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ORIGINAL RESEARCH

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Knowledge levels of male agricultural workers about colorectal cancer, health belief levels and determination of cancer risk

Yusuf Güver[1], Nükhet Ballıel[2,*]

[1]Department of Public Health Nursing, Akdeniz University Nursing Faculty, 07070 Antalya, Türkiye
[2]Department of Public Health Nursing, Aydın Adnan Menderes University Nursing Faculty, 09010 Aydın, Türkiye

***Correspondence**
nukhet.kirag@adu.edu.tr
(Nükhet Ballıel)

Abstract

Background: Colorectal cancer (CRC) is one of the most common causes of cancer deaths worldwide and ranks among the top 3 cancer types in Turkey. **Methods**: This cross sectional study aimed to determine the knowledge, health beliefs, risk levels, and related factors of colorectal cancer among male agricultural workers in a western Turkish city with intense agricultural activities. During the data collection period, from November 2020 to January 2021, 205 male agricultural workers volunteered to participate in the study. Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) software version 22.0. **Results**: Confidence-benefit-health motivation scores of male agricultural workers differ significantly according to the status of undergoing colonoscopy in the past ten years ($p < 0.05$). Confidence-benefit-health motivation scores of male agricultural workers also differ significantly according to the presence of occult blood in the stool within the last year ($p < 0.05$). When examining the correlation analyses between Confidence/Benefits/Health Motivation, Susceptibility and CRC knowledge level, a positive correlation ($p < 0.05$) was found between CRC knowledge level and Confidence/Benefits/Health Motivation scores. Male agricultural workers showed low participation in CRC screenings, with a significant link to their level of health belief. The study aimed to assess participants' knowledge, attitudes and behaviors regarding CRC screenings. Only 21.5% received information from health professionals, and 10.7% underwent FOBT in the last year, suggesting information alone is insufficient to boost screening rates. **Conclusions**: Comprehensive strategies, including addressing smoking, alcohol use and physical inactivity, along with enhancing health beliefs, may improve screening rates and reduce cancer risk.

Keywords

Colorectal cancer; Health beliefs; Male agricultural workers; Knowledge level

1. Introduction

Colorectal Cancer (CRC) is one of the most common reasons of cancer deaths in the world. Many studies have indicated that colorectal cancer (CRC) is one of the leading cancer types in terms of malignancy and mortality [1–6]. According to Cancer Statistics 2021 [7], CRC's estimated new cases of 2021 year is 149,500 and CRC's estimated deaths of 2021 year is 52,980 in US. Cancer Statistics 2021 also shows that CRC is the fourth cancer of all cancers in the new cases and death counts in the US [7].

Türkiye Cancer Statistics 2017 [8] reports that CRC is the top 3 cancer type for both genders among all cancers' incidence rates. Pesticide usage is a risk factor that may increase the incidence of colorectal cancer and agricultural workers are using these chemicals rarely while they are working in their site. In a study examining the relationship between pesticide use and colorectal cancer formation, it was observed that long-term use of a pesticide called acetochlor, increased the risk of colorectal cancer in pesticide users [9]. Another study reported that pesticide use is a risk factor for colon cancer and that there is a relationship between colorectal cancer mortality and the level of pesticide use [10].

CRC is treatable disease when detected at an early stage with screening tests like fecal occult blood testing (FOBT), colonoscopy and fexible sigmoidoscopy. Some studies show that applying rates of screening tests like FOBT and colonoscopy are related with individuals' levels of knowledge about CRC and individuals' Cancer Statistics 2021 levels of health beliefs [11–13].

Agriculture is a sector where the majority of workers are male. Also, male individuals are under risk belongs to statistics by International Agency for Research on Cancer and the agency says that CRC is the third leading cancer type among

all over the male population [1]. Pesticide usage in agricultural working may increase the agricultural worker's risk level of CRC because studies shows that pesticides are increasing the CRC incidence and mortality rates [9, 10, 14]. Researches about this topic indicates that individuals's participation rates of screening test and CRC knowledge levels are low [15–19].

