COLORECTAL CANCER SCREENING: UNDERSTANDING THE NEEDS OF THE PRE-SCREENING GROUP

Onur Acar[1], Ersin Nazlıcan[2], Elif Dönmez[3]
[1]Ağrı Provincial Health Directorate, Republic of Turkey Ministry of Health, Ağrı, Turkey
[2]Department of Public Health, Faculty of Medicine, Çukurova University, Adana, Turkey
[3]Department of Oncology Nursing, Hamidiye Nursing Faculty, University of Health Sciences, Istanbul, Turkey

SUMMARY

Objectives: For the last three decades, although colorectal cancer incidence has been decreasing in those over 50 years of age, it has been increasing in those under 50 included in the pre-screening group (PSG). The present study aims to explain the screening-related factors and compliance of individuals in PSG who are not included in the colorectal cancer screening programme.

Methods: This cross-sectional study was conducted with a total of 323 participants, 143 of whom were from the pre-screening group (40–49 years), and 180 from the screening included group (SIG) (50–70 years).

Results: Individuals included in PSG were more likely to have accepted that both faecal occult blood test (FOBT) (2.23 ± 1.22 vs. 1.89 ± 1.33, p = 0.018) and colonoscopy (2.37 ± 0.97 vs. 2.02 ± 1.14, p = 0.003) were useful and suitable screening tests in colorectal cancer. Adequate health literacy (OR = 4.3, 95% CI: 1.8–10.0, p = 0.001) and better education level (OR = 3.3, 95% CI: 1.3–8.4, p = 0.010) were factors of increased knowledge of colorectal cancer screening.

Conclusions: The findings show that PSG has different characteristics than SIG and may be more fitting in the colorectal cancer screening programme if included.

Key words: colorectal cancer, cancer screening tests, screening, early diagnosis of cancer, health literacy

Address for correspondence: O. Acar, Ağrı Provincial Health Directorate, Republic of Turkey Ministry of Health, Ağrı, Turkey. E-mail: dronuracar@yandex.com

https://doi.org/10.21101/cejph.a7184

INTRODUCTION

Colorectal cancer constitutes an integral part of cancers worldwide. It is the third most common type of cancer in men and the second most common in women. In developed countries, the age-standardized mortality rate for men and women is 12.8 and 8.5 per 100,000, respectively (1).

Colorectal cancer incidence increases after the age of 40–50, and most of the cases are diagnosed in individuals aged over 50 years (2). Colorectal cancer screening is a critical public health practice for the early detection of cancerous lesions. Likewise, screening enables precancerous polyps and early-stage cancers to be detected; therefore, a significant reduction in cancer-related mortality is achieved (3). Achieving the anticipated goal of cancer screening depends on high participation in the target population. The minimum desired colorectal screening participation rate is 65% considering the EU Commission recommendations, and at least 80% according to the American Cancer Society (4, 5). It is stated that the participation rate in colorectal cancer screening is not at the desired level in many developed and developing countries worldwide (6, 7). Similarly, this rate is not at the requested level in Turkey, and the Ministry of Health states that it varies between 30–40% (2).

Not participating in cancer screening is associated with low income, low education level and employment status. Young age, male gender, living alone, and having an ethnic minority correlate with low screening rates (8). In addition, it is reported that the low screening rate is due to the lack of awareness of the symptoms and risk factors of colorectal cancer, inadequate awareness of screening tests, low referrals by health professionals, and inadequate health literacy levels (9).

In recent years, health literacy has been proposed as a factor influencing participation in colorectal cancer screening. Health literacy refers to personal, cognitive, and social skills that determine an individual's ability to access, understand and use the information to improve and maintain his/her overall health (10). The concept of health literacy is an essential factor that is of paramount importance in eliminating health inequalities such as failures in cancer screening. However, the relationship between health literacy and colorectal cancer screening is observed to be inconsistent in the literature. While some studies have associated poor health literacy with low screening participation, others reported no particular association between the two.

Along with health literacy, the values, beliefs, and attitudes of individuals determine preventive health behaviours. Although colorectal cancer screening is free and accessible, it is unlikely to

succeed without understanding individuals' values, beliefs, and attitudes. Problematic beliefs and attitudes should be identified, and individual health education and necessary preventive health services should also be provided (11).

