecal occult blood test (iFOBT) targeting the average-risk individuals since 2014, via its nationwide network of primary care clinics, the screening behavior of Malaysians and the associated factors remain largely unknown. This is particularly important considering that barriers to undergo iFOBT in affluent settings have been attributed to the complexity of the screening itself, such as uncertainty about sampling instructions or procedures that might be overwhelming for laypersons. Knowledge of such factors within the local context may be most helpful in the development of measures to mitigate them to ensure the efficiency of current screening approaches and to embark on an organized national screening program for colorectal cancer in Malaysia. Hence, this study determined factors associated with colorectal cancer screening via iFOBT among the average-risk population using public outpatient healthcare facilities in Malaysia, which presently caters to a majority (65%) of Malaysians. Average-risk individuals comprised those of age 50 years and above who were asymptomatic and have no positive family history of colorectal cancer.
METHODS
Participants and Settings
Participants of this cross-sectional study were selected among visitors attending five urban and semiurban government-run primary care clinics (Ampang, Batu 14, Sungai Chua, Kajang, and Batu 9 health clinic) in Hulu Langat district in the state of Selangor. Potential participants comprised Malaysians seeking primary care services including outpatient services and routine health checks as well as the accompanying persons. Attendees of age >50 years, asymptomatic of colorectal cancer, with no family history of colorectal cancer (average risk) were selected via systematic random sampling. Participant recruitment was conducted concurrently in all clinics, and on a given day, the selection of the first participant was done using a table of random numbers based on the registration list of eligible patients (and accompanying persons). The subsequent participants were chosen with an interval of two based on the calculation of the estimated previous year attendance of adults of age 50-75 years, per day divided by the calculated sample size. In total, 508 participants were recruited between May 1, 2019, and July 31, 2019.

This study received approval from the Medical Research Ethics Committee (NMRR-19-396-46040). Written informed consent was obtained from all participants.

Study Tool
Interviews were conducted using validated questions adapted from a questionnaire used by the Asia Pacific Colorectal Cancer Working Group, which was developed based on the Health Belief Model, and the Cancer Awareness Measure. These questions were forward translated from English to Malay language by two research staff, reconciled, and then back-translated before being incorporated into a bilingual questionnaire. Before the initiation of this study, face validation of the new questionnaire was conducted among experts and laypersons, who were independent of the present study. Test-retest was conducted with a Cronbach’s alpha of .70. It must nonetheless be acknowledged that the cross-cultural adaptation for construct validity among Malaysian population was not determined.

Apart from collecting information on sociodemographic characteristics including age, sex, ethnicity, highest attained education level, employment status, and total household monthly income, the questionnaire included a few sections:

Knowledge of Colorectal Cancer and Its Screening
For the knowledge of colorectal cancer symptoms, there were nine close-ended items where the respondents had the options to answer yes” or “no” comprising bleeding from back passage or rectal, persistent abdominal pain, altered bowel habits, tenesmus, blood in stools, pain in back passage, lump in abdomen, lethargy (anemia), and unexplained weight loss. Each correct answer was given one mark. A total score ≤4 was considered as poor and ≥5 as good knowledge. Risk factors were assessed using 10 questions based on a 5-point Likert scale from definitely agree (scored 1), agree (scored 1), do not know (scored 0), disagree (scored 0), and definitely disagree (scored 0). The accepted answers included alcohol consumption >1 unit per day; low-fiber, vegetables, and fruit intake; high red meat and/or processed food consumption; obesity; being >70 years of age; a positive family history of colorectal cancer; lack of physical activities or exercise; inflammatory bowel disease; and diabetes mellitus. The total score was then categorized into good (score ≥5) and poor (score ≤4).

