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REVIEW PUBLIC HEALTH

Recognition and participation of colorectal cancer screening in Turkiye: A systematic review and meta-analysis study

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ABSTRACT

Colorectal cancers (CRCs) have an important share in the prevalence and mortality among all cancers. It was aimed to make a systematic review and meta-analysis of researches about the prevalence of knowing fecal occult blood test (FOBT) and colonoscopy, which are among the CRC screening methods, and the prevalence of having these tests at any time in life. A literature search using five different databases were screened both in Turkish and English language and a total of 1176 studies were reached. Of these, 22 studies were selected to be included in this study. In the evaluation of the researches included in the study, the studies were read in a way to look for answers to PICOS questions. Open Meta-analyst demo program and random effects model was used. The prevalence rate and 95% confidence interval of knowing and having FOBT and colonoscopy were calculated. According to the meta-analysis results, the prevalence of knowing the FOBT among the CRC screening tests was 19.3%, the prevalence of having the FOBT was 13.2%, the prevalence of knowing colonoscopy was 31.7%, and the prevalence of having colonoscopy was 10.0%. As a conclusion prevalence of knowing and having FOBT and colonoscopy was low in risky individuals in Turkiye.

Keywords: Colonoscopy; colorectal cancer; FOBT; screening.

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40.5 million (71%) of 56.9 million deaths in the world in 2016 were caused by non-communicable diseases. Cancers ranked second with 9 million deaths among them [1, 2]. Colorectal cancers (CRCs) have an important share in the prevalence and mortality among all cancers. Approximately 1.85 million new CRCs were diagnosed worldwide in 2018 (10.2% of all newly diagnosed cancers) and approximately 880 thousand people died due to colorectal cancer (8.2% of deaths from all cancers). Among the most common cancer types in men, CRC is in the 3rd place with approximately 1 million (10.9%) new cases, and in the 2nd place with 823 thousand (9.5%) in women. The highest incidences are in Asia and Europe while it is lower in Africa [3].

In Turkiye, CRC, in the newly diagnosed cases of cancer in both men (11.548) and women (8483), has taken the 3rd place in 2018 [4]. The incidence rate is 16.0 per hundred thousand for women and 27.4 per hundred thousand for men [5]. While factors such as age, adenomatous polyp, inflammatory bowel disease, and family history are irreversible risk factors for CRC; factors such as diet (fatty and meat-rich diet), obesity, low physical activity, smoking, and alcohol consumption are among the changeable risk factors [6, 7]. Although the lifetime prevalence of CRCs is 2.4–5.0%, the risk factors existing in the person may increase this rate [8]. When the data of recent years are evaluated, although there is no significant increase

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or decrease in the incidence of colorectal cancer, it is expected that the incidence of CRCs will increase in the following years along with the aging population and changing lifestyle [9, 10].

The prognosis of CRC is closely related to the stage at the time of diagnosis and only 40% of patients are diagnosed at an early stage. Colon tumors are suitable for screening because they grow slowly. The CRC, which has remained asymptomatic for a long time, is usually at an advanced stage when they become symptomatic. Early detection of cancer by screening, and detection and removal of premalignant adenomatous lesions are very important in reducing disease-related mortality and morbidity. In addition, early diagnosis reduces treatment costs [8, 11].

CRC screenings in Turkiye first came into force in 2008 with the recommendation that all individuals aged 50–70 years should have an annual fecal occult blood test (FOBT) and a colonoscopy every 10 years [12]. The current national screening program is valid since 2014 [13]; in all individuals between the ages of 50–70, FOBT is performed every 2 years and colonoscopy every 10 years, and screening is terminated in 70-year-old individuals whose last two tests are negative. The population to be screened is defined on the basis of individuals registered with family physicians and the participation of individuals is ensured by means of invitation methods to be developed. CRC screening for applicants is carried out by the Family Health Centers, and Cancer Early Diagnosis, Screening, and Education Centers within the Community Health Centers [14].

The success of CRC screenings depends on the participation rates of individuals. What determines participation is the level of knowledge about screening. Although there are studies in the literature about information about colorectal cancer screening tests and having these screening tests done in Turkiye, no meta-analysis was found on this subject. For this reason, it was decided to conduct this study. In this study, to revise knowledge, attitudes, and behaviors related to colorectal cancer screening program in Turkiye, it was aimed to make a systematic review and meta-analysis of researches about the prevalence of knowing FOBT and colonoscopy method, which are among the colorectal cancer screening methods, and the prevalence of having these tests at any time in life. For this purpose, it was aimed to find answers to the following questions at the end of the study:

Highlight key points

- Participation in colorectal cancer screenings in Turkiye is lower than expected.
- Individuals in the colorectal cancer screening age range in Turkiye have insufficient information about screening tests.
- Awareness should be increased and participation should be ensured in the age range where screening is required.

