

RESEARCH ARTICLE

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Colorectal Cancer (CRC) Screening Literacy and Facilitators Related to a Free Screening Program in Thailand

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Abstract

Objective: This study aimed to evaluate CRC screening literacy and to determine the association between demographic characteristics and levels of CRC screening literacy and facilitators motivating participation. **Methods:** This cross-sectional study was carried out with 1,272 Thai citizens aged 50-70 years consenting to complete the screening protocol. Data were collected at the final visit by a self-reported questionnaire which was developed and validated using I-CVI=1. Difficulty of CRC screening knowledge dimension was tested by KR20, Cronbach's alpha 0.49. **Results:** The majority of participants, 834 (65.6%) had sufficient CRC screening literacy and association between characteristics and levels of CRC screening literacy was not different. Comparing between characteristics and facilitators showed significant differences in trusting healthcare providers, perceiving harmless procedures, having constipation and time available. By married and own income participants exhibited lower trust in healthcare providers, 68% (OR 0.32, 95%CI 0.14 - 0.73) and 59% (OR 0.41, 95%CI 0.19 - 0.95), respectively. Married individuals perceived the procedures of screening involved higher harm, 32% (OR 0.68, 95%CI 0.45 - 0.99). Female and age over 60 with constipation constituted higher screening, 1.9 fold (OR 1.93, 95%CI 1.44 - 2.60) and 1.4 fold (OR 1.44, 95%CI 1.09 - 1.90). Though time available, age over 60 was lower screening 56% (OR 0.44, 95%CI 0.24 - 0.80), while own income and income more than 30,000 THB/month participants constituted higher screening 15 fold (OR 15.14, 95%CI 4.72 - 48.56) and 2.5 fold (OR 2.50, 95%CI 1.50 - 4.18), respectively. **Conclusion:** CRC screening literacy of participants was high. The association between characteristics and CRC screening literacy levels did not differ while characteristics and facilitators differed in some aspects. The free program promoted CRC screening equity; however, multilevel facilitators must be concerned, prioritized and intervened to motivate participation.

Keywords: CRC screening- CRC screening literacy- facilitator- health literacy

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Introduction

New cases and the death rates of colorectal cancer (CRC) have been rising, especially in Asia (Onyiah et al., 2019). In 2020, Globocan reported 52.3% incidence and 54.2% mortality rates in Asia population (WHO, 2020). Thailand is a Southeast Asian country where CRC comprises the only increasing cancer in both sexes the second most common cancer among females and the third among males by over 10,000 new cases occurring annually (Lohsiriwat et al., 2020; WHO 2021). Unhealthy behaviors have been reported as risk factors, including low physical activity, low fiber, high red meat and fat consumption, and current smoking (Johnson et al., 2013; Supachai et al., 2020; Lewandowska et al., 2022).

While CRC screening programs have shown cost-effectiveness that early detection contributes substantially to QALY (Quality-Adjusted Life Year), participation in CRC screening is quite low (Obaro et al.,

2018; Jahn et al., 2019; Khalili et al., 2020; Ladabaum et al., 2020; Naber et al., 2021; Bretthauer et al., 2022; Burnett-Hartman et al., 2022). For example, middle to high income countries provided their existing effective CRC screening programs for their populations, but people participated only 16.1% in Canada, 19.9 to 68.2% in nine European countries, 21 to 62.9% in three East Asian countries, 45.4% in Australia, and 48.2% in the US (Navarro et al., 2017).

Concerning CRC screening, demographic characteristics were considered as the strong independent predictors (Hosseini-Ali et al., 2018). Married individuals influenced participation in CRC screening (Gram et al., 2021) and increasing income was related to screening (Frederiksen et al., 2010). Additionally, chronic diseases might affect cancer screening (Renzi et al., 2019).