For the knowledge of screening, colonoscopy, fecal occult blood testing, sigmoidoscopy, colon capsule endoscopy, and barium enema were listed. A score of 1 was given for each test correctly recognized by the respondents (score 1: poor knowledge and score ≥2: good knowledge).
Health Beliefs About Colorectal Cancer and Its Screening

The attitude and barriers toward colorectal cancer screening were assessed based on the Health Belief Model with four main perceptions: perceived susceptibility (one item),6,7 perceived severity (four items), perceived benefit (one item), and perceived barrier (eight items). Those who answered yes for susceptibility perceived that they were at risk of developing colorectal cancer. Perceived severity, benefits, and barriers were assessed based on a 5-point Likert scale. Scores ranging from 0 (strongly disagree), 1 (disagree), 2 (do not know), 3 (agree), and 4 (strongly agree) were given. Total score was divided into low, moderate, and high.6,7

Cues to action included (i) the physician’s recommendation, (ii) health insurance that covers colorectal cancer screening, and (iii) personal experience (close friends with colorectal cancer).

Participants’ willingness to undergo screening via iFOBT was assessed. Respondents were required to provide a reason if they had indicated that there were not willing to undergo screening (open-ended). History of undergoing prior iFOBT was also assessed.

Statistical Analysis

Continuous variables were described using mean or median, whereas categorical variables were presented using frequencies and percentages. Univariable logistic regression analyses were performed to determine factors that were significantly associated with willingness to undergo colorectal screening using iFOBT. Variables with $P$-value $<$ .25 were included in a multivariable logistic regression model using the backward elimination technique. A second model was used to assess factors that were associated with the actual uptake of iFOBT among study participants who had indicated willingness to undergo screening via iFOBT.

RESULTS

The response rate in this study was 95.8%. The median age of participants was 61 years (interquartile range, 56 to 66). An ethnically representative sample of the Malaysian population was obtained, with almost equal representation of males and females (Table 1). Approximately 75% of study participants were from low-income (B40) groups, and more than 90% had comorbidities.

The majority of participants fared well in terms of overall knowledge of colorectal cancer. Among the respondents, 263 (51.8%) had good knowledge of signs and symptoms of colorectal cancer, whereas 306 (60.2%) had good knowledge of risk factors and 269 (53%) had good knowledge of screening methods.

Health Beliefs and Perceptions About Colorectal Cancer and Screening with iFOBT

Overall, a majority of respondents perceived that colorectal cancer was a severe disease leading to pain (82.5%), impairment in activities of daily living (85.8%), financial difficulties (77.2%), and family burden (82.9%). Most patients also had moderate-to-high perception that screening for colorectal cancer will be beneficial in preventing or reducing deaths because of the disease.

It was nonetheless intriguing to note that only one fourth ($n = 131$) of the respondents perceived that they were susceptible to get colorectal cancer (Table 2). Close to 20% of the study participants reported having close friends with colorectal cancer, whereas $<$ 10% had received recommendation from their doctors to undergo screening for colorectal cancer or had health insurance with coverage for colorectal cancer screening (Table 2).

It was observed that more than half (65%) of the study respondents had high-to-moderate negative perception toward iFOBT as a screening tool. Close to 50% of the participants agreed that they would avoid iFOBT as it required them to handle stool. Approximately 21% agreed that it was embarrassing. Only a small proportion (10%) had perceived that iFOBT was harmful or painful. Most of the respondents had moderate-to-high perceived access barriers to iFOBT; 41.1% of the respondents were not aware of the (zero) cost, whereas 30.9% were unaware of the availability of the test in government clinics (not mutually exclusive). A substantial proportion of respondents also perceived colorectal cancer screening as time-consuming, with 43.5% indicating preference for a test that does not need to be done annually.

Further analysis showed that participants who had previously undergone colorectal cancer screening were significantly associated with low perceived negativity toward iFOBT and low perceived barrier to access screening (not shown).

Willingness to Undergo Colorectal Cancer Screening Using iFOBT

Half of the respondents (51.4%) indicated willingness to undergo screening for colorectal cancer using iFOBT. From the remaining respondents who were not willing to be screened, up to 59% justified that they were asymptomatic and therefore did not require testing, whereas about 15% preferred to wait for their doctor’s recommendation. Approximately 5% of participants also cited additional reasons including lack of knowledge of the test and that the screening process is dirty (open-ended).