In recent years, with the help of national screening programmes, the incidence and death rates due to colorectal cancer in individuals over 50 have decreased, but on the contrary, the figures have increased for those under the age of 50 (12). In 2020, the incidence of colorectal cancer in the age range of 40–49 was 13.9 per 100,000 people, while the mortality rate was 4.6 (13). Colorectal cancer diagnosed before the age of 50 is called early-onset colorectal cancer (eoCRC). It has been reported that 11% of emerging colorectal cancers in men and 10% in women are eoCRC, and its prevalence has almost doubled since the beginning of the 1990s (14). The rate of colorectal cancer in individuals aged 20–49 in the USA increased from 8.6 per 100,000 in 1992 to 13.1 per 100,000 in 2016, and it was stated that the increase was primarily noticed in the 40–49 age group (15). Again, while the incidence of colorectal cancer in the USA between 2000 and 2013 decreased by 32% in individuals over 50, it increased by 22% in those under the age of 50. Between 2000 and 2014, mortality rates declined by 34% in individuals over the age of 50 and increased by 13% in those under 50 (12). Similarly, in the survival analysis performed on patients diagnosed with colorectal cancer between 2004 and 2015, individuals with eoCRC had a significantly lower survival rate than individuals diagnosed between the ages of 51 and 55 (16).

When considering the rise in incidence in the pre-screening group, colorectal cancer screening was reduced from 50 to 45 years of age for individuals at average risk, according to the American Cancer Society guideline from 2018 (17).

The focus of interest in recent studies has chiefly been centred on explaining the factors associated with participation in colorectal cancer screening in individuals over 50 years of age. Nonetheless, this study is one of the pioneering studies focusing on the needs of individuals under the age of 50 who are not included in the national screening programme, whose risk of developing colorectal cancer and death is constantly increasing. Therefore, this study aims to reveal and explain the factors affecting the participation in colorectal cancer screening in individuals under the age of 50 who are not included in the national screening programme.

MATERIALS AND METHODS

Study Design and Sample

The research is a cross-sectional study conducted on 323 people aged 40–70 years between August and October 2020 in Adana, Turkey. We compared 143 people aged 40–49 years who were not previously included in the national colorectal cancer screening – pre-screening group (PSG) and 180 people aged 50–70 years included in national screening as a control group – screening included group (SIG). Individuals who applied to four different family medicine departments located in different socioeconomically and geographically parts of the city and did not have a personal history of colorectal cancer were included in the study. The necessary permission was obtained from the Çukurova University Ethics Committee (No. 15.05.2020/17) for this study.

Turkey National Colorectal Cancer Screening Programme

In Turkey, the national colorectal cancer screening programme is applied to all men and women between the ages of 50–70. As a screening method, faecal occult blood test (FOBT) per two years and colonoscopy screening per ten years are planned. Screenings are carried out on a community-based basis, free of charge, at the Family Medicine Departments and Cancer Early Diagnosis Screening and Training Centres (CEDTS, Turkish acronym KETEM) under the Ministry of Health (2).

Data Collection Tools

As data collection tools, the personal information form consists of three parts: Turkey Health Literacy Scale-32 (THLS-32, Turkish acronym TSOY-32) and Colorectal Cancer Screening Behaviours Benefit and Obstacle Perception Scale (BOPS).

Turkey Health Literacy Scale-32

The Turkish Health Literacy Scale provides an assessment of the health literacy level of literate individuals who are 15 and above. The scale is structurally composed of a 2x4 matrix structure that includes two dimensions and four processes and consists of overall 32 questions. The scale was developed under the conceptual framework of the European Health Literacy Research Consortium (HLS-EU CONSORTIUM, 2012) as a result of a study conducted by Abacıgil et al. for the Ministry of Health (18).

Two sub-dimensions of the scale consist of treatment and service, prevention of diseases, and health promotion. The four processes in the scale are accessing, understanding, evaluating, and using (application) health-related information. THLS-32 is a Likert-type scale, and the score is calculated by giving points between 0–4 for each item. As a result of scoring, individuals are divided into four groups based on health literacy levels: inadequate, problematic-limited, adequate, and excellent. In studies in Turkey, these four groups are often divided into two groups only as insufficient and adequate health literacy levels. The overall Cronbach's alpha coefficient of the scale is 0.927.