1. What is the frequency of knowing FOBT in the CRC risk group in Turkiye?
2. What is the frequency of having the FOBT in CRC risk groups in Turkiye?
3. What is the frequency of knowing colonoscopy in CRC risk groups in Turkiye?
4. What is the frequency of having a colonoscopy in CRC risk groups in Turkiye?

METHODS

The PRISMA notification checklist was used in the writing of the study report [15, 16]. Initially, a detailed literature search was made from national and international electronic databases. Studies were searched through databases Google Scholar, PubMed, Turkiye Citation Index, Web of Science, and Council of Higher Education Thesis Center. The keywords of "colorectal cancer," "colon cancer," "cancer screening," "information," "attitude," "behavior" and "awareness" were used in the searching of studies published in Turkish. Studies published in English were searched with the keywords "colorectal cancer," "cancer screening," and "Turkiye." Studies published at all times were searched without any time limitation (Date of screening, October 2018).

A total of 1176 studies were reached first in the literature search conducted with the specified keywords. The 697's of the studies were from Google Scholar, 331 from Turkiye Citation Index, 73 from PubMed, 51 from Web of Science, and 24 from the Council of Higher Education Thesis Center. Duplications were eliminated, abstracts of the remaining studies were read, studies that did not fit the purpose were excluded, and 52 studies were selected for the purpose of this study.

In the study, the framework of the research question was formed according to the PICOS format (Table 1) [15]. In the evaluation of the researches included in the study, the studies were read in a way to look for answers to PICOS questions. To evaluate the studies, a table was

Table 1. Inclusion and exclusion criteria by PICOS format

PICOS	Inclusion criteria	Exclusion criteria
P: Population	• First-degree relatives of patients with CRC† • Individuals 50 and older	• Ones having first-degree relatives without CRC • Individuals 50 and under
I: Interventions	• FOBT‡ • Colonoscopy	• Other CRC screening methods (fecal DNA test, enema with double contrast barium, sigmoidoscopy, colonography with computed tomography, and capsule endoscopy)
C: Comparators	• Comparison group suitable for the intervention§	
O: Outcomes	• Frequency of knowing the FOBT • Frequency of having FOBT • Frequency of knowing colonoscopy • Frequency of having a colonoscopy	• Researches that do not specify the frequencies clearly
S: Study designs	• Descriptive • Cross-sectional • Case–control • Cohort • Randomized controlled	• Review • Systematic review • Meta-analysis • Case report • Case series • Letter to the editor

†: Colorectal cancer; ‡: Fecal occult blood test; §: Since the frequency of knowing and having FOBT and colonoscopy over a single group was examined in the study, no comparison group was taken.

created containing the author of the article, the year of publication, the type of research, the type of publication, who the research was done with, how many people worked, and the number of people who knew and had the FOBT and colonoscopy.

Five of the 52 selected studies were excluded from the study as their full text was not available. The full texts of the remaining 47 studies were read by the researchers as double-blind to reduce the risk of bias and ensure reliability, and the necessary data for each study (the author of the article, the year of publication, the type of research, the type of publication, who the research was done with, how many people worked, and the numbers of people who knew and had FOBT and colonoscopy) were entered by coding in the table created. The non-overlapping codings were checked and corrected by the researchers again. Over the table, 47 studies were searched, studies that did not meet the inclusion criteria were excluded, and a total of 22 studies were selected to be included in this study fulfill the answer to four questions.

Criteria for inclusion in the analysis were; conducted in Turkiye, original, conducted in CRC risky groups, studies that give the number of total participants, and number of people who having FOBT and/or colonoscopy screening in any period of their lives and/or the number of knowing them. As CRC risk group, first degree relatives of patients with CRC and being aged 50 and over were accepted. Studies carried out in countries other than Turkiye, published outside the Turkish and English languages, performed in individuals outside of CRC risk groups, and studies of the type that do not provide data on prevalence (reviews, case reports, case series, and letters to the editor) were excluded from the analysis.

Eight [17–24] studies about knowing FOBT, 16 [18–21, 23–34] about having FOBT, 9 [17–23, 35, 36] about knowing colonoscopy, and 17 studies about having colonoscopy [18–20, 23–28, 30, 31, 33–38] were analyzed. The diagram showing the process of literature search and the included studies to the meta-analysis is given in Figure 1.