Following multivariable analysis, it was found that good knowledge of risk factors, perceived susceptibility, and recommendation from physicians were independent facilitators associated with willingness to be screened for colorectal cancer using iFOBT (Table 2). Older age and moderate and high negative perceptions toward the test itself were inversely associated with willingness to be screened using iFOBT. Education status nonetheless was not associated with willingness for screening using iFOBT. The $P$-value from Hosmer-Lemeshow test for the above multivariable logistic regression model was .933 with areas
| Characteristic                  | Overall (%) | Not Willing to Be Screened (N = 209, No. (%)) | Willing But Never Underwent iFOBT (n = 261, No. (%)) | Had Undergone iFOBT (n = 38, No. (%)) | P*  |
|--------------------------------|-------------|---------------------------------------------|----------------------------------------------------|--------------------------------------|-----|
| **Age**                        |             |                                             |                                                    |                                      |     |
| 50-59 years                    | 216 (42.5)  | 80 (38.3)                                   | 123 (47.1)                                         | 13 (34.2)                           | 0.087|
| 60-75 years                    | 292 (57.5)  | 129 (61.7)                                  | 138 (52.9)                                         | 25 (65.8)                           |     |
| **Sex**                        |             |                                             |                                                    |                                      |     |
| Male                           | 236 (46.5)  | 85 (40.7)                                   | 134 (51.3)                                         | 17 (44.7)                           | 0.068|
| Female                         | 272 (53.5)  | 124 (59.3)                                  | 127 (48.7)                                         | 21 (55.3)                           |     |
| **Ethnicity**                  |             |                                             |                                                    |                                      |     |
| Chinese                        | 120 (23.6)  | 39 (18.7)                                   | 75 (28.7)                                          | 6 (15.8)                            | 0.072|
| Malay                          | 300 (59.1)  | 129 (61.7)                                  | 146 (55.9)                                         | 25 (65.8)                           |     |
| Indian                         | 79 (15.6)   | 37 (17.7)                                   | 35 (13.4)                                          | 7 (18.4)                            |     |
| Othersb                        | 9 (1.8)     | 4 (1.9)                                     | 5 (1.9)                                            | 0                                   |     |
| **Education level**            |             |                                             |                                                    |                                      |     |
| No education or primary education | 159 (31.3) | 76 (36.4)                                   | 66 (24.9)                                          | 18 (47.4)                           | 0.021 |
| Secondary education            | 263 (51.8)  | 105 (50.2)                                  | 143 (54.8)                                         | 15 (39.5)                           |     |
| Tertiary education             | 86 (16.9)   | 28 (13.4)                                   | 53 (20.3)                                          | 5 (13.2)                            |     |
| **Employment status**          |             |                                             |                                                    |                                      |     |
| Unemployed                     | 157 (30.9)  | 62 (29.7)                                   | 81 (31.0)                                          | 14 (36.8)                           | 0.656|
| Self-employed                  | 70 (13.8)   | 29 (13.9)                                   | 33 (12.6)                                          | 8 (21.1)                            |     |
| Government servant             | 35 (6.9)    | 14 (6.7)                                    | 17 (6.5)                                           | 4 (10.5)                            |     |
| Private sector                 | 73 (14.4)   | 28 (13.4)                                   | 42 (16.1)                                          | 3 (7.9)                             |     |
| Housewife                      | 69 (13.6)   | 34 (16.3)                                   | 32 (12.3)                                          | 3 (7.9)                             |     |
| Retiree                        | 104 (20.5)  | 42 (20.1)                                   | 56 (21.5)                                          | 6 (15.8)                            |     |
| Monthly household income<sup>d</sup> |         |                                             |                                                    |                                      |     |
| Low (B40) (< USD $912.50)      | 382 (75.2)  | 162 (77.5)                                  | 190 (72.8)                                         | 30 (78.9)                           | 0.656|
| Middle (M40) (USD $912.70-1,966.70) | 99 (19.5) | 38 (18.2)                                   | 54 (20.7)                                          | 7 (18.4)                            |     |
| High (T20) (> USD $1,966.90)   | 27 (5.3)    | 9 (4.3)                                     | 17 (6.5)                                           | 1 (2.6)                             |     |
| **Smoking status**             |             |                                             |                                                    |                                      |     |
| Smoker                         | 69 (13.6)   | 20 (9.6)                                    | 43 (16.5)                                          | 6 (15.8)                            | 0.087|
| Nonsmoker                      | 439 (86.4)  | 189 (90.4)                                  | 218 (83.5)                                         | 32 (84.2)                           |     |
| **Medical conditions**         |             |                                             |                                                    |                                      |     |
| No illness<sup>*</sup>         | 39 (7.7)    | 15 (7.2)                                    | 22 (8.4)                                           | 2 (5.3)                             | 0.743|
| Hypertension<sup>1</sup>       | 351 (69.1)  | 151 (72.2)                                  | 175 (67.0)                                         | 25 (65.8)                           | 0.432|
| Diabetes mellitus<sup>4</sup>  | 262 (51.6)  | 118 (56.5)                                  | 128 (49.0)                                         | 16 (42.1)                           | 0.133|
| Dyslipidemia<sup>5</sup>       | 210 (41.3)  | 84 (40.2)                                   | 108 (41.4)                                         | 18 (47.4)                           | 0.711|
| Others<sup>6</sup>             | 101 (19.9)  | 37 (17.7)                                   | 53 (20.3)                                          | 11 (28.9)                           | 0.271|