Colorectal Cancer Screening Behaviours Benefit and Obstacle Perception Scale

The Colorectal Cancer Screening Behaviours Benefit and Obstacle Perception Scale allows individuals to evaluate their perception of benefits and obstacles to faecal occult blood test and colonoscopy, which are colorectal cancer screening tools. The scale consists of 31 items, each included in only one of four different subgroups. The four subgroups in the scale include faecal occult blood test benefit (questions 1–3) and barrier (questions 4–12), and colonoscopy benefit (questions 13–16) and obstacles (questions 17–31). Each item in the Likert-type scale is scored between 1 and 4. There is no total score on the scale. The arithmetic averages are found by adding the scores of each section and dividing by the number of items in the sections. Individuals with high utility scores are considered to have a higher perception of benefits, and individuals with high obstacle scores are considered to have a higher perception of obstacles. The scale was initially created by Rawl et al., and Dönmez et al. carried out the validity-

reliability analysis of the scale Turkish version, and they reported the test to be suitable for use in Turkish society. The Cronbach's alpha coefficients are 0.85, 0.79 in the FOBT benefit and barrier sub-dimension, and 0.84 and 0.86 in the colonoscopy benefit and barrier sub-dimension (19).

Statistical Analysis

SPSS 20.0 for Windows was used for statistical analysis. Data were presented as frequency (%) and mean (standard deviation). The Shapiro-Wilk test was used to investigate the suitability of the data for normal distribution. Group means with normal distribution were analysed by t-test. Frequencies were compared using Pearson's chi-square, chi-square with continuity correction, and Fisher's exact test. Factors affecting pre-screening individuals' knowledge about screening were analysed using multiple logistic regression.

RESULTS

A total of 323 people were included in the study, 143 (44.2%) of which constitute the PSG (40–49 years old) and 180 (55.8%) the SIG (50–70 years old). The mean age of the participants was 51.7 ± 7.5 years, and 53.3% were women. The characteristics of the study population are presented in Table 1.

The bivariate analysis of the participants characteristics according to the current screening age range is shown in Table 2. Regarding PSG, health perception was better (96.5% vs. 90.6%, p = 0.035), more knowledgeable about colorectal cancer screening tests (47.6% vs. 33.9%, p = 0.013), and individuals using mobile applications and the internet as primary information sources (15.4% vs 5.0%, p = 0.002). Although PSG applied to the physicians for examination with similar frequency (39.2% vs. 38.9%, p > 0.05), they received less frequent colorectal cancer screening recommendations (5.6% vs. 21.1%, p < 0.001) and had one of the screening tests, FOBT (4.2% vs. 13.3%, p = 0.005). The rate of an insufficient level of health literacy was 77.1%. There was no statistically significant difference in the perception of risk for developing colorectal cancer and the level of health literacy.

The perception levels of the participants towards colorectal cancer screening tools are shown in Table 3. Individuals in PSG were more considerate about the usefulness of both FOBT (2.23 ± 1.22 vs. 1.89 ± 1.33, p = 0.018) and colonoscopy (2.37 ± 0.97 vs. 2.02 ± 1.14, p = 0.003) in colorectal cancer screening accepting them as suitable screening tests.

Factors affecting individuals in PSG to have information about screening are shown in the multivariate regression analysis in Table 4. Individuals with adequate health literacy (OR = 4.3, 95% CI: 1.8–10.0, p = 0.001) and well-educated (OR = 3.3, 95% CI:

Table 1. *Socio-demographic characteristics of participants (N = 323)*

Variables	PSG n (%)	SIG n (%)
Number of participants	143 (44.2)	180 (55.8)
Age, mean (SD)	45.0 (2.7)	57.0 (5.6)
Gender		
Male	58 (40.6)	93 (51.7)
Female	85 (59.4)	87 (48.3)
Marital status		
Married	118 (82.5)	157 (87.2)
Single	25 (17.5)	23 (12.8)
Education level		
Well educated	106 (74.1)	93 (51.7)
Less educated	37 (25.9)	87 (48.3)
Current status of employment		
Working	82 (57.3)	78 (43.3)
Not-working	61 (42.7)	102 (56.7)
Family history of colorectal cancer		
Yes	8 (5.6)	17 (9.4)
No	135 (94.4)	163 (90.6)

PSG – pre-screening group; SIG – screening included group; SD – standard deviation