Previous studies are primarily focused on determining the knowledge levels about colorectal cancer (CRC) or the participation rates of CRC screening tests among different populations. However, the samples of these studies are different from agricultural workers. For example, studies by Sung *et al*. [1] and Siegel *et al*. [2] provide global and national cancer statistics, but do not specifically address agricultural workers. Dekker *et al*. [3] and Keum & Giovannucci discuss CRC broadly, without focusing on specific occupational groups [4]. Ilgaz & Gözüm and Mafiana *et al*. [5] are among the few studies that examine CRC risk levels and screening participation in specific populations, including those working in agriculture in Türkiye, but they do not exclusively focus on male agricultural workers [6]. Additionally, Rakhshanderou *et al*. [11] and Huang *et al*. [12] investigate interventions based on health belief models and their impact on CRC screening, again in more general populations. Therefore, our study aims to fill this gap by specifically examining male agricultural workers and their CRC knowledge, attitudes and behaviors.

2. Materials and methods

2.1 Participants and procedure

This cross-sectional study was conducted at a city located at western of Türkiye from November 2020 and January 2021. For the sample size calculation, the sample calculation formula was used when the number of elements in the universe is unknown ($n = t^2 \times p \times q/d/d^2$). In a study conducted in the USA, the frequency of having a fecal occult blood test in the last 1 year was 12.4 of percent so the sample size was calculated as minimum of 166 male agricultural workers should be included in the sample, according to the calculation made at the 5% significance level [20]. During the time period determined for data collection, 205 male agricultural workers were volunteered to participate and the study was conducted with 205 male agricultural workers. Volunteering to participate in the study, not having been diagnosed with colorectal cancer and being a male agricultural worker between the ages of 40–70 living in Isikli neighborhood were the inclusion criteria.

2.2 Measures

2.2.1 Sociodemographics characteristics

The Sociodemographic Characteristics Questionnaire Form includes researcher-made questions about sociodemographic characteristics such as age, marital status, educational status, health insurance, income status, having information from family physicians or health personnel about bowel cancer screening status, knowledge level about CRC and habits regarding pesticide usage.

2.2.2 Health belief model scale for colorectal cancer prevention

The health belief scale developed by Victoria L. Champion for breast cancer was adapted by Jacobs by changing a few questions and replacing the term "breast cancer" with "colon cancer" across all six sub-dimensions [21]. The Turkish population reliability and validity studies of the scale were performed by Özsoy *et al*. [22]. The Turkish version of the scale consists of six sub-scales: Confidence/Benefits/Health Motivation ($\alpha = 0.88$), Susceptibility ($\alpha = 0.76$), Barrier ($\alpha = 0.60$), Health Motivation ($\alpha = 0.54$), Seriousness ($\alpha = 0.58$) and Confidence ($\alpha = 0.72$). In this study, only the subscales of Confidence/Benefits/Health Motivation ($\alpha = 0.88$) and Susceptibility ($\alpha = 0.76$), which had alpha values above 0.70, were used.

2.2.3 Colorectal cancer knowledge level

Structured Form with 10 questions About Colorectal Cancer Knowledge Level developed by Acar Vaizoğlu *et al*. [23] was used to measure the knowledge level of the participants about colorectal cancer. Participants receive "1" points for each "correct answer" they give to the questions in the scale, and "0" points for each "wrong answer"; eventually they get a total score out of 10 points. It is understood that the higher the total score, the higher the level of knowledge [23].

2.2.4 Harvard cancer risk index

Harvard Cancer Risk Index is an online cancer risk level measure tool for calculate cancer risk levels of 40 to 70 aged individuals [24–26]. Validity and reliability of the Harvard Cancer Risk Index performed by Kim *et al*. [27]. CRC risk level measure section of Harvard Cancer Risk Index has 21 question and accessible at Siteman Cancer Center's website (siteman.wustl.edu/prevention/ydr/). The risk levels of the index are: Very much below average, Much below average, below average, Average, Above average, Much above average and Very much above average.

2.3 Statistical analysis

Statistical Package for the Social Sciences (SPSS) software version 22.0 (IBM, Aydın, Turkey) was used for data analysis. Numbers, frequency, standard deviation, and mean descriptive statistics tests were used in the data analysis. To compare the quantitative continuous data between two independent groups, the *t*-test was used. To compare the quantitative continuous data between more than two independent groups, one-way ANOVA (Analysis of Variance) test was used. Scheffe test was used as a complementary *post-hoc* analysis to determine the differences. Pearson correlation analysis was applied between the continuous variables of the study. Chi-square analysis was used to compare group variables. A *p*-value of less than 0.05 was considered statistically significant.