Abbreviations: iFOBT, immunochemical fecal occult blood test; USD, US dollars.
<sup>a</sup> Derived using chi-square test.
<sup>b</sup> Other races were excluded in the chi-square test.
<sup>c</sup> Statistically significant.
<sup>d</sup> Based on the findings from the Eleventh Malaysia Plan, 2016-2020. B40: bottom 40%; M40%: middle 40%; Top 20: top 20%. 1 USD = 4.23 Malaysian Ringgit.
<sup>e</sup> In comparison with those with medical illness.
<sup>f</sup> In comparison with those without hypertension.
<sup>g</sup> In comparison with those without diabetes mellitus.
<sup>h</sup> In comparison with those without dyslipidemia.
### TABLE 2. Factors Associated With Willingness to Undergo Colorectal Cancer Screening via iFOBT Among Malaysians With Average Risk of Colorectal Cancer (N = 508)

| Characteristic                        | Not Willing to Be Screened (%) | Willing to Be Screened (%) | P*  | Multivariable ORb (95% CI) |
|---------------------------------------|---------------------------------|----------------------------|-----|---------------------------|
| **Age**                               |                                 |                            |     |                           |
| 50-59 years                           | 80 (38.3)                       | 136 (45.5)                 | .106| 1.00                      |
| 60-75 years                           | 129 (61.7)                      | 163 (54.5)                 | 0.67| (0.45 to 0.99)            |
| **Sex**                               |                                 |                            |     |                           |
| Male                                  | 85 (40.7)                       | 151 (50.5)                 | .029| —                         |
| Female                                | 124 (59.3)                      | 148 (49.5)                 | —   | —                         |
| **Ethnicity**                         |                                 |                            |     |                           |
| Chinese                               | 39 (18.7)                       | 81 (27.1)                  | .156| —                         |
| Malay                                 | 129 (61.7)                      | 171 (57.2)                 | —   | —                         |
| Indian                                | 37 (17.7)                       | 42 (14.0)                  | —   | —                         |
| Others                                | 4 (1.9)                         | 5 (1.7)                    | —   | —                         |
| **Education level**                   |                                 |                            |     |                           |
| No education or primary education     | 76 (36.4)                       | 69 (27.8)                  | .104| —                         |
| Secondary                             | 105 (50.2)                      | 158 (52.8)                 | —   | —                         |
| Tertiary                              | 28 (13.4)                       | 58 (19.4)                  | —   | —                         |
| **Smoking status**                    |                                 |                            |     |                           |
| Nonsmoker                             | 189 (90.4)                      | 250 (83.6)                 | .027| —                         |
| Smoker                                | 20 (9.6)                        | 49 (16.4)                  | —   | —                         |
| **Knowledge of symptoms**             |                                 |                            |     |                           |
| Poor                                  | 118 (56.5)                      | 127 (42.5)                 | .002| —                         |
| Good                                  | 91 (43.5)                       | 172 (57.5)                 | —   | —                         |
| **Knowledge of risk factors**         |                                 |                            |     |                           |
| Poor                                  | 100 (47.8)                      | 102 (34.1)                 | .002| 1.00                      |
| Good                                  | 109 (52.5)                      | 197 (65.9)                 | 1.66| (1.12 to 2.46)            |
| **Knowledge of screening**            |                                 |                            |     |                           |
| Poor                                  | 114 (54.5)                      | 125 (41.8)                 | .005| —                         |
| Good                                  | 95 (45.5)                       | 174 (58.2)                 | .005| —                         |
| **Perceived susceptibility**          |                                 |                            |     |                           |
| No                                    | 169 (80.9)                      | 208 (69.6)                 | .004| —                         |
| Yes                                   | 40 (19.1)                       | 91 (30.4)                  | 1.70| (1.08 to 2.70)            |
| **Perceived benefit of screening**    |                                 |                            |     |                           |
| Low                                   | 28 (13.4)                       | 23 (7.7)                   | .053| —                         |
| Moderate                              | 119 (56.9)                      | 166 (55.5)                 | —   | —                         |
| High                                  | 62 (29.7)                       | 110 (36.8)                 | —   | —                         |
| **Perceived negativity to iFOBT**     |                                 |                            |     |                           |
| Low                                   | 36 (17.2)                       | 139 (46.5)                 | < .001| 1.00                      |
| Moderate                              | 156 (74.6)                      | 151 (50.5)                 | 0.25| (0.16 to 0.40)            |
| High                                  | 17 (8.1)                        | 9 (3.0)                    | 0.12| (0.05 to 0.30)            |
| **Having close friends with colorectal cancer** |                                 |                            |     |                           |
| No                                    | 178 (85.2)                      | 241 (80.6)                 | .183| —                         |
| Yes                                   | 31 (14.8)                       | 58 (19.4)                  | —   | —                         |