Table 2. *Comparison of PSG and SIG characteristics using chi-square analysis*

Variables	PSG (n = 143) n (%)	SIG (n = 180) n (%)	p-value
Knowledgeable of screening test			
Yes	68 (47.6)	61 (33.9)	**0.013**
No	75 (52.4)	119 (66.1)	
Screening suggestion			
Yes	8 (5.6)	38 (21.1)	**< 0.001**
No	135 (94.4)	142 (78.9)	
Applied screening testing			
Faecal occult blood test (yes)	6 (4.2)	24 (13.3)	**0.005**
Colonoscopy (yes)	10 (7.0)	18 (10.0)	0.340
Risk perception			
Average and above	83 (58.0)	104 (57.8)	0.962
Below average	60 (42.0)	76 (42.2)	
Health perception			
Average and above	138 (96.5)	163 (90.6)	**0.035**
Below average	5 (3.5)	17 (9.4)	
Health literacy status			
Sufficient	37 (25.9)	37 (20.6)	0.259
Insufficient	106 (74.1)	143 (79.4)	
Medical examination			
4 or more/year	56 (39.2)	70 (38.9)	0.960
Less than 4/year	87 (60.8)	110 (61.0)	
Information resources on colorectal cancer screening			
Internet-mobile application (yes)	22 (15.4)	9 (5.0)	**0.002**
TV-radio (yes)	21 (14.7)	27 (15.0)	0.937
Health personnel (yes)	25 (17.5)	24 (13.3)	0.302
Family-friend (yes)	21 (14.7)	32 (17.8)	0.456

PSG – pre-screening group; SIG – screening included group

Table 3. *Comparison of perception of benefit and obstacle scores of colorectal cancer screening tools in PSG and SIG using t-test*

Benefit and obstacle perception scale	PSG Mean (SD)	SIG Mean (SD)	p-value
FOBT benefits	2.2 (1.2)	1.9 (1.3)	0.018
FOBT obstacles	2.1 (0.5)	2.0 (0.6)	0.094
Colonoscopy benefits	2.4 (1.0)	2.0 (1.1)	0.003
Colonoscopy obstacle	2.1 (0.6)	2.0 (0.7)	0.116

PSG – pre-screening group; SIG – screening included group; FOBT – faecal occult blood test; SD – standard deviation

Table 4. *Factors affecting individuals in PSG to have knowledge about screening using multivariate logistic regression analysis (N = 143)*

Variables	Odds ratio	95% CI	p-value
Health literacy			
Insufficient	1	1.8–10.0	0.001
Sufficient	4.3		
Education level			
Less educated	1	1.3–8.4	0.010
Well educated	3.3		
Family history			
No	1	0.9–31.3	0.051
Yes	5.5		
Gender			
Male	1	0.4–2.2	0.905
Female	1.0		

PSG – pre-screening group
Dependent variable: having information about screening in PSG

1.3–8.4, p = 0.010) were more knowledgeable about colorectal cancer screening.

DISCUSSION

In Turkey, the colorectal cancer screening programme is applied to all male and female individuals between the ages of 50 and 70, utilizing a faecal occult blood test every two years and a colonoscopy every ten years. In this study, the rate of those who had at least one colorectal cancer screening test (FOBT or colonoscopy) was 16.6% in SIG and 9.2% in PSG. In the colorectal cancer national control plan in Turkey, it is stated that the colorectal cancer screening rate in the target Turkish population is between 30–40% (2). In other studies conducted in Turkey, Şahin et al. reported the figures as 11.9%, Gulten et al. as 12%, and Emiral et al. as 19.4% (20–22). In Turkey's neighbour Iran, Ramazani et al. reported 8.3% and Salimzadeh et al. as 11% (23, 24). In the study conducted among European countries, low participation was observed in Croatia (19.9%) and the Czech Republic (22.7%), while the highest participation was reported in Slovenia (60.4%) and the Netherlands (68.2%) (6). This study presents similar results with other studies previously conducted in Turkey regarding cancer participation rates. It is different from other countries because of the differences in cancer incidences, cancer screening programmes, and sociocultural needs for cancer screening in countries.

Individuals need to accept the screening tests for the success of colorectal cancer screening. Perceptions, beliefs, and behaviours that individuals develop towards colorectal cancer screening significantly determine participation in the screening. For instance, the perception of benefits and obstacles developed against colorectal cancer screening tools were measured, and it was observed that individuals in PSG adopted FOBT and colonoscopy, which are colorectal cancer screening tests, more than SIG. The perception of benefit was higher in the first group. This significant difference is crucial because it indicates that when individuals before the age of 50 are included in the colorectal cancer screening programme, their adoption and participation in screening tests may be higher than the current screening group.