Study data (author surname, publication year, number of people who know FOBT/have had FOBT/knows colonoscopy/have had colonoscopy, and total number of people participating in the study) in four different databases (for knowing FOBT, having FOBT, knowing colonoscopy, and having colonoscopy) were entered to Open Meta-analyst demo program. In the heterogeneity test, $p<0.1$ and I2 value greater than 50%

indicate significant heterogeneity between studies [39]. It has also been reported as 25% low heterogeneous, 50% medium heterogeneous, and 75% high heterogeneous for I2 value [40]. In the presence of heterogeneous studies, a random effects model should be used [39]. In this meta-analysis, since I2 values were highly heterogeneous and $p<0.001$ in the heterogeneity test of the studies included in the analysis, the random effects model was used in the group analysis. The heterogeneity test values of the studies included in the analysis for the four separate databases created are given in Table 2. By dividing the total number of cases by the total number of participants, the prevalence rate and 95% confidence interval for knowing and having FOBT and colonoscopy were calculated.

RESULTS

Six of the 22 studies included in the analysis were performed in the first-degree relatives of patients with CRC [25, 28, 33, 35, 37, 38], 10 in individuals aged 50, and over [17, 19–21, 23, 24, 27, 29–31]. Although six studies were studied in samples covering larger age groups, they were considered as studies conducted in individuals 50 years and older because they also gave the findings of individuals 50 years and older [18, 22, 26, 32, 34, 36]. Fourteen of the studies were research articles, seven were theses, and one was the project. The publication dates of the studies varied between 2010 and 2018. Nineteen of the studies were performed on both men and women, and three were done only on women. The sample sizes, including CRC risk groups, ranged from 83 to 1992. Study having the minimum sample size by conducted Gulten et al. [26], study having the maximum sample size was conducted by Baycelebi et al. [18]. Descriptive features of the studies included in the meta-analysis are given in Table 3.

The sample sizes of eight studies included in the meta-analysis related to knowing the FOBT varied between 94 and 1992. The number of people who knew the FOBT ranged from 3 to 988. The total sample size of the studies included in terms of knowing the FOBT was 4334. The study with the widest confidence interval was carried out by Bicer [22], and the study with the smallest confidence interval was carried out by Sahin et al. [19]. As a result of the analysis, it was determined that 1315 out of 4334 individuals knew the FOBT. The prevalence rate was found to be 0.193 (95% CI: 0.066–0.321) to know the FOBT ($p=0.003$, standard error=0.065). The

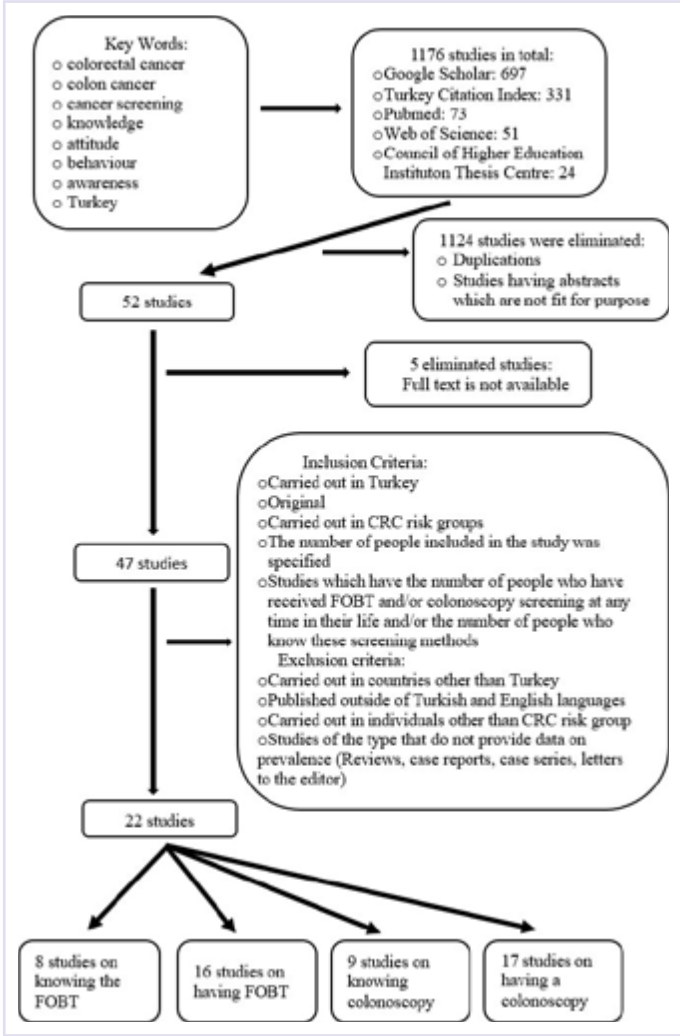

FIGURE 1. Literature searching diagram.

prevalence rate of knowing the FOBT in the studies included in the meta-analysis and results of meta-analysis is given in Figure 2.