Health literacy (HL) has been defined covering the individual's ability to obtain and translate knowledge and information to promote, maintain and improve health in

ways appropriate to different individual contexts (Liu et al., 2020). It played a moderating role (Rahimian Boogar et al., 2018) and was recognized as a contributing factor in CRC screening (Oldach et al., 2014). Many studied the association between HL and CRC screening but people with sufficient HL hesitantly participated in the screening (Horshauge et al., 2020; Pancar and Mercan, 2021). The association between HL and CRC screening adherence differed by sex (Zanobini et al., 2022). To measure HL in CRC screening, a wide variety of instruments have been used, the most common being S-TOFHLA. Validated instruments appropriate to variables being measured, should be employed (Oldach et al., 2014; Liu et al., 2020).

To determine other factors related to CRC screening, barriers and facilitators have been studied. Barriers included limited health literacy, procedural-related anxieties, fear of pain and result, high cost, and lack of gastrointestinal symptoms (Kobayashi et al., 2014, Travis et al., 2022). On the contrary, facilitators included free screening, having knowledge, health education, physician recommendation, trust in organization and provider, perceived risk and severity of screening procedures, family history of cancer, convenient transportation and time available (Byrd et al., 2019; Muthukrishnan et al., 2019; Unger-Saldaña et al., 2020; Hatamian et al., 2021; Ramanathan et al., 2022;). Promoting CRC screening, barriers should be addressed and facilitators must be enhanced in multilevel social ecological models (SEM) describing the interactive characteristics of individuals and environments underlying decision-making related to CRC screening (Golden and Earp, 2012; Unger-Saldaña et al., 2020).

Because of the increasing incidence rate, Chulabhorn Royal Academy provided a free CRC screening programs aiming to promote CRC screening equity for Thais across the country. Considering demographic characteristics, HL and facilitators related to the screening were investigated and this study aimed to evaluate CRC screening literacy levels and determine the association between characteristics and CRC screening literacy and facilitators of participants adhering until completing screening.

Materials and Methods

This cross-sectional survey was conducted under an umbrella of a free CRC screening program at Chulabhorn Hospital between 2020 and 2023. Participants were enrolled by registering via organizational website. Inclusion criteria comprised Thai citizens aged 50 to 70 years who never presented any types of cancers. Exclusion criteria consisted of having CRC or abnormal CRC symptoms, having a CT colonography or colonoscopy, underlying diseases inappropriate for colonoscopy or CT colonography and unable to adhere the protocol for all four visits.

The study instrument comprised a self-reported questionnaire developed based on literature reviews regarding CRC knowledge, constructs of HL and facilitators. The reasonable and approval final version of the instrument comprised three parts described below.

Part 1 Demographic data were dichotomous variables

including sex (male, female), age (≤ 60 , >60), education level ($<$ bachelor's degree, \geq bachelor's degree), marital status (unmarried, married), own income (no, yes), income ($\leq 30,000$, $>30,000$) and chronic diseases (no, yes). Reasons for choosing and classifying these were because age at 60 constitutes statutory retirement in Thailand. While educational attainment is higher, average monthly income per household is still low, less than 30,000 THB/month (National Statistical Office, 2021; National Statistical Office Education Branch, 2023). Married individuals and high income related to screening and chronic diseases might affect cancer screening (Frederiksen et al., 2010; Renzi et al., 2019; Gram et al., 2021).

Part 2 CRC screening literacy was based on elements and constructs of HL. Elements of HL are knowledge related to CRC screening including CRC incidence, risk factors, CRC screening methods and benefits of screening, ten items. Constructs of HL are individuals' ability to access, understand and prepare to participate the screening, six items. Scores of 13 to 16 were classified as sufficient, 9 to 12 as problematic, and less than 9 as inadequate literacy.

Part 3 Facilitators motivating CRC screening were based on literature reviews including perceived benefits of screening and harmless procedures, trust in organization's capability and healthcare providers' competency, CRC family history, having constipation, free screening, convenient transportation and time available (Muthukrishnan et al., 2019; Unger-Saldaña et al., 2020; Hatamian et al., 2021), nine items. Dichotomous question (yes/no) was used to identify the different groups of answers, while "yes" answers were accepted as a facilitator motivating participations.