Similarly, Hobbs et al. reported the acceptance rates of opportunistic FOBT screening in individuals over the age of 40, and it was found that individuals aged 40–49 refused the screening test at a significantly lower rate than individuals aged 50–69 (43.8% vs. 61.6%) (25). It is thought that gender may also be an essential factor in conformity with screening in PSG individuals. A study conducted on workers in England stated that women between the ages of 41–50 showed higher conformity with screening than men in the same age range (48% vs. 24%) (26). In three independent computational modelling studies performed by Mannucci et al., they stated that starting colorectal cancer screening at the age of 45 provides a better assessment of benefit and risk than the current age of 50 (27). In a study conducted using the health belief model, the majority of the participants stated that screening should begin at the age of 40–49 (28). Some studies in the literature suggested that participation in colorectal cancer screening in the 51–60 age range or over the age of 60 is more compatible (29, 30).

Individuals in PSG had higher knowledge about colorectal cancer screening (47.6% vs. 33.9%) and used the internet and mobile applications more as sources of information (15.4% vs. 5.0%). This is not surprising given today's technological advances. According to the literature, internet and mobile applications reduce negative thoughts about preventive health services and increase participation. In addition, it is reported that eHealth literacy owned by internet users increases participation in colorectal cancer screening (31). These results indicate that internet and mobile applications are very effective in reaching the desired target in colorectal cancer screening and that healthcare providers should be careful in creating content.

Individual's educational status and health literacy are essential in adopting various preventive health services such as colorectal cancer screening. In this study, individuals in PSG had a higher education level than those of SIG (74.1% vs. 51.7%). In addition, in the multivariate regression analysis of PSG, having sufficient health literacy (OR = 4.3) and good education (OR = 3.3) increased knowledge about colorectal cancer screening. In many studies conducted in Turkey, it was found that a sufficient level of health literacy and well-educated individuals are among the factors that increase participation in preventive health services. According to these studies, adequate health literacy is a factor that increases prostate and breast cancer screening (32, 33). Again, as the level of education increases, the knowledge about colorectal cancer screening increases (20, 22).

Similarly, in participants who have never been suggested colorectal cancer screening in Denmark, as health literacy level decreased, knowledge about screening decreased, and concerns about the tests increased (34). In a study conducted on Chinese Americans, high health literacy levels increased participation in cancer screenings in general and expanded the number of colonoscopies, one of the colorectal cancer screening tests, by 1.4 times (35). Galal et al. reported that having a low level of education reduced participation in colorectal cancer screening by 64% (36). There are also studies in the literature stating no relationship between health literacy and participation in colorectal cancer screening or anxiety or negative attitude about screening (37, 38). As a standard view, adequate education and health literacy level increase awareness and knowledge of the disease and protective behaviours. Individuals with high knowledge and awareness also have a high perception of health, and as a result, the demand for preventive health services such as cancer screening increases.

CONCLUSIONS

As a result of national screening programmes for the last three decades, while the incidence and mortality of colorectal cancer have decreased in individuals over 50 years of age, the incidence and mortality of colorectal cancer have increased in the young population under the age of 50 who are excluded from the screening programme. This increased risk is a significant public health problem. This study found that individuals under 50 are more willing to participate in colorectal cancer screening and have less anxiety about screening if they are included in national screening programmes. In addition, since the younger group uses the internet and mobile applications more than those over 50 years of age as a source of information, appropriate and effective content should be created for these communication tools. However, in individuals under 50 years of age, good education levels and adequate health literacy have emerged as factors that improve knowledge about colorectal cancer screening. Consequently, it was seen that young individuals included in the PSG have different characteristics about colorectal cancer screening, and it is recommended to conduct more population-based studies to determine the needs of these individuals.

Funding

This study was supported by the Çukurova University Scientific Research Projects Unit (Project No. TTU-2020-12917).