Considering the weight of studies related to knowing the FOBT, Bicer [22] has the smallest weight percentage (11.994%), while Sahin et al. [19] have the highest weight value (12.663%).

The sample sizes of 16 studies included in the meta-analysis related to having FOBT varied between 83 and 1992 and the total sample size was 6825. The number of people who had FOBT varied between 2 and 562. The study with the widest confidence interval was carried out by Oztas et al. [33], while the study with the smallest confidence interval was carried out by Koc and Esin [28]. As a result of the analysis, it was found that 1174 of 6825 individuals had FOBT. The prevalence rate was found to be 0.132 (95% CI: 0.080–0.185) for

TABLE 2. Heterogeneity test values of the studies included in the analysis for four separate databases

	tau²	Q	df	p	I² (%)
Knowing FOBT†	0.033	1753.568	7	<**0.001**	99.601
Having had FOBT	0.011	1021.482	15	<**0.001**	98.532
Knowing colonoscopy	0.042	1133.490	8	<**0.001**	99.294
Having had colonoscopy	0.001	152.095	16	<**0.001**	89.48

†: Fecal occult blood test.

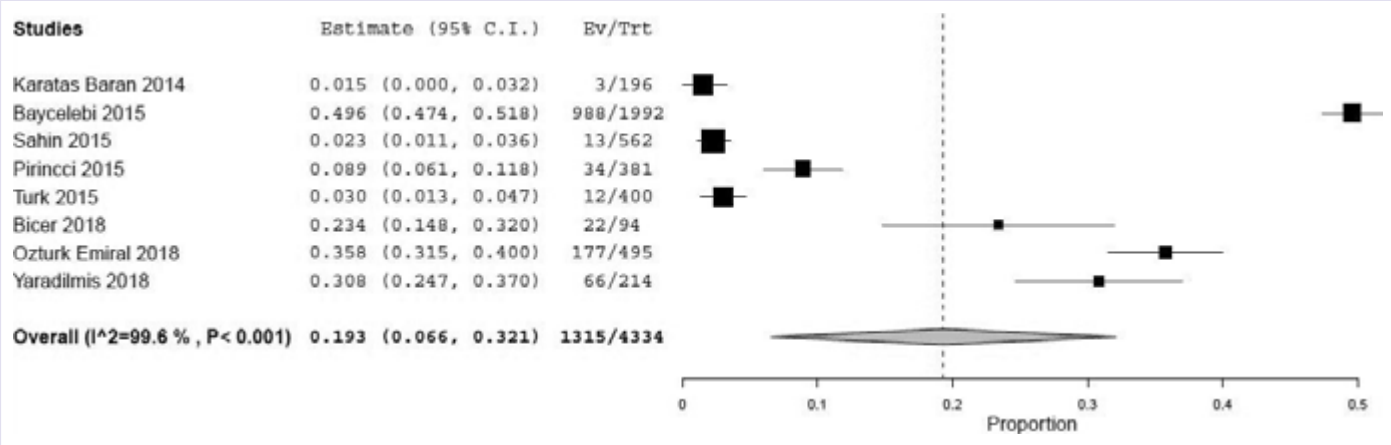

FIGURE 2. Forest plot showing prevalence of knowing FOBT.

having the FOBT (p<0.001, standard error=0.027). The prevalence rate of having FOBT in the studies included in the meta-analysis and results of meta-analysis is given in Figure 3.

Among the weights of the studies related to having the FOBT, the study carried out by Oztas et al. [33] has the smallest weight percentage (5.705%), while the study carried out by Koc and Esin [28] has the highest weight value (6.494%).

The sample sizes of nine studies included in the meta-analysis related to knowing colonoscopy varied between 94 and 1992. The number of people who knew the colonoscopy ranged from 27 to 984. In terms of knowing the colonoscopy, the total sample size of the included studies was 5728. The study with the widest confidence interval was carried out by Bicer [22], and the study with the smallest confidence interval was carried out by Sahin et al. [19]. As a result of the analysis, it was determined that 2197 of 5728 individuals knew the colonoscopy. The prevalence rate was found to be 0.317 (95% CI: 0.182–0.452) to know colonoscopy (p<0.001, standard error=0.069). The prevalence rate of knowing the colonoscopy in the studies included in the meta-analysis and results of meta-analysis is given in Figure 4.

Considering the weight of studies related to knowing colonoscopy, the work of Bicer [22] has the smallest weight percentage (10.634%), while Sahin et al. [19] have the highest weight value (11.248%).