To validate the instrument, one colorectal surgeon and two university instructors in the HL field were invited to approve the questionnaire for two rounds until I-CVI (item-level content validity index) reached 1. For reliability, CRC screening knowledge, ten items were tested for level of difficulty by using the Kubler-Richardson formula (KR20), showing a good level at 0.49. Data were collected at the last visit of screening before receiving the results of screening tests.

IBM SPSS, Version 23 Software was employed for analyses. Descriptive statistics were performed to describe demographic characteristics of participants. The Chi-square test was deployed to determine the association between demographic characteristics and levels of CRC screening literacy, and facilitators. Binary logistic regression was used to explain the different association between characteristic groups and facilitators and a p-value less than 0.05 was accepted.

Results

All 1,296 participants were included, while 1,272 completed the screening. The majority of participants were female (64.2%) with a mean age of 58.9 years (SD+5.5), had graduated bachelor's degree and higher (71.4%), married (64.9%), own income (58.8%), incomes less than 30,000 THB monthly (64.2%) and at least one chronic disease (56.1%) (Table 1).

In determining the level of CRC screening literacy, the

score ranges varied from 2 to 16, mean 12.7, SD+1.6. More than 65% of both sexes were at a sufficient CRC screening literacy level, and association between characteristics and levels of CRC screening literacy was not different (Table 1).

Regarding facilitators motivating CRC screening, all nine facilitators were accepted. However, the associations between characteristics and facilitators were found significant differences including between sex and constipation ($p=0.001$), age and constipation ($p=0.01$), age and time available ($p=0.006$), marital status and trust in healthcare providers ($p=0.005$), marital status and harmless procedures ($p=0.04$), own income and trust in healthcare providers ($p=0.03$), own income and time available ($p=0.001$) and income and time available ($p=0.001$) (Table 2). The differences of those are expressed in Table 3 as detailed below.

As to trust in healthcare providers, more than 89% of participants believed in the healthcare providers' competency. However, different associations were found between married and unmarried individuals ($p=0.007$) and between participants having their own income and having none ($p=0.03$). Trusting healthcare providers was significantly lower among those married than among unmarried individuals, 68% (OR 0.32, 95%CI 0.14 - 0.73)

and among those having their own income than among those having none, 59% (OR 0.41, 95%CI 0.19 - 0.95).

Regarding harmless procedures, more than 87% of participants perceived screening procedures (colonoscopy and CT colonography) were harmless. However, a significantly different association was found between marital status and this facilitator ($p=0.04$). Perceiving harm procedures was higher among married than unmarried individuals, 32% (OR 0.68, 95%CI 0.45 - 0.99).

Concerning constipation, 26.6% of female and 15.8% of male participants reported this problem. The association between characteristics and this facilitator showed significant difference for sex ($p<0.001$) and age ($p=0.01$). Females with constipation participated significantly higher in the screening than males, 1.9 fold (OR 1.93, 95%CI 1.44 - 2.60), and those aged over 60 with this problem participated higher than those younger, 1.4 fold (OR 1.44, 95%CI 1.09 - 1.90).

Considering time available, more than 90% of participants entered the program because they possessed free time. However, the associations between characteristics and time available were significant differences for age ($p=0.007$), own income ($p<0.001$) and income ($p<0.001$). Though participants at age over 60 with time available participated less in the screening than those

Table 1. Demographic Characteristics, Levels of CRC Screening Literacy and Association between Characteristic Groups and CRC Screening Literacy Levels (n=1272)