(Continued on following page)
under the receiver operating characteristic (ROC) curves of > 0.70, indicating a good model fit.

**Actual Uptake of iFOBT Screening**

In this study, although half of the study participants indicated willingness to be screened, only 7.5% had undergone screening via iFOBT. Multivariable analysis conducted within the subgroup of participants who were willing to participate in colorectal cancer screening showed that the doctor’s recommendations were strongly associated with the actual uptake of iFOBT (Table 3). The lack of iFOBT uptake on the other hand was significantly associated with moderate-to-high perceived negativity toward iFOBT itself. The P-value from Hosmer-Lemeshow test for the above model was .324. The areas under ROC curve for perceived negativity were 0.59 and 0.83 for the doctor’s recommendation, respectively, indicating good model fit. A post hoc analysis where individual components of perceived negativity toward iFOBT were included in the multivariable analysis, however, showed that none of them were independently associated with the actual uptake of iFOBT.

**DISCUSSION**

Based on the findings of the Malaysian National Health and Morbidity Survey in 2019, it appears that the distribution of the study population in our present work fairly represents the distribution of Malaysians using services from the government-run health clinics, in terms of income status,9 and distribution of comorbidities.13 Despite the fact that iFOBT is being offered at no cost in the government health clinics in Malaysia, the present study reveals that only 7.5% of the average-risk individuals attending these clinics had undergone colorectal cancer screening. Similarly, a recent population-based study conducted in an urban Malaysian setting had shown that <10% of its participants had undergone colorectal cancer screening using either iFOBT or colonoscopy in the preceding 5 years.14 Although these rates may be construed as low, there appears to be an improvement in the uptake of colorectal cancer screening in Malaysia compared with previous reports in 2012 where only 3.8% of Malaysians with average risk indicated an intention to participate in screening activities for colorectal cancer,15 with only 3.0% who had actually undergone any form of screening.15,16