The sample sizes of 17 studies included in the meta-analysis related to colonoscopy varied between 83 and 1992 and the total sample size was 8860. The number of people who had a colonoscopy ranged from 7 to 260. The study with the widest confidence interval was carried out by Oztas et al. [33], while the study with the smallest confidence interval was carried out by Kilickap et al. [37]. As a result of the analysis, it was determined that 913 of 8860 individuals had colonoscopy. The prevalence rate was found to be 0.100 (95% CI: 0.081–0.120) for having colonoscopy (p<0.001, standard error=0.010). The prevalence rate of having colonoscopy in the studies included in the meta-analysis and result of meta-analysis is given in Figure 5.

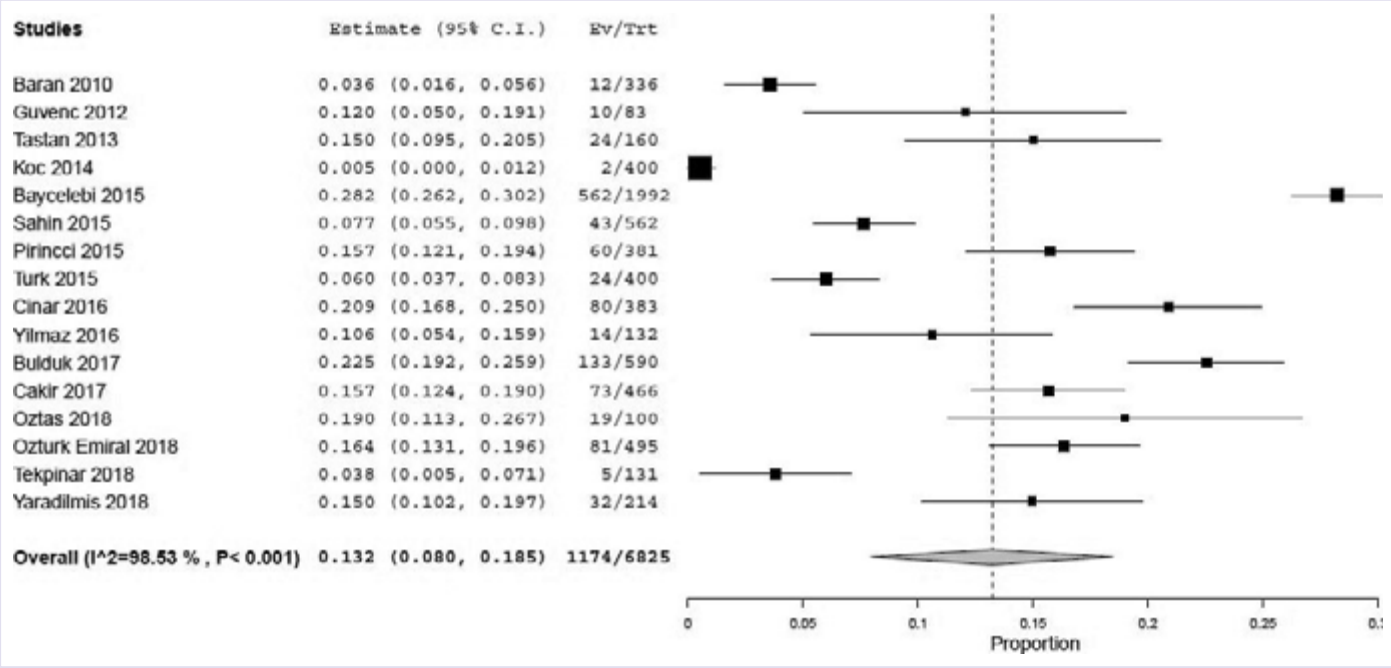

FIGURE 3. Forest plot showing prevalence of having FOBT.