Characteristic	Total	CRC screening literacy			X ²
		min 2, max 16, mean 12.7, SD+1.6			
		Inadequate (<9)	Problematic (9-12)	Sufficient (13-16)	
		n (%)			
Sex					0.09
Male	456 (35.8)	16 (3.5)	138 (30.3)	302 (66.2)	
Female	816 (64.2)	14 (1.7)	270 (33.1)	532 (65.2)	
Age (years)					0.55
min 50, max 70, mean 58.9, SD+ 5.5					
<60	780 (61.3)	16 (2.1)	246 (31.5)	518 (66.4)	
≥60	492 (38.7)	14 (2.8)	162 (32.9)	316 (64.2)	
Educational level					0.06
<bachelor's degree	364 (28.6)	13 (3.6)	127 (34.9)	224 (61.5)	
≥bachelor's degree	908 (71.4)	17 (1.9)	281 (30.9)	610 (67.2)	
Marital status					0.85
Unmarried (single/widowed/divorced/separated)	447 (35.1)	12 (2.7)	143 (32.0)	292 (65.3)	
Married	825 (64.9)	18 (2.2)	265 (32.1)	542 (65.7)	
Own income					0.97
No	524 (41.2)	13 (2.5)	168 (32.1)	343 (65.4)	
Yes (working/pension)	748 (58.8)	17 (2.3)	240 (32.1)	491 (65.6)	
Income (THB/mth)					0.1
<30,000	816 (64.2)	24 (2.9)	269 (33.0)	523 (64.1)	
≥30,000	456 (35.8)	6 (1.3)	139 (30.5)	311 (68.2)	
Chronic diseases					0.59
No	559 (43.9)	11 (2.0)	185 (33.1)	363 (64.9)	
Yes	713 (56.1)	19 (2.7)	223 (31.3)	471 (66.0)	

Abbreviation: THB, Thai Baht, mth, month, X², Chi-square test

Table 2. Association between Demographic Characteristics and Facilitators (n=1272)

Characteristic	Total		Benefit of CRC screening		Trust in organization		Trust in healthcare providers		Harmless procedure		CRC family history		Having constipation		Free screening		Convenient transportation		Time available	
	n (%)	n (%)	X ²	n (%)	X ²	n (%)	X ²	n (%)	X ²	n (%)	X ²	n (%)	X ²	n (%)	X ²	n (%)	X ²	n (%)	X ²	
Sex			0.46		0.4		0.8		0.41		0.07		0.001		0.34		0.22		0.08	
Male	456 (35.8)	455 (99.8)		452 (99.1)		448 (98.2)		413 (90.6)		86 (18.8)		72 (15.8)		438 (96.1)		434 (95.2)		427 (93.6)		
Female	816 (64.2)	812 (99.5)		812 (99.5)		800 (98)		727 (89.1)		189 (23.2)		217 (26.6)		792 (97.1)		788 (96.6)		782 (95.8)		
Age (years)			0.39		0.95		0.95		0.86		0.15		0.01		0.94		0.85		0.006	
≤60	780 (61.3)	776 (99.5)		775 (99.4)		765 (98.1)		700 (89.7)		179 (22.9)		196 (25.1)		754 (96.7)		750 (96.2)		731 (93.7)		
>60	492 (38.7)	491 (99.9)		489 (99.4)		483 (98.2)		440 (89.4)		96 (19.5)		93 (18.9)		476 (96.7)		472 (95.9)		475 (96.5)		
Educational level			0.67		0.58		0.39		0.29		0.96		0.69		0.72		0.46		0.25	
<Bachelor's degree	364 (28.6)	363 (99.7)		361 (98.9)		359 (98.6)		321 (88.1)		79 (21.7)		80 (22)		353 (97)		352 (96.7)		350 (96.2)		
≥Bachelor's degree	908 (71.4)	904 (99.6)		903 (99.4)		889 (97.9)		819 (90.2)		196 (21.6)		209 (23)		877 (96.6)		870 (95.8)		859 (94.6)		
Marital status			0.82		0.38		0.005		0.04		0.96		0.73		0.16		0.1		0.43	
Unmarried	447 (35.1)	445 (99.6)		442 (98.9)		432 (96.6)		390 (87.2)		97 (21.7)		104 (23.3)		428 (95.7)		424 (94.9)		422 (94.4)		
Married	825 (64.9)	822 (99.6)		821 (99.5)		816 (98.9)		750 (90.9)		178 (21.6)		185 (22.4)		802 (97.2)		798 (96.7)		787 (95.4)		
Own income			0.08		0.61		0.03		0.94		0.86		0.28		0.09		0.64		0.001	
No	524 (41.2)	520 (99.2)		520 (99.2)		509 (97.1)		470 (89.7)		112 (21.4)		127 (24.2)		512 (97.7)		505 (96.4)		521 (99.4)		
Yes	748 (58.8)	747 (99.9)		744 (99.5)		739 (98.8)		670 (89.6)		163 (21.8)		162 (21.7)		718 (96)		717 (95.9)		688 (92)		
Income (THB/mth)			0.84		0.92		0.12		0.11		0.36		0.89		0.19		0.07		0.001	
≤30,000	816 (64.2)	813 (99.6)		811 (99.4)		729 (89.3)		723 (88.6)		183 (22.4)		187 (22.9)		785 (96.2)		778 (95.3)		789 (96.7)		
>30,000	456 (35.8)	453 (99.3)		452 (99.1)		451 (98.7)		416 (91.2)		92 (20.2)		102 (22.4)		444 (97.4)		443 (97.1)		419 (91.9)		
Chronic disease			0.47		0.29		0.52		0.71		0.48		0.79		0.89		0.15		0.48	
No	559 (43.9)	556 (99.5)		554 (99.1)		550 (98.4)		503 (90)		126 (22.5)		125 (22.4)		541 (96.8)		542 (97)		534 (95.5)		
Yes	713 (56.1)	711 (99.7)		710 (99.6)		698 (97.9)		637 (89.3)		149 (20.9)		164 (23)		689 (96.6)		680 (95.4)		675 (94.7)		