The current study highlights that negative perception toward iFOBT might be a major barrier to colorectal cancer screening in multicultural settings, with the lack of willingness to handle stool being cited as the leading reason. This is in keeping with other studies where stool-based colorectal cancer screening method has been consistently regarded as disgusting, embarrassing, and emotionally distressing.16-19 It is felt that in multicultural settings, open conversations between healthcare professionals and patients may not only be useful in removing the taboo associated with handling of feces20 but also helping patients to prepare themselves to undergo the test with ease. Furthermore, messaging to promote iFOBT in these settings may need to be more creative and tailored to suit different cultures so that it may effectively convince the community that personal benefits of undergoing iFOBT outweigh any perceived barriers. It has also been previously proposed that simple physical adaptations of the iFOBT kit to allow easier collection of stools and the provision of disposable glove may be worth considering to make the stool specimen collection process less unpleasant.21

We found that a recommendation to undergo colorectal screening by the doctors was strongly associated with increased willingness to undergo iFOBT, and the actual uptake of the test has been shown in other settings.6,22 Malaysians nonetheless have been reported to receive less recommendation to undergo colorectal cancer screening from their doctors as compared with other countries.15 In the present study, <10% of the average-risk population had received prior advice from their physicians to undergo iFOBT. Although this may be attributed to the high patient load and busy working schedule in government-run primary care clinics,22 our findings underscore the need to engage all doctors to routinely recommend iFOBT to patients with average risk during their primary care encounters. In busy clinical practices, educational videos on colorectal cancer in

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**TABLE 2.** Factors Associated With Willingness to Undergo Colorectal Cancer Screening via iFOBT Among Malaysians With Average Risk of Colorectal Cancer (N = 508) (Continued)

| Characteristic | Not Willing to Be Screened (%) n = 209 | Willing to Be Screened (%) n = 299 | P* | Multivariable OR* (95% CI) |
|---------------|--------------------------------------|-----------------------------------|----|--------------------------|
| **Doctor’s recommendation** | | | | |
| No | 204 (97.6) | 260 (87) | | |
| Yes | 5 (2.4) | 39 (13.0) | <.001c | 5.76 (2.13 to 15.6) |
| **Health insurance covering cancer screening** | | | | |
| No | 196 (93.8) | 268 (89.6) | .102 | |
| Yes | 13 (6.2) | 31 (10.4) | | |
the waiting room may help improve shared decision making and lessen the time with the physician. This also allows patients to take control of their own health and open room for discussion with their providers on iFOBT. It must nonetheless be noted that doctors in the public service may face additional barriers, such as unavailability of stool test kits, which in turn point toward other health systems-related issues in terms of ensuring adequate supply of iFOBT kits to roll out free opportunistic colorectal cancer screening program.

In light of our finding that those who had previously undergone screening via iFOBT had low perceived negativity toward the test, it may be worthwhile to consider recruiting such individuals as lay health advisors in engaging and motivating the subgroups of average-risk individuals who were shown to be less willing to participate in colorectal cancer screening such as the elderly. Similarly, these lay motivators may play an important role in addressing taboos associated with stool-based screening. The idea of incorporating colorectal cancer screening as part of existing local community-led health programs, such as KOSPEN, is also expected to exert a positive impact on colorectal cancer screening practices in Malaysia.

### TABLE 3
Factors Associated With Actual Uptake of iFOBT Among Malaysians With Average Risk of Colorectal Cancer Who Were Willing to Be Screened (n = 299)