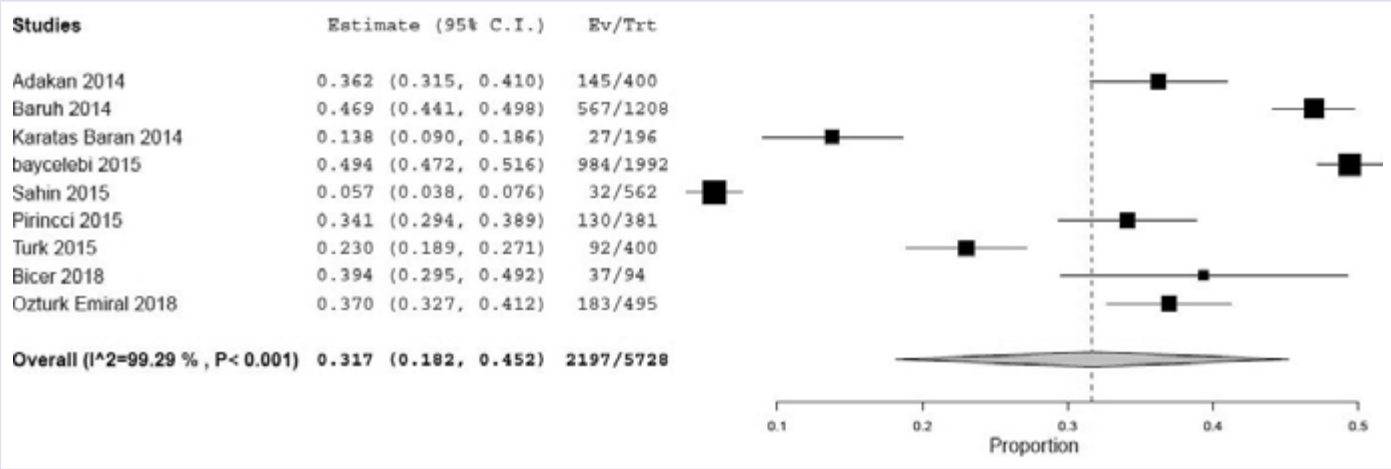

FIGURE 4. Forest plot showing the prevalence of knowing colonoscopy.

Among the weights of the studies related to having colonoscopy, the study carried out by Oztas et al. [33] has the smallest weight percentage (3.556%), while the study carried out by Kilickap et al. [37] has the highest weight value (7.101%).

DISCUSSION

The most important risk factor for sporadic CRC is age. The incidence of CRC, which is rarely seen at younger ages, starts to increase after 40–50 years. In addition, various environmental and genetic factors increase the risk of CRC. Family history of familial colon cancer, adenoma, and CRC are cases that increase the risk of the individual and screening recommendations change in these situations. The percentage of CRC development increases 1.7 times compared to the general population in those with one first-degree relative with CRC. This rate increases even more when two of the first-degree relatives have CRC or the age of diagnosis is under 55 years old [8]. Today, according to the CRC national screening program implemented in Turkiye, it is recommended that

TABLE 3. Descriptive features of the studies included in the meta-analysis

Study	YoP	Participants	PT	G	SS	FOBT		Colonoscopy	
						NofPWK	NofPHD	NofPWK	NofPHD
Baran [25]	2010	Relatives of patients with CRC	T	W&M	336		12		23
Gulten et al. [26]	2012	Individuals 50 and older	RA	W	83		10		10
Kilickap et al. [37]	2012	Relatives of patients with CRC	RA	W&M	1534				127
Tastan et al. [27]	2013	Individuals 50 and older	RA	W&M	160		24		18
Adakan et al. [35]	2014	Relatives of patients with CRC	RA	W&M	400			145	38
Baruh [36]	2014	Individuals 50 and older	P	W&M	1208			567	132
Karatas Baran [17]	2014	Individuals 50 and older	T	W	196	3		27	
Koc and Esin [28]	2014	Relatives of patients with CRC	RA	W&M	400		2		89
Baycelebi et al. [18]	2015	Individuals 50 and older	RA	W&M	1992	988	562	984	260
Pirincci et al. [20]	2015	Individuals 50 and older	RA	W&M	381	34	60	130	16
Sahin et al. [19]	2015	Individuals 50 and older	RA	W&M	562	13	43	32	30
Turk [21]	2015	Individuals 50 and older	T	W&M	400	12	24	92	
Cinar [29]	2016	Individuals 50 and older	T	W	383		80		
Yilmaz et al. [30]	2016	Individuals 50 and older	RA	W&M	132		14		12
Bulduk et al. [31]	2017	Individuals 50 and older	RA	W&M	590		133		47
Cakir [32]	2017	Individuals 50 and older	T	W&M	466		73		
Bicer [22]	2018	Individuals 50 and older	T	W&M	94	22		37	
Oztas et al. [33]	2018	Relatives of patients with CRC	RA	W&M	100		19		18
Ozturk Emiral et al. [23]	2018	Individuals 50 and older	RA	W&M	495	177	81	183	29
Tekpinar et al. [34]	2018	Individuals 50 and older	RA	W&M	131		5		7
Yaradilmis [24]	2018	Individuals 50 and older	T	W&M	214	66	32		44
Yuceler Kacmaz and Curuk [38]	2018	Relatives of patients with CRC	RA	W&M	142				13

