

Factors Affecting Cancer Prevention Behaviors and Cancer Screening in First-Degree Relatives of Breast and Colorectal Cancer Patients in Korea: A Cross-Sectional Study

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Background: First-degree relatives (FDRs) of cancer patients have a high risk of cancer due to a similar lifestyle and genetic predisposition. However, previous studies rarely examined the level of cancer prevention behaviors and screening and affecting factors in cancer patients' FDRs. **Purpose:** This study aimed to describe the levels of cancer knowledge, attitudes toward cancer, cancer worry, perceived cancer risk, and cancer prevention behaviors and cancer screening in FDRs of breast and colorectal cancer patients. Moreover, it sought to identify factors affecting cancer prevention behavior and cancer screening. **Methods:** A cross-sectional, descriptive correlational design was used. The study enrolled 138 FDRs of breast and colorectal cancer patients. Participants completed self-administered questionnaires at a tertiary hospital in Seoul, Korea. Descriptive statistics, frequencies, chi-square test, independent *t*-test, one-way analysis of variance (ANOVA), Pearson's correlation, multiple regression, and logistic regression were performed for data analysis. **Results:** The levels of perceived cancer risk, cancer knowledge, attitude toward cancer, and cancer prevention behaviors were moderate, while the level of cancer worry was high. Ninety-two participants reported having undergone cancer screenings, but the types of screening were not associated with their family history. Age, gender, and attitude toward cancer affected cancer prevention behaviors. The

cancer screening rate was higher in older participants, in women, and in patients' FDRs with a longer cancer diagnosis. **Implications for Practice:** Attitude was the modifiable factor for cancer prevention behaviors. Nurse-led educational and counseling interventions should be developed to improve attitude toward cancer among FDRs of cancer patients.

Keywords: neoplasms; family; health behavior; early diagnosis

Cancer is broadly categorized into sporadic cancer or familial cancer. Representative cancers with familial genetic tendencies include breast cancer, ovarian cancer, and colon cancer (Lee & No, 2009). Family members of cancer patients generally have a higher risk of cancer because they share a similar lifestyle and genetic predispositions (Lee & No, 2009). First-degree relatives (FDRs) of breast cancer patients have almost twice the risk of breast cancer compared to those without a family history of breast cancer, and the risk can increase three times if the person has two FDRs with cancer (American Cancer Society, 2017). A literature review of 34 breast cancer studies showed family history is a known risk factor for breast cancer in Korean women (Lee et al., 2008). If a person has one FDR with colorectal cancer among their FDRs, the risk of colorectal cancer increases 2.3 times, while, if a person has two FDRs with colorectal cancer, the risk of having colorectal cancer increases 4.3 times (Johns & Houlston, 2001). The Korean Cancer Prevention Study-II also reported that colorectal cancer risk significantly increased among individuals with a family history (Jo et al., 2012).

A healthy lifestyle, including not smoking, limiting alcohol consumption, being physically active, and maintaining a healthy body weight, is important to prevent breast and colorectal cancer (LoConte et al., 2018; Torre et al., 2016). However, according to a study in the UK, less than half the participants who visited a family history clinic for breast and colorectal cancer screenings met the recommendations for cancer prevention in the aspects areas of physical activity, Body Mass Index, and alcohol consumption (Anderson et al., 2017). Moreover, participants rarely changed their lifestyle based on cancer risk (Anderson et al., 2017).

Early detection of cancer enables treatment that is more effective, less complicated, and less expensive (World Health Organization, 2017). However, individuals with a family history of breast or colorectal cancer had lower levels of cancer screening behaviors (Ait Ouakrim et al., 2012; Kirca et al., 2018). According to the protocols of the National Cancer Screening Program (NCSP) for low-income medical aid recipients in Korea, individuals over 50 years old are eligible to undergo colorectal cancer screening, and women older than 40 years old are eligible to undergo breast cancer screening for free (Suh et al., 2016). Even though repeated screenings performed in optimal time intervals are required for early detection, many do not follow the recommendations (Suh et al., 2016). There are several reasons why people disregard cancer screening recommendations: (a) they think they are healthy, (b) they do not

have time, (c) the process of cancer screening is difficult and scary, and/or (d) they are afraid they might have cancer (National Cancer Center Korea, 2015). Accordingly, healthcare providers should strive to assess perceived cancer risk, cancer worry, and cancer knowledge related to prevention. Also, they should encourage people to undergo cancer screenings, especially those in high-risk groups.