X², Chi-square test; p<0.05

Table 3. The Different Associations between Characteristic Groups and Facilitators

Facilitator	Characteristic group	B	S.E	Wald	df	Sig	Exp(B)	95%CI
Trust in healthcare providers	Marital status (ref: unmarried)							
	Married	-1.15	0.43	7.25	1	0.007	0.32	0.14-0.73
	Own income (ref: no)							
	Yes	-0.88	0.43	4.31	1	0.03	0.41	0.19-0.95
Perceived harmless procedures	Marital status (ref: unmarried)							
	Married	-0.38	0.19	4.14	1	0.04	0.68	0.45-0.99
	Sex (ref: male)							
Having constipation	Female	0.66	0.15	19.05	1	<0.001	1.93	1.44-2.60
	Age (ref:≤60)							
	>60	0.36	0.14	6.62	1	0.01	1.44	1.09-1.90
Time available	Age (ref:≤60)							
	>60	-0.82	0.31	7.19	1	0.007	0.44	0.24-0.80
	Own income (ref: no)							
	Yes	2.72	0.59	20.9	1	<0.001	15.14	4.72-48.56
	Income (ref: ≤30,000 THB/mth)							
	>30,000	0.918	0.26	12.31	1	<0.001	2.5	1.50-4.18

p<0.05

younger 56% (OR 0.44, 95%CI 0.24 - 0.80), those with their own income participated more than those without, 15 fold (OR 15.14, 95%CI 4.72 - 48.56), and those with income more than 30,000THB/month participated more, 2.5 fold (OR 2.50, 95%CI 1.50 - 4.18).