FOBT: Fecal occult blood test; CRC: Colorectal cancer; W: Woman; M: Man; RA: Research article; T: Thesis; P: Project; YoP: Year of publication; PT: Publication type; G: Gender; SS: Sample size; NofPWK: Number of people who know; NofPHD: Number of people having had it.

all individuals between the ages of 50 and 70 are given a bi-annual FOBT and a colonoscopy every 10 years, and it is suggested to end the screening in 70-year-old individuals who are negative in the last two FOBT. Community-based screening should be carried out on the basis of individuals registered to family physicians. Application of FOBT kit is provided by training given to individuals who are invited to screening by health personnel working in Community Health Centers, Cancer Early Diagnosis, Screening, and Education Centers and family medicine. FOBT-positive individuals are directed to the hospital's gastroenterology, general surgery, or gastrointestinal surgery services for further examination and colonoscopy [14]. Even if the tests of the individuals participating in the screening program are negative, individuals are invited for colonoscopy every 10 years (2 times in total, 51 and 61 years old). The ones whose first-degree relatives have CRC or adenomatous polyps, it is recommended to start screening from the age of 40. If the CRC in first-degree relatives appeared at an early age, the individual should be screened 5 years before the onset of cancer [8].

Within the framework of this screening program related to CRC in Turkiye, every individual who is 50 years old should be invited for CRC screenings; individuals with CRC in their first-degree relatives should be informed about the screenings at an early age and they should be invited to the screenings when the time comes. Considering these standards, it is expected that almost all individuals aged 50 and over and those who have CRC in their first-degree relatives have heard and had the FOBT and colonoscopy method, which is one of the CRC screening methods. In this systematic review and meta-analysis conducted in CRC risk groups, the prevalence of knowing the FOBT among the CRC screening tests was 19.3%,

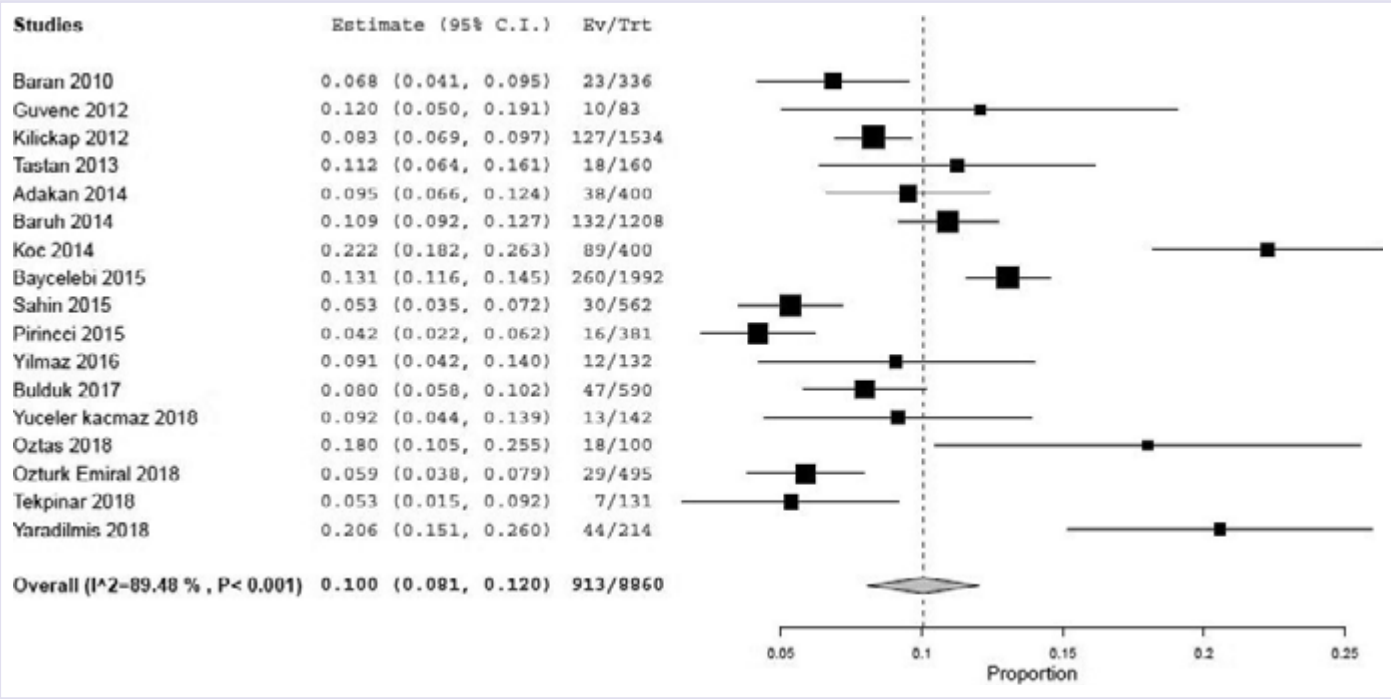

FIGURE 5. Forest plot showing the prevalence of having colonoscopy.

the prevalence of having the FOBT was 13.2%, the prevalence of knowing colonoscopy was 31.7%, and the prevalence of having colonoscopy was 10.0%. In this group, which should have had CRC screening, the prevalence of knowing and having CRC screening methods applied in our country was found to be low.