Cancer knowledge, attitude toward cancer, cancer worry, and perceived cancer risk were related with cancer prevention behaviors and screening in previous studies (Freitas & Weller, 2016; Haug et al., 2018; Kim & Kim, 2012; Taheri-Kharameh et al., 2015; White et al., 2018). A previous study reported that cancer patients' FDRs had higher levels of perceived cancer risk and showed an increased degree of readiness to stop smoking, reduce alcohol consumption, increase physical activity, and eat more fruits and vegetables (Haug et al., 2018). Family members of breast cancer patients tended to undergo more magnetic resonance imaging (MRI) scans if they had a higher level of perceived cancer risk and worry (White et al., 2018). For colorectal cancer FDRs, knowledge and perceived susceptibility and barriers were significant predictors of screening adherence (Taheri-Kharameh et al., 2015). On the other hand, in Korea, many studies on cancer patients' family members have focused on examining care burden, stress, and psychological health. Studies focused on family members as a high-risk group for cancer were rare and did not examine the level of cancer prevention behaviors including cancer screening and the factors influencing it.

Therefore, this study aimed (a) to describe the levels of cancer knowledge, attitude toward cancer, cancer worry, perceived cancer risk, and cancer prevention behaviors and cancer screening, (b) to examine the association between participants' characteristics, cancer knowledge, attitude toward cancer, cancer worry, perceived cancer risk, cancer prevention behaviors, and cancer screening, (c) to examine the correlation between general characteristics and the five main variables except for cancer screening, and (d) to identify the factors affecting cancer prevention behavior and cancer screening in FDRs of breast and colorectal cancer patients in Korea.

CONCEPTUAL FRAMEWORK

The conceptual framework of this study was developed based on the previous literature review and theory of planned behavior (Ajzen, 1991) (Figure 1). According to the literature review, there were relationships between general characteristics (demographic and disease related characteristics), cancer knowledge, attitude toward cancer, cancer worry, perceived cancer risk, prevention behaviors, and cancer screening (Freitas & Weller, 2016; Haug et al., 2018; Kim & Kim, 2012; Taheri-Kharameh et al., 2015; White et al., 2018). In addition, the theory of planned behavior explained that attitude was an important factor affecting behavioral intention, which could affect human behavior (Ajzen, 1991).

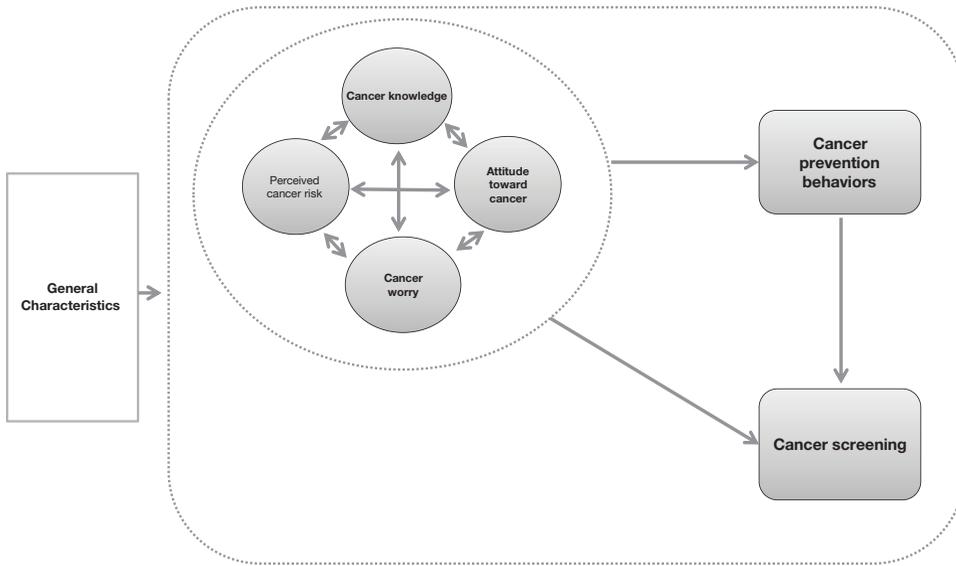


Figure 1. Conceptual framework.