| Characteristic                  | Yes (%) n = 38 | No (%) n = 261 | P     | OR† (95% CI) |
|---------------------------------|----------------|----------------|-------|--------------|
| **Age**                         |                |                |       |              |
| 50-59 years                     | 13 (34.2)      | 123 (47.1)     | .135  |              |
| 60-75 years                     | 25 (65.8)      | 138 (52.9)     |       |              |
| **Ethnicity**                   |                |                |       |              |
| Chinese                         | 6 (15.8)       | 75 (28.7)      | .186  |              |
| Malay                           | 25 (65.8)      | 146 (55.9)     |       |              |
| Indian                          | 7 (18.4)       | 35 (13.4)      |       |              |
| Others                          | 0              | 5 (1.9)        |       |              |
| **Knowledge of symptom**        |                |                |       |              |
| Poor                            | 12 (31.6)      | 115 (44.1)     | .146  |              |
| Good                            | 26 (68.4)      | 146 (55.9)     |       |              |
| **Knowledge of screening**      |                |                |       |              |
| Poor                            | 12 (31.6)      | 113 (43.3)     | .171  |              |
| Good                            | 26 (68.4)      | 148 (56.7)     |       |              |
| **Perceived severity**          |                |                |       |              |
| Low to moderate                 | 6 (15.8)       | 66 (25.3)      | .229  |              |
| High                            | 32 (84.2)      | 195 (74.7)     |       |              |
| **Perceived susceptibility**    |                |                |       |              |
| No                              | 23 (60.5)      | 185 (70.9)     | .195  |              |
| Yes                             | 15 (39.5)      | 76 (29.1)      |       |              |
| **Perceived negativity to iFOBT**|     |                |       |              |
| Low                             | 24 (63.2)      | 115 (44.1)     | .027  | 1.00         |
| Moderate to high                | 15 (36.8)      | 138 (55.9)     | .32   | (0.11 to 0.85) |
| **Perceived barrier to iFOBT**  |                |                |       |              |
| Low                             | 12 (31.6)      | 31 (11.9)      | .001  |              |
| Moderate to high                | 26 (68.4)      | 230 (88.1)     |       |              |
| **Doctor’s recommendation**     |                |                |       |              |
| No                              | 11 (28.9)      | 249 (95.4)     | < .001 | 1.00         |
| Yes                             | 27 (71.1)      | 12 (4.6)       | 58.87 | (22.20 to 156.16) |

Abbreviations: iFOBT, immunochemical fecal occult blood test; OR, odds ratio.

*Derived using chi-square and Fisher’s exact tests. Only variables with P value < .25 are presented in this table.

†Derived using a backward logistic regression analysis.

Statistically significant.
Although a substantial proportion of the average-risk population in this study had perceived that colorectal cancer is severe and that screening via iFOBT may be beneficial, they largely (74%) did not perceive themselves to be susceptible of colorectal cancer and were unwilling to undergo iFOBT, as was also observed in other studies. These findings indicate a lack of awareness that individuals with colorectal cancer might be asymptomatic at earlier stages of the disease. About 40% of the study participants did not possess good knowledge on risk factors of colorectal cancer, which is a significant determinant of willingness to be screened using iFOBT, further highlighting areas for improvement. Policy initiatives are necessary to increase the awareness of colorectal cancer in the community with the development of structured government and community-endorsed messages for the general public about risk factors of colorectal cancer, who should undergo screening, and modalities of colorectal cancer screening. Particularly, strong involvement of cancer survivors and also community leaders in health promotion efforts can be useful in reaching underserved populations such as the low socioeconomic groups and rural dwellers.

We echo a previous recommendation that individual countries in Asia need to take their ethnic diversities into account when structuring screening policies to ensure that the benefit of the program is maximized while remaining cost-effective. It is also felt that the development of an Asian-specific colorectal cancer risk prediction tool may facilitate the uptake of iFOBT in our settings as it will enable the general public to appreciate their individuals’ risks better. This notion is well supported by the findings of this study where knowledge of risk factors of colorectal cancer was significantly associated with willingness to be screened using iFOBT, indicating that people with good knowledge of risk factors of colorectal cancer were better able to understand their risk of developing colorectal cancer than those with poor knowledge and hence were more willing to undergo screening. Colorectal cancer risk prediction tools are gaining popularity in affluent Western settings, and their utility in guiding clinical decision making is being widely discussed. Further research in this area is also warranted in Asian settings, including the validation and adaptation of previously developed colorectal cancer risk prediction tools.

The present findings are particularly important amid the ongoing COVID-19 pandemic, where home-based stool testing has been reported to be widely gaining acceptance in the United States. It is only conceivable that in multicultural Asian settings, such as in Malaysia, a similar approach of promoting home-based iFOBT is highly unlikely to succeed if the negative perception against stool-based testing in the population is left unaddressed.

This study used a validated questionnaire and randomly sampled participants representing the low- and middle-income Malaysian population from urban and semiurban settings. Nonetheless, we may have missed factors influencing colorectal cancer screening in the rural populations and those from high-income backgrounds who were under-represented in this study.