3. Results

3.1 Sociodemographic characteristics of male agricultural workers

The study was conducted and completed 205 male agricultural workers. By age, 78 (38.0%) of male agricultural workers were between the ages of 40–50, 173 (84.4%) were married, 141 (68.8%) were in primary school or below, 23 (11.2%) secondary school, 41 (20.0%) high school and above; According to their health insurance, 195 (95.1%) have health insurance, 10 (4.9%) do not have health insurance, according to income status, 68 participants (33.2%) reported income lower than expenses, 103 (50.2%) reported income equal to expenses, and 34 (16.6%) reported income higher than expenses. Almost all participants (87.8%) did not have Fecal Occult Blood Test (FOBT) in the last 1 year. More than half of the participants (78.5%) had never been informed about bowel cancer screenings by their family doctor or health personnel (Table 1).

3.2 Colorectal cancer health belief and knowledge levels

The mean "Confidence/Benefits/Health Motivation" score of male agricultural workers was 51.62 ± 4.85 (Min = 35; Max = 55), the mean of "Susceptibility" score was 10.58 ± 4.83 (Min = 6; Max = 30), the mean of "CRC Knowledge" score was 8.81 ± 1.19 (Min = 4; Max = 10) (Table 2).

3.3 Harvard cancer risk index for colon cancer levels

According to the Harvard Cancer Risk Level for colon cancer, 96 of the participants (46.8%) were above average and 35 (17.1%) were well above average (Table 3). Confidence-benefit-health motivation scores of male agricultural workers differ significantly according to the status of undergoing colonoscopy in the past ten years ($F = 3.678$; $p = 0.027 < 0.05$).

TABLE 1. Sociodemographic characteristics of male agricultural workers.

Groups	Frequency (n)	Percentage (%)
Age (yr)		
40–50	78	38.0
51–60	62	30.2
61–70	65	31.7
Marital Status		
Married	173	84.4
Single	32	15.6
Educational Status		
Primary school and below	141	68.8
Middle school	23	11.2
High school and above	41	20.0
Health Insurance		
Yes	195	95.1
No	10	4.9
Income Status		
Income is less than expenses	68	33.2
Income equal to expense	103	50.2
Income is more than expenses	34	16.6
Information from Health Professionals on Bowel Cancer Screening		
Yes	44	21.5
No	161	78.5
Having FOBT Status in the Last 1 Year		
Yes	22	10.7
No	180	87.8
I do not know	3	1.5

FOBT: fecal occult blood tests.

TABLE 2. Colorectal cancer health belief and knowledge levels.

	N	Average	SD	Min	Max
Confidence/Benefits/Health Motivation	205	51.620	4.856	35.000	55.000
Susceptibility	205	10.581	4.838	6.000	30.000
CRC Knowledge Level	205	8.815	1.190	4.000	10.000

CRC: Colorectal cancer; SD: standard deviation; Min: minimum; Max: maximum.

TABLE 3. Harvard cancer risk index for colon cancer levels.

Groups	Frequency (n)	Percentage (%)
Harvard Risk Index Level		
Below average	49	23.9
Average	25	12.2
Above average	96	46.8
Much above average	35	17.1

3.4 Investigation of male agricultural workers confidence/benefits/health motivation, susceptibility and colorectal cancer knowledge levels according to colorectal cancer screening

Confidence-benefit-health motivation scores of male agricultural workers differ significantly in the last 1 year according to the variable of occult blood in the stool ($F = 5.422$; $p = 0.005 < 0.05$). Confidence-benefit-health motivation scores of male agricultural workers differ significantly in the last five years according to the variable of having tests related to colorectal cancer such as Flexiblesigmoidoscopy and Double Contrast Barium Enema (DCBE) ($F = 6.760$; $p = 0.001 < 0.05$). Susceptibility scores of participants differ significantly according to the status of having Colorectal Cancer-Related Tests such as Flexiblesigmoidoscopy and DCBE in the Last Five Years. However, the CRC knowledge scores of participants do not differ significantly according to the variable of having Tested for Colorectal Cancer such as Flexiblesigmoidoscopy and DCBE in the Last Five Years ($p > 0.05$) (Table 4).

3.5 Investigation of colorectal cancer-risk related characteristics of male agricultural workers according to colorectal cancer screening

A significant negative correlation was found between the status of having a colonoscopy in the past ten years and the Harvard Risk Level ($\chi^2 = 16.825$; $p = 0.010 < 0.05$). A significant negative correlation was found between the status of having FOBT in the last year and Harvard Risk Level ($\chi^2 = 23{,}243$; $p = 0.001 < 0.05$). Also, there was a significant correlation between the status of having tests related to bowel cancer in the last 5 years, such as flexible sigmoidoscopy and DCBE, and Harvard Risk Level ($\chi^2 = 14.877$; $p = 0.021 < 0.05$) (Table 5).