Conflict of Interests

None declared

REFERENCES

1. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2018 Nov;68(6):394-424.
2. International Cancer Control Partnership. Turkey cancer control programme [Internet]. ICCP [cited 2022 Dec 13]. Available from: https://www.iccp-portal.org/plans/turkey-cancer-control-programme.
3. Maida M, Macaluso FS, Ianiro G, Mangiola F, Sinagra E, Hold G, et al. Screening of colorectal cancer: present and future. Expert Rev Anticancer Ther. 2017 Dec;17(12):1131-46.
4. Moss S, Ancelle-Park R, Brenner H; International Agency for Research on Cancer. European guidelines for quality assurance in colorectal cancer screening and diagnosis. First edition - evaluation and interpretation of screening outcomes. Endoscopy. 2012 Sep;44 Suppl 3:SE49-64.
5. American Cancer Society. Colorectal cancer facts & figures 2017-2019. Atlanta: ACS; 2017.
6. Navarro M, Nicolas A, Ferrandez A, Lanas A. Colorectal cancer population screening programs worldwide in 2016: an update. World J Gastroenterol. 2017 May 28;23(20):3632-42.
7. Hirst Y, Stoffel S, Baio G, McGregor L, von Wagner C. Uptake of the English Bowel (Colorectal) Cancer Screening Programme: an update 5 years after the full roll-out. Eur J Cancer. 2018 Nov;103:267-73.
8. Larsen MB, Mikkelsen EM, Rasmussen M, Friis-Hansen L, Ovesen AU, Rahr HB, et al. Sociodemographic characteristics of nonparticipants in the Danish colorectal cancer screening program: a nationwide cross-sectional study. Clin Epidemiol. 2017;9:345-54.
9. Koo JH, Leong RWL, Ching J, Yeoh KG, Wu DC, Murdani A, et al. Knowledge of, attitudes toward, and barriers to participation of colorectal cancer screening tests in the Asia-Pacific region: a multicenter study. Gastrointest Endosc. 2012 Jul;76(1):126-35.
10. Nutbeam D. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. Health Promot Int. 2000 Sep 1;15(3):259-67.
11. Tekiner S, Peker GC, Doğan MC. Colorectal cancer screening behaviors. PeerJ. 2021;9:e10951. doi: 10.7717/peerj.10951.
12. Siegel RL, Miller KD, Fedewa SA, Ahnen DJ, Meester RGS, Barzi A, et al. Colorectal cancer statistics, 2017. CA Cancer J Clin. 2017 May 6;67(3):177-93.
13. International Agency for Research on Cancer. TIA for R on [Internet]. Lyon: IARC [cited 2022 Dec 12]. Available from: https://gco.iarc.fr/.
14. Siegel RL, Fedewa SA, Anderson WF, Miller KD, Ma J, Rosenberg PS, et al. Colorectal cancer incidence patterns in the United States, 1974-2013. J Natl Cancer Inst. 2017 Aug 1;109(8):djw322. doi: 10.1093/jnci/djw322.
15. Stoffel EM, Murphy CC. Epidemiology and mechanisms of the increasing incidence of colon and rectal cancers in young adults. Gastroenterology. 2020 Jan;158(2):341-53.
16. Cheng E, Blackburn HN, Ng K, Spiegelman D, Irwin ML, Ma X, et al. Analysis of survival among adults with early-onset colorectal cancer in the National Cancer Database. JAMA Netw Open. 2021 Jun 1;4(6):e2112539. doi: 10.1001/jamanetworkopen.2021.12539.
17. Wolf AMD, Fontham ETH, Church TR, Flowers CR, Guerra CE, LaMonte SJ, et al. Colorectal cancer screening for average-risk adults: 2018 guideline update from the American Cancer Society. CA Cancer J Clin. 2018 Jul;68(4):250-81.
18. Abacigil F, Harlak H, Okyay P, Kiraz DE, Gursoy Turan S, Saruhan G, et al. Validity and reliability of the Turkish version of the European Health Literacy Survey Questionnaire. Health Promot Int. 2019 Aug 1;34(4):658-67.
19. Dönmez E, Nahcivan NO, Rawl SM. Validity and reliability of the instruments to measure colorectal cancer screening benefits and barriers - Turkish version. Cancer Nurs. 2022 Mar-Apr;45(2):E364-73.
20. Şahin NŞ, Üner BA, Aydın M, Akçan A, Gemalmaz A, Dişcigil G, et al. [Knowledge of, attitudes toward, and barriers to participation of colorectal cancer screening in Aydın central region]. Türk Aile Hekim Derg. 2015;19(1):37-48. Turkish.
21. Gulten G, Memnun S, Ayse K, Aygul A, Gulcin A. Breast, cervical, and colorectal cancer screening status of a group of Turkish women. Asian Pac J Cancer Prev. 2012;13(9):4273-9.
22. Emiral GÖ, Atalay BI, Önsüz MF, Zeytin AM, Küçük YS, Işıklı B, et al. [Fecal occult blood screening in people living in semirural area and their awareness about screening programs]. Türk Dünyası Uygulama ve Araştırma Merkezi Halk Sağlığı Dergisi. 2018;3(1):42-55. Turkish.
23. Ramazani AA, Norozi E, AmirabadiZadeh H, Ehteshampour AR, Salehiniya H. Predictors of colorectal cancer screening participation in Southern Khorasan (Iran). J Gastrointest Cancer. 2021 Mar 1;52(1):187-91.
24. Salimzadeh H, Eftekhar H, Delavari A, Malekzadeh R. Psycho-social determinants of colorectal cancer screening in Iran. Int J Prev Med. 2014 Feb;5(2):185-90.
25. Hobbs FD, Cherry RC, Fielding JW, Pike L, Holder R. Acceptability of opportunistic screening for occult gastrointestinal blood loss. BMJ. 1992 Feb 22;304(6825):483-6.