In conclusion, in Malaysia, more effort needs to be focused on educating the public that colorectal cancer may be asymptomatic in the earlier stages, and screening via iFOBT enables detection at these stages. Addressing the aversion toward stool-based testing among the average-risk community should also be a priority. A low-hanging fruit in improving the uptake of iFOBT may involve getting all primary care doctors to routinely incorporate the recommendation to undergo iFOBT during clinical encounters with the average-risk population. All these efforts must go hand in hand with ensuring the adequate supply of iFOBT kits in the government facilities and timely follow-up of those with positive screening tests.

AFFILIATIONS
1Department of Social and Preventive Medicine, Centre for Epidemiology and Evidenced-Based Practice, Faculty of Medicine, Lembah Pantai, Kuala Lumpur, Malaysia
2Batu 14 Health Clinic, Jalan Hulu Langat, Selangor, Malaysia
3Hulu Langat District Health Office, Kajang, Selangor, Malaysia
4Gastroenterology Service, Ministry of Health, Malaysia
5Department of Internal Medicine, Hospital Sultanah Bahiyah, Kedah, Malaysia

CORRESPONDING AUTHOR
Nirmala Bhoopathy, MD, PhD, Department of Social and Preventive Medicine, Centre for Epidemiology and Evidenced-Based Practice, Faculty of Medicine, 50603 Lembah Pantai, Kuala Lumpur, Malaysia; e-mail: ovenjjay@gmail.com.

SUPPORT
Supported by the Long-Term Research Grant Scheme (LR001C-2019) from the Malaysian Ministry of Higher Education.

AUTHOR CONTRIBUTIONS
Conception and design: Nur-Nadiatul-Asyikin Bujang, Yu-Jie Lee, Siti-Anis-Suraya Mohd-Zain, Fitriz-Amalina Md-Yusof, Muhammad-Radzi Abu-Hassan, Nirmala Bhoopathy
Financial support: Nur-Nadiatul-Asyikin Bujang, Nirmala Bhoopathy
Administrative support: Nur-Nadiatul-Asyikin Bujang, Zailiza Suli, Nirmala Bhoopathy
Provision of study materials or patients: Nur-Nadiatul-Asyikin Bujang, Junita-Harizon Aris, Nirmala Bhoopathy
Collection and assembly of data: Nur-Nadiatul-Asyikin Bujang, Yu-Jie Lee, Siti-Anis-Suraya Mohd-Zain, Junita-Harizon Aris, Muhammad-Radzi Abu-Hassan, Nirmala Bhoopathy
Data analysis and interpretation: Nur-Nadiatul-Asyikin Bujang, Yu-Jie Lee, Zailiza Suli, Muhammad-Radzi Abu-Hassan, Nirmala Bhoopathy
Manuscript writing: All authors
Final approval of manuscript: All authors

ACCOUNTABLE FOR ALL ASPECTS OF THE WORK: All authors

AUTHORS’ DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST
The following represents disclosure information provided by authors of this manuscript. All relationships are considered compensated unless otherwise
noted. Relationships are self-held unless noted. I = Immediate Family Member, Inst = My Institution. Relationships may not relate to the subject matter of this manuscript. For more information about ASCO’s conflict of interest policy, please refer to www.asco.org/rcw or ascopubs.org/go/authors/author-center.

Open Payments is a public database containing information reported by companies about payments made to US-licensed physicians (Open Payments).

**Nirmala Bhoo-Pathy**

**Honoraria:** Novartis

**Speakers’ Bureau:** Roche, Novartis

**Research Funding:** Pfizer

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**Travel, Accommodations, Expenses:** Roche

No other potential conflicts of interest were reported.

**ACKNOWLEDGMENT**

The authors wish to thank Soffea Syazlin Azhar, Joanne Chin, Muhamad Fikri Arizan, Sok-Teng Chan, Ady Zarith Ahmad, Puteri Zulaikha Mohd Zukri, and Sharvinee Ragunatha Rao (stage III medical students of the University of Malaya) who assisted with data collection. Our gratitude is also extended to Professor Ida Normiha Hilmi for providing permission to adapt the questionnaire used by the Asia Pacific Colorectal Cancer Working Group.