3.6 Investigation of colorectal cancer-risk related characteristics of male agricultural workers according to colorectal cancer screening

When the correlation analyses between Confidence/Benefits/Health Motivation, Susceptibility and CRC knowledge level are examined; a positive correlation ($p = 0.018 < 0.05$) is found between CRC knowledge level and Confidence/Benefits/Health Motivation score. The relationships between Susceptibility and CRC knowledge level, and between Susceptibility and CRC knowledge level were not statistically significant ($p > 0.05$) (Table 6).

4. Discussion

The level of health belief is a significant factor affecting individuals' participation in cancer screenings and thereby their cancer risk. In this study, the mean Susceptibility score of male agricultural workers was 10.581 ± 4.838, and the mean Confidence/Benefits/Health Motivation score was 51.620 ± 4.856. Although the sub-dimension score averages of the health belief model in our study are similar to those in the literature, the Confidence/Benefits/Health Motivation score average is higher than in other studies [28–30].

Participants who had undergone FOBT within the last year and those who had a colonoscopy within the last 10 years had higher Confidence/Benefits/Health Motivation scores than those who had not undergone these screenings. Similar relationships were found in other studies as well [16, 31–33].

The CRC knowledge level score of the male agricultural workers in our study was relatively high at 8.815 ± 1.190. However, there was no significant relationship between CRC knowledge level and participation rates in CRC screening tests. This contrasts with findings from other studies, which concluded that higher CRC knowledge levels positively affect participation in CRC screenings [16, 34, 35].

A majority of the participants were not informed about CRC screenings by health professionals. FOBT is an easily accessible CRC screening test that should be applied annually to high-risk groups. The low participation rates for the FOBT test in the last year may be due to the lack of information provided by health professionals.

The CRC risk level of 63.9% (n = 131) of participants was above average or well above average. Known risk factors for CRC include smoking, alcohol use and lack of physical activity. To prevent CRC, it is recommended to consume high-fiber foods, vegetables and fruits, and to participate in regular screening tests [30, 36].

Our study found correlations between the Harvard risk level

TABLE 4. Investigation of male agricultural workers confidence/benefits/health motivation, susceptibility and colorectal cancer knowledge levels according to colorectal cancer screening.

Colorectal Cancer Screenings	n	Confidence/Benefits/Health Motivation	Susceptibility	CRC Knowledge
Having Colonoscopy Screening Status in the Last 10 Years		Mean ± SS	Mean ± SS	Mean ± SS
Yes	16	49.500 ± 6.593	12.250 ± 5.040	8.625 ± 1.500
No	186	51.887 ± 4.594	10.393 ± 4.809	8.850 ± 1.143
I do not know	3	46.333 ± 6.506	13.333 ± 4.509	7.667 ± 2.082
F		3.678	1.588	1.690
p		0.027	0.207	0.187
Post Hoc		2 > 3 ($p < 0.001$)		
Having FOBT Status in the Last 1 Year		Mean ± SS	Mean ± SS	Mean ± SS
Yes	22	51.546 ± 5.527	12.046 ± 4.776	9.227 ± 1.152
No	180	51.778 ± 4.674	10.333 ± 4.825	8.783 ± 1.178
I do not know	3	42.667 ± 2.517	14.667 ± 3.055	7.667 ± 1.528
F		5.422	2.344	2.830
p		0.005	0.099	0.061
Post Hoc		1 > 3, 2 > 3 ($p < 0.001$)		
Status of Applying Test for Colorectal Cancer such as Flexiblesigmoidoscopy. DCBE in the Last Five Years		Mean ± SS	Mean ± SS	Mean ± SS
Yes	5	54.600 ± 0.894	16.600 ± 4.336	9.400 ± 0.548
No	192	51.776 ± 4.777	10.380 ± 4.803	8.818 ± 1.181
I do not know	8	46.000 ± 4.567	11.625 ± 3.701	8.375 ± 1.598
F		6.760	4.361	1.153
p		0.001	0.014	0.318
Post Hoc		1 > 3, 2 > 3 ($p < 0.001$)	1 > 2 ($p < 0.001$)	

CRC: Colorectal cancer; FOBT: fecal occult blood tests; DCBE: Double Contrast Barium Enema; SS: Standard deviation.

