

A 5-year evaluation of using stool-based test for opportunistic colorectal cancer screening in primary health institutions across Malaysia

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ABSTRACT

Introduction: The immunochemical fecal occult blood test (iFOBT) has been widely used for opportunistic colorectal cancer (CRC) screening in average-risk individuals seeking care from public health clinics in Malaysia. This study provides a 5-year outcome evaluation of such a practice.

Methods: The findings for a few outcome indicators, ranging from the iFOBT uptake to the CRC and polyp detection rates, were generated from the data contributed by 583 public health clinics between 2014 and 2018. The trends in their changes were also evaluated.

Results: The iFOBT uptake constantly increased over the years ($p < 0.001$), totaling 2.29 % ($n = 127,957$) as at 2018. Nearly 10 % ($n = 11,872$) of the individuals screened had a positive test result. Of those who underwent colonoscopy ($n = 6,491$), 4.04 % ($n = 262$) and 13.93 % ($n = 904$) were found to have CRC and polyps, respectively.

Conclusion: An uptrend in the CRC screening uptake was witnessed following the introduction of the iFOBT in public health clinics.

1. Introduction

Colorectal cancer (CRC), along with lung and breast cancer, emerges as the most common and life-threatening cancer globally [1]. In Malaysia, it currently ranks second in the incidence (14.8 per 100,000 in men and 11.1 per 100,000 in women) among all the cancer types. A total of 15,515 CRC cases were recorded between 2012 and 2016, accounting for 13.5 % of the new cancer cases in the country. Although CRC is highly preventable through the early detection and removal of pre-malignant polyps, nearly 70 % of the patients in Malaysia were only diagnosed at stage III or IV of the disease [2]. Due to the high proportion of delayed presentation for medical care, the 5-year survival of CRC patients in Malaysia has been consistently below 50 %, much lower than that of patients in most developed countries [3].

The late diagnosis of CRC among Malaysian patients results primarily from their poor awareness of the disease [4]. As a strategy to promote the timely CRC prevention and treatment, the non-invasive screening approach of using a commercially available immunochemical fecal

occult blood test (iFOBT) kit has been adopted by the Ministry of Health (MOH) since 2014. The test was also incorporated into the algorithm for opportunistic CRC screening in public health clinics (Fig. 1), serving as a means to justify the referral of patients to hospitals for confirmatory investigation with colonoscopy. It is currently recommended to be performed on the average-risk, symptom-free individuals in the age range between 50 and 75 years [5].

While it is generally believed that the stool-based screening test encourages the early diagnosis of CRC, little discussion has been undertaken on how it has transformed the landscape of CRC management in Malaysia. Therefore, this study was designed to evaluate the outcomes of the government-led initiatives to promote the use of the iFOBT for CRC screening in public health clinics.

2. Materials and methods

This study was approved by the Medical Research Ethics Committee of the MOH under the protocol number NMRR-20-888-54814. The

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findings were generated from the data gathered by the Disease Control Division (DCD) of the MOH between January 2014 and December 2018. Over the 5-year period, each clinic providing the iFOBT-based, opportunistic CRC screening services was required to report the following information to the DCD quarterly: (i) the number of patients offered the iFOBT, (ii) the number of patients recording a positive iFOBT result, (iii) the number of patients undergoing colonoscopy, (iv) the number of patients missing the hospital appointments, (v) the number of patients refusing the hospital referral, and (vi) the number of patients found to have CRC or polyps following colonoscopy.

In this study, the data management and analysis were performed using the SPSS for Windows version 21 (IBM, Chicago). The mid-year population aged between 50–75 years in the country from 2014 to 2018 was used as the denominator for calculating the annual iFOBT uptake, and the overall iFOBT uptake was estimated based on the mid-year population of 2018 [6]. Meanwhile, the number of patients receiving the test was used as the denominator for calculating the rate of positive iFOBT results. The colonoscopy uptake, along with the rates of missed and refused hospital appointments, was also computed in relation to the number of patients who had a positive iFOBT result. Moreover, the rates of CRC and polyp detection in those undergoing colonoscopy were determined. The trends in the changes of all the above parameters over the years were also evaluated using the Mantel-Haenszel test of linear association, with the significant level fixed at 5%.

3. Results

Up until December 2018, 583 public health clinics were known to have provided the iFOBT-based, opportunistic CRC screening services. A total of 127,957 iFOBT tests were performed between 2014 and 2018, yielding an overall CRC screening uptake of 2.29 %. The annual screening uptake ranged from 0.23 % to 0.68 %, and a linear association suggested its constant increase over the years ($p < 0.001$). Although nearly 10 % ($n = 11,782$) of the individuals receiving the iFOBT had a positive test result, only slightly more than half of them ($n = 6,491$) eventually underwent colonoscopy (Table 1).