Discussion

To appropriately measure CRC screening literacy and facilitators promoting participation, the instrument was scientifically developed covering dimensions of CRC screening knowledge, constructs of health literacy, and facilitators. Intentionally, it specified the variables being measured, and item numbers were pragmatic approach in a large survey. Validating the instrument followed recommendations of Polit and Beck (2006) that three to five experts, and acceptable CVI should be 1. About reliability, difficulty of CRC screening knowledge was tested using Kuder-Richardson 20 (KR20), a test in which each question has dichotomous answers; Cronbach's alpha showed 0.49. According to Basuki and Hariyanto, determination of the level of difficulty and quality of tests with values of 0.9 to 1 indicated the items were too easy, 0.7 to 0.8 should be revised, 0.3 to 0.7 was quite good, 0.2 to 0.3 was difficult, and less than 0.2 was not good (Friaatma and Anhar, 2019). Therefore, CRC screening knowledge items used in this study were acceptable (not too easy or too difficult).

Evaluating CRC screening literacy levels, because item numbers with dichotomous answers of instrument used in this study were the same as the 16 items of the European Health Literacy Survey Questionnaire (HLS-EU-Q16) scores of 13 to 16 were classified as sufficient, 9 to 12 as problematic, and less than 9 as inadequate (Rosano et al., 2022). Therefore, cutoff scores and levels were mimicked. Though the majority of participants had sufficient CRC screening literacy, it is only the contributing factor related to CRC screening.

Regarding facilitators motivating CRC screening, evidence revealed that the multilevel SEM related to participation (Unger-Saldana et al., 2020; Kim et al., 2020), while cost of screening, transportation problem and time constraint were common barriers (Muthukrishnan et al., 2019). Facilitators in this study can be categorized in three levels-intrapersonal (perceived benefits of screening and harmless procedures, CRC family history, having constipation and time available), interpersonal (trust in organization and healthcare providers), organizational policy (free screening) and environmental situation (convenient transportation). Participants highly agreed with those facilitators. However, different associations were observed between characteristic groups and facilitators.

Trusting in healthcare providers' competency was less among married and own income individuals. This constitutes a set of expectations of professional responsibilities to serve people in a technically proficient way without inappropriately deferring to others, and is associated with satisfaction, continuity and adherence to treatment (Muller et al., 2014). Trust in this dimension was explained as a significant driver of CRC screening, higher trust was associated with participating and completing CRC screening (Gupta et al., 2014; Chawla et al., 2021). Low trust in healthcare provider affected CRC screening and reflected knowledge levels and cultural competency among healthcare providers which should be improved (Muliira et al., 2016; Dawadi et al., 2021).

Concerning perceived harmless procedures, individuals joining this screening received both colonoscopy and CT colonography. Most perceived those procedures were harmless; however, married individuals perceived greater harm. Perceiving harm must be a concern because it determines the decision making to impede screening and hamper procedures (Wongtawee et al., 2021; Pluymen et al., 2023).

As to having constipation, about 42% of participants

had this present symptom. Females and those aged over 60 reporting this symptom revealed higher screening rates than males and those younger. Lack of symptom was the most common barrier to CRC screening (Huang et al., 2019; Hatamain et al., 2021).

Time available was a facilitator, and lack of time was illustrated as a barrier related to CRC screening (Muthukrishnan et al., 2019; Hatamain et al., 2021). However, this study found that though having free time, the elderly exhibited lesser screening, while those having their own and those with high income screened more frequently.

Strength and limitation of study

Using the developed and validated instrument specific the study posed a strength. However, testing only the difficulty of CRC screening knowledge part without testing internal consistency of the whole and evaluating CRC screening literacy and determining facilitators motivating participation only among participating individuals without comparing unwilling people were the limitations.

In conclusion, free screening promoted CRC screening equity. The majority of participants possessed sufficient CRC screening literacy level and no different association was noted among characteristic groups. Facilitators used highly motivated participation; however, different association were observed among sex, age, marital status, own income and amount of income groups and facilitators of trust in healthcare providers, harmless procedures, having constipation and time available. Multilevel facilitators affected CRC screening, so they must be concerned, prioritized and intervened in a manner appropriate to individual context.

Author Contribution Statement

None.

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Conflict of interest

We have no conflicts of interest to disclose.

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