26. Hart AR, Eaden J, Barnett S, de Bono AM, Mayberry JF. Colorectal cancer prevention. An approach to increasing compliance in a faecal occult blood test screening programme. J Epidemiol Community Health. 1998 Dec;52(12):818-20.
27. Mannucci A, Zuppardo RA, Rosati R, Leo MD, Perea J, Cavestro GM. Colorectal cancer screening from 45 years of age: thesis, antithesis and synthesis. World J Gastroenterol. 2019 Jun 7;25(21):2565-80.
28. Almadi MA, Mosli MH, Bohlega MS, Al Essa MA, AlDohan MS, Al-abdallatif TA, et al. Effect of public knowledge, attitudes, and behavior on willingness to undergo colorectal cancer screening using the health belief model. Saudi J Gastroenterol. 2015;21(2):71-7.
29. Chong VH, Kadir L, Kamis Z, Kassim N, Khalil MAM, Tan J, et al. Factors associated with participation in stool based colorectal screening in Brunei Darussalam. Asian Pac J Cancer Prev. 2020 Aug 1;21(8):2231-6.
30. Hart AR, Glover N, Howick-Baker J, Mayberry JF. An industry based approach to colorectal cancer screening in an asymptomatic population. Postgrad Med J. 2003 Nov;79(937):646-9.
31. Mitsutake S, Shibata A, Ishii K, Oka K. Association of eHealth literacy with colorectal cancer knowledge and screening practice among internet users in Japan. J Med Internet Res. 2012 Nov 13;14(6):e153. doi: 10.2196/jmir.1927.
32. Tayhan A, Özmen D. [Relationship between knowledge levels of men about prostate cancer screenings and their health literacy]. Cukurova Med J. 2019;44(4):233-40. Turkish.
33. Kendir C, Kartal M. Health literacy levels affect breast cancer knowledge and screening attitudes of women in Turkey: a descriptive study. Turk J Public Health. 2019;17(2):183-94.
34. Gabel P, Larsen MB, Edwards A, Kirkegaard P, Andersen B. Knowledge, attitudes, and worries among different health literacy groups before receiving first invitation to colorectal cancer screening: cross-sectional study. Prev Med Rep. 2019 Apr 25;14:100876. doi: 10.1016/j.pmedr.2019.100876.
35. Li CC, Matthews AK, Dong X. The influence of health literacy and acculturation on cancer screening behaviors among older Chinese Americans. Gerontol Geriatr Med. 2018 Jul 17;4:2333721418778193. doi: 10.1177/2333721418778193.
36. Galal YS, Amin TT, Alarfaj AK, Almulhim AA, Aljughaiman AA, Almulla AK, et al. Colon cancer among older Saudis: awareness of risk factors and early signs, and perceived barriers to screening. Asian Pac J Cancer Prev. 2016;17(4):1837-46.
37. Horshauge PM, Gabel P, Larsen MB, Kirkegaard P, Edwards A, Andersen B. The association between health literacy and colorectal cancer screening uptake in a publicly funded screening program in Denmark: cross-sectional study. Prev Med Rep. 2020 May 29;19:101132. doi: 10.1016/j.pmedr.2020.101132.
38. Almutairi KM, Alonazi WB, Alodhayani A, Vinluan JM, Ahmad M, Alhurishi SA, et al. A cross-sectional assessment of literacy and awareness, attitudes, and beliefs about colorectal cancer and its screening in Riyadh Region. J Cancer Educ. 2018 Jun;33(3):660-7.

Received November 4, 2021
Accepted in revised form March 9, 2023