Irrespective of an increasing trend shown in both the rates of positive iFOBT results ($p < 0.001$) and screening uptake ($p = 0.001$), approximately 30 % ($n = 3,393$) of the individuals who tested positive were still found to have either missed or refused the hospital appointments. Despite the uptrend in the missed hospital appointments ($p < 0.001$), CRC and polyps were, respectively, detected in 4.04 % ($n = 262$) and 13.93 % ($n = 904$) of those who underwent colonoscopy. An increasing

trend was also demonstrated in the rate of polyp detection ($p < 0.001$) (Table 1).

4. Discussion

To the best of our knowledge, this study represents the first attempt to comprehensively evaluate the outcomes of the MOH-led initiatives to scale up the CRC screening in Malaysia. While the findings in other local studies were generally limited in generalizability [7–9], this study provides a bigger picture of how the iFOBT translated into a public health tool by helping the prevention and early detection of CRC throughout the country. However, regardless of their limitations, it is encouraging to note that a number of non-MOH institutions, including one of the university hospitals under the Ministry of Education, have also endeavored to battle CRC together with the MOH by promoting the use of the iFOBT [9].

Since the launch of the iFOBT-based, opportunistic CRC screening services by the MOH in 2014, public health clinics across the country were found to have tested over 120,000 individuals. The MOH fully recognized the likelihood of the overall iFOBT uptake being slightly overestimated due to the absence of the information about the retested individuals. However, the findings presented in this study could still give a rough idea about the CRC screening coverage in the country, as the iFOBT was mainly offered to the screening-naive population in the first five years of its use. While the MOH also aims at scaling up retesting in those who received their first iFOBT more than two years ago, the information about the retested individuals shall be gathered in addition to what have been periodically reported by health clinics to the MOH.

Despite the above uncertainty, the iFOBT uptake demonstrated an increasing trend over the years. This is attributable to the continuous efforts made by the MOH to promote the public awareness of the test, in addition to the increased number of centers providing the services. Yet, it is noteworthy that the CRC screening uptake was still constantly below 1% in each of the years studied. Although giving the option of performing the iFOBT at home could encourage populations of different socio-demographics to take up the test [10], it had still been commonly performed by trained laboratory technicians in Malaysia. Those who agreed to the iFOBT were often instructed to collect their stool samples at home and brought them back to clinics a few days later for the test. Such an approach was adopted mainly as a strategy to avert the potential waste resulting from unused test kits. Nonetheless, this might have also restricted the number of tests offered due to the limited capacity of the clinics. Going forward, in order to optimize the screening uptake, the MOH should push for the patient empowerment by encouraging the

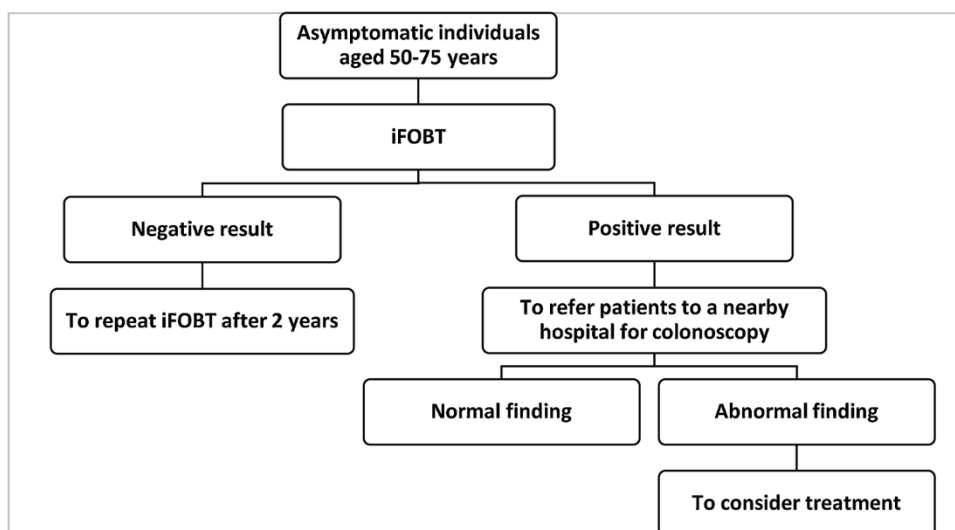


Fig. 1. Algorithm for opportunistic colorectal cancer screening using the immunochemical fecal occult blood test (iFOBT) in health clinics across Malaysia.

Table 1

Outcomes of the use of immunochemical fecal occult blood test for colorectal cancer screening in public health clinics across Malaysia.