Receiving screening suggestions by health-care professionals and knowing the screening tests are the main factors that enable participation in CRC screenings [41–43]. In addition, low education level is one of the obstacles to CRC screening [43, 44]. In this meta-analysis, the fact that the percentages of the FOBT and colonoscopy known and had are low make one think that the society is not sufficiently informed by the health-care providers. In addition, even if information is provided on the subject, people's low level of education, not fully understanding the education and information provided, forgetting over time or not paying enough attention may also have resulted in low percentages of knowing and having the FOBT and colonoscopy.

When studies conducted in various countries are analyzed, it has been reported that 46.1% of individuals aged 50 and over in America know a CRC screening test [45]. In a study conducted in Australia, it was reported that 14% of individuals aged 35 and over knew what the FOBT was, and that 30% had heard of it after detailed description and explanation [46].

When the frequency of screening tests is examined, it has been reported that the frequency of having FOBT varies between 20.6% and 75% [45, 47–50], and the frequency of having colonoscopy between 22.6% and 56% in studies conducted in individuals aged 50 and over in the USA [45, 49, 50]. In Australia, it is reported that individuals 35 years of age and older have 15% colonoscopy and 5.6% have FOBT [46]. In a study conducted in Canada, 23% of individuals over the age of 50 participated in CRC screening, 17% had a FOBT and 4% had a colonoscopy [51]. In a multi-centered study conducted in the Asia-Pacific Region, 27% of individuals over the age of 50 previously had a CRC screening test, with the highest participation in the Philippines (69%), Australia (48%), and Japan (38%). The lowest participation was reported in India (1.5%), Malaysia (3%), Indonesia (3%), and Pakistan (7.5%) [41]. It has been reported in different studies that CRC screening is 55.3% in age 50 and over in Massachusetts and 0.7% in CRC risk groups in Malaysia [42, 48].

In the study, the percentage of knowing for both FOBT and colonoscopy was found higher than the percentage of having. In other words, not all individuals who know these tests have had it. There are those who do not have it, although they know it. This shows that people are not conscious enough about early diagnosis practices

that constitute a step in preventive health services and that they cannot grasp the importance of these practices. The fact that people do not understand the importance of their health unless they get sick and the belief that "nothing happens to me" may have led to this result.

Considering the difference between the percentage of knowing and the percentage of having for both tests in the study, there is a difference of about 6% (knowing 19.3%, having 13.2%) for FOBT, about 20% (knowing 31.7%, having 10.0%) for colonoscopy. In other words, the percentage of those who know but do not have it is higher for colonoscopy. The fact that colonoscopy is a more invasive and difficult procedure, stressing, and frightening the patient may cause this procedure to be done less. In a study conducted in individuals with CRC risk group in Malaysia, the reasons for not participating in the screening were reported as embarrassment and discomfort [42].

Limitations

A limitation of this study is that the literature is only searched in Turkish and English. Researches published in other languages are not included in the study. Searching only some selected databases is another limitation of the study.

Strengths

This is the first meta-analysis study which examined the prevalence of knowing FOBT and colonoscopy methods which one of the CRC screening methods, and having these tests done at any time in one's life in CRC risk group in Turkiye. One of the strengths of this study is that meta-analyses and systematic reviews are at the top of the proof pyramid.

Conclusion

As a result of extensive literature research, it was found that the prevalence of knowing and having FOBT and colonoscopy was low in risky individuals with CRC in their first-degree relatives and 50 ages and older.

Awareness should be increased in risky groups that need to be screened and participation should be ensured. For this purpose, it may be suggested to increase the training activities aimed at informing the society in the institutions that provide primary health-care services and to make promotions with posters, brochures, etc. It may also be useful to keep this issue on the agenda through social media and public service announcements.

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Authorship Contributions: Concept – SAG, SM, MFO; Design – SAG, SM, MFO; Supervision – SAG, SM, MFO; Materials – SAG, SM, MFO; Data collection and/or processing – SAG, SM, MFO; Analysis and/or interpretation – SAG, SM, MFO; Literature review – SAG, SM, MFO; Writing – SAG, SM, MFO; Critical review – SM, MFO.

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