TABLE 5. Investigation of colorectal cancer-risk related characteristics of male agricultural workers according to colorectal cancer screening.

	Below Average		Average		Average		Well Above Average		*p*
	n	%	n	%	n	%	n	%	
Having Colonoscopy Screening Status in the Last 10 Years									
Yes	10	20.4%	0	0.0%	4	4.2%	2	5.7%	χ^2 =16.825 p = 0.010
No	38	77.6%	24	96.0%	91	94.8%	33	94.3%	
I do not know	1	2.0%	1	4.0%	1	1.0%	0	0.0%	
Having FOBT Status in the Last 1 Year									
Yes	14	28.6%	1	4.0%	6	6.2%	1	2.9%	χ^2 = 23.243 p = 0.001
No	34	69.4%	24	96.0%	88	91.7%	34	97.1%	
I do not know	1	2.0%	0	0.0%	2	2.1%	0	0.0%	
Status of Applying Test for Colorectal Cancer such as Flexiblesigmoidoscopy. DCBE in the Last Five Years									
Yes	2	4.1%	0	0.0%	3	3.1%	0	0.0%	χ^2 = 14.877 p = 0.021
No	41	83.7%	25	100.0%	91	94.8%	35	100.0%	
I do not know	6	12.2%	0	0.0%	2	2.1%	0	0.0%	

FOBT: fecal occult blood tests; DCBE: Double Contrast Barium Enema.

TABLE 6. Investigation of correlation analysis between confidence/benefits/health motivation, susceptibility and colorectal cancer knowledge levels.

	Confidence/Benefits/Health Motivation	Susceptibility	CRC Knowledge
Confidence/Benefits/Health Motivation			
r	1.000		
p	<0.001*		
Susceptibility			
r	0.013	1.000	
p	0.849	<0.001*	
CRC Knowledge Levels			
r	0.165*	0.105	1.000
p	0.018	0.135	<0.001*

**p < 0.05. CRC: Colorectal cancer.*

for CRC and several factors: consuming fruit, being informed by health professionals about bowel cancer screening tests, visiting any physician for cancer control in the last two years, smoking, using alcohol, walking at least thirty minutes a day or at least three hours a week, having a colonoscopy in the last ten years, and having FOBT in the last year.

Additionally, we found a relationship between CRC knowledge level and Confidence/Benefits/Health Motivation score. To our knowledge, no previous study has analyzed the relationship between CRC knowledge level and health belief level, highlighting the unique contribution of our study to the literature.

5. Limitations and strengths

This study has several limitations. First, as a cross-sectional study, it is limited in its ability to infer causality between health beliefs and screening behaviors. Second, the sample is limited to male agricultural workers in a specific region of Türkiye, which may not be generalizable to other populations or regions. Third, self-reported data on screening behaviors and health beliefs may be subject to recall bias or social desirability bias.

Despite these limitations, the study has several strengths. It addresses a specific and understudied population, providing valuable insights into the health beliefs and screening behaviors of male agricultural workers. The use of validated scales and indices, such as the Health Belief Model Scale and Harvard Cancer Risk Index, enhances the reliability and validity of the findings. Additionally, the study identifies significant factors that influence colorectal cancer screening behaviors, which can inform targeted interventions to improve screening rates in high-risk populations. There are no studies in the literature that combine the determination of CRC knowledge levels, CRC health belief levels, and CRC risk levels specifically among male agricultural workers in Turkey.

6. Conclusions

It has been observed that male agricultural workers participating in this study have a low level of participation to CRC screenings and a relationship found between the level of health belief and colorectal cancer screenings. It was concluded that most of the participants were not informed about colorectal cancer screenings by health professionals such as nurses and doctors. If health professionals in the primary care reach and inform more individuals who are in the risk group about colorectal cancer screenings, a dramatic increase will be achieved in screening participation rates of colonoscopy, FOBT and DCBE.

AVAILABILITY OF DATA AND MATERIALS

The data presented in this study are available on reasonable request from the corresponding author.

AUTHOR CONTRIBUTIONS

YG and NB—designed the research study, analyzed the data; YG—performed the research, wrote the manuscript. Both authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical permission was taken from the Aydın Adnan Menderes University Non-Interventional Clinical Research Ethics Committee of the Nursing Faculty (code number: 2019/143). Also, necessary institution permit for collecting data was taken from Aydın governorship. Informed consent was obtained from all agricultural workers included in the study.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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