Parameters		Total	Year					p ^a
			2014	2015	2016	2017	2018	
CRC Screening uptake	Number of patients screened using the iFOBT	127,957	11,230	16,743	29,551	32,464	37,969	<0.001
	% ^b	2.29	0.23	0.33	0.57	0.60	0.68	
Rate of positive iFOBT results	Number of patients with a positive iFOBT result	11,782	799	1,509	2,697	3,391	3,386	<0.001
	% ^c	9.21	7.11	9.01	9.13	10.45	8.92	
Colonoscopy uptake	Number of patients undergoing colonoscopy	6,491	477	685	1,460	1,992	1,877	0.001
	% ^d	55.09	59.70	45.39	54.13	58.74	55.43	
Rate of missed hospital appointments	Number of patients missing hospital appointments	2,121	0	137	656	850	478	<0.001
	% ^d	18.00	0.00	9.08	24.32	25.07	14.12	
Rate of refused hospital appointments	Number of patients refusing hospital appointments	1,272	59	174	327	318	394	0.202
	% ^d	10.80	7.38	11.53	12.12	9.38	11.64	
Proportion of patients with an unclear status	Number of patients with an unclear status	1,898	263	513	254	231	637	<0.001
	% ^d	16.11	32.92	34.00	9.42	6.81	18.81	
Rate of CRC detection	Number of patients found to have CRC	262	18	29	59	86	70	0.803
	% ^e	4.04	3.77	4.23	4.04	4.32	3.73	
Rate of polyp detection	Number of patients found to have polyps	904	25	47	181	354	297	<0.001
	% ^e	13.93	5.24	6.86	12.40	17.77	15.82	

CRC, colorectal cancer; iFOBT, immunochemical fecal occult blood test.

^aMantel-Haenszel test of linear association.^bCalculated in relation to the mid-year population aged between 50–75 years in Malaysia.^cCalculated in relation to the number of patients screened using iFOBT.^dCalculated in relation to the number of patients with a positive iFOBT result.^eCalculated in relation to the number of patients undergoing colonoscopy.

home-based iFOBT.

In line with the recommendations by international guidelines [11], the iFOBT was only performed on the average-risk group seeking care from the public health clinics. This could explain why the rate of positive iFOBT results in this study (9.21 %) was lower than that of another local study (13.1 %), which targeted volunteers with a wider age range and different levels of risk from an existing cohort [9]. In fact, moderate- and high-risk individuals in the clinics, namely those with either a family history or presumptive symptoms of CRC, had been directly referred to hospitals for colonoscopy. Nevertheless, a comparable colonoscopy uptake of slightly over 50 % was still found in this study. As promising as the increasing trends in the colonoscopy uptake and the polyp detection rate sound, attention should also be equally paid to the uptrend in the missed hospital appointments. To ensure that the iFOBT serves its purpose, efforts should be continuously made to correct the negative perceptions of colonoscopy in the public and overcome the logistic barriers to visiting hospitals, which are particularly common in those with a lower socioeconomic status in Malaysia [12].

The rate of CRC detection among the individuals undergoing colonoscopy in this study was approximately 4%, consistent with the findings in the other two smaller-scale studies in Malaysia [7–9]. While the delayed presentation of cancer patients for medical care remains the major challenge in the country [13], the iFOBT proves to be a handy and yet affordable approach to promote the timely management of CRC. As the MOH managed to acquire the iFOBT kits at a price below US\$1 per unit in the first five years after it was introduced in public health clinics, the fully subsidized CRC screening services are expected to be sustainable in the foreseeable future.

5. Conclusion

Following the use of the iFOBT, the MOH had screened over 120,000 individuals from the average-risk population between 2014 and 2018, and had identified nearly 10 % of them who tested positive. While the MOH is motivated by the increasing trend in the number of individuals receiving the test, future plans to improve the colonoscopy uptake are warranted. Measures to keep lowering the proportion of patients with an unclear status, which was likely due to incomplete documentation or loss to follow-up, also need to be sought out. Although an organized, population-based CRC screening program is still not in place in

Malaysia, the MOH is currently paving a path toward expanding the coverage of the existing services, mainly through the introduction of the iFOBT in more clinics, inter-organizational partnership and outreach programs.

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CRediT authorship contribution statement

Nor Saleha Ibrahim Tamin: Conceptualization, Methodology, Formal analysis, Investigation, Resources, Data curation, Writing - review & editing, Visualization, Supervision, Project administration. **Khursiah Ahmad Razalli:** Conceptualization, Methodology, Formal analysis, Investigation, Resources, Data curation, Writing - review & editing, Visualization, Supervision, Project administration. **Siti Norain Sallahuddin:** Conceptualization, Methodology, Formal analysis, Investigation, Resources, Data curation, Writing - review & editing, Visualization, Supervision, Project administration. **Huan-Keat Chan:** Conceptualization, Methodology, Formal analysis, Writing - original draft, Visualization. **Muhammad Radzi Abu Hassan:** Conceptualization, Methodology, Formal analysis, Resources, Writing - review & editing, Visualization, Supervision.

Declaration of Competing Interest

The authors report no declarations of interest.

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