METHODS

STUDY DESIGN, SETTING, AND SAMPLE

A cross-sectional, descriptive correlational design was used. This study was conducted at a tertiary hospital in Seoul, Korea, and a convenience sampling method was used. The inclusion criteria were as follows: (a) FDRs of breast and colorectal cancer patients, (b) age 19 years or older, and (c) ability to understand and sign the informed consent form. Participants who had a past history of cancer or who were undergoing cancer treatments were excluded.

The minimum sample size was calculated with these parameters and assumptions by using the G*power program version 3.1. (Faul et al., 2009); multiple regression, five predictors, medium effect size (Cohen's $f^2 = 0.15$), a significance level of 0.05, and a power of 0.95. The required sample size was 138 participants based on these assumptions and this study was planned to recruit 152 participants considering 10% drop-out rate. One hundred forty-one people agreed to participate in this study, but three participants with incomplete questionnaires were excluded from data analysis.

ETHICAL CONSIDERATIONS

The study was approved by the Institutional Review Board (IRB) of the hospital (IRB no. 4-2016-0494), and informed consent forms were voluntarily provided by all participants. Participants were informed that they could withdraw from the study at any time, and all personal information was kept confidential.

MEASUREMENTS

General Characteristics. In the questionnaire, participants provided demographic information such as age, gender, marital status, education level, job status, monthly income, family history of cancer, relationship to breast or colorectal cancer patients, and stage and diagnosis length for the family member with cancer.

Cancer Knowledge. Cancer knowledge was measured with the instrument developed by Suh et al. (1998) and then modified by Kim and Kim (2012). The instrument consisted of 30 items about risk groups, risk factors, screening methods, and inspection frequency of six representative cancers (stomach, lung, liver, colorectal, breast, cervical) in Korea (Kim & Kim, 2012; Suh et al., 1998). The total score ranges from 0 to 30 points, and higher scores denote higher levels of knowledge (*right answer* = 1, *wrong answer or I do not know* = 0). Kim and Kim (2012) reported that the percentage of correct answers was 47.8%, and it was 61.7% in this study.

Attitude Toward Cancer. Attitudes toward cancer was measured with the instrument developed by Suh and colleagues (1998). Attitude toward cancer scale has 10 items about "general attitude toward cancer" and "early detection and prevention of cancer" that are assessed via a five-point Likert scale, where 1 = *strongly disagree* and 5 = *strongly agree*. From a total score range of 10–50, a higher score means a more positive attitude toward cancer (Suh et al., 1998). Cronbach's alpha was 0.71 in the original article (Suh et al., 1998) and it was 0.41 in this study.

Cancer Worry. Cancer worry was measured using the breast cancer fear scale developed by Champion and Skinner (2004) and confirmed as valid and reliable for use among Chinese adults aged 60 or above by Leung et al. (2014). In this study, the back-and-forth translation method and committee approach used to develop the Korean version of the cancer worry scale was as follows: (a) a professor of nursing and two bilingual doctoral students translated it from English into Korean, (b) they discussed the differences between their versions and reached agreement on the appropriate translation, (c) another bilingual person independently translated it from Korean into English, and (d) a professor of nursing and two doctoral students confirmed the Korean version of the cancer worry scale (Brislin, 1970; Simonsen & Mortensen, 1990; Yu et al., 2004). This five-point Likert scale has eight items (1 = *strongly disagree* to 5 = *strongly agree*; the total score range = 8–40 points), with a higher score meaning a higher level of cancer worry. Cronbach's alpha was 0.91 in the original article (Champion et al., 2004) and 0.95 in this study.

Perceived Cancer Risk. A single question was used to assess participants' perceived cancer risk and the question was as follows, "Please think about your expected risk of having cancer in your lifetime, and how many points would you assign this risk out of 1 to 100 (1 = *I will never get cancer in my life*, 100 = *I will definitely get cancer*)?"

Cancer Prevention Behaviors. Cancer prevention behaviors were measured using the cancer-preventive health behavior scale developed by Suh et al. (1998) and then modified by Kim and Kim (2012). This five-point Likert scale has 18 items related

to diet, lifestyle, and exercise for cancer prevention, and a higher score denotes a higher level of cancer prevention behaviors (1 = *never do it* to 5 = *always do it*; the total score range = 18–90 points) (Kim & Kim, 2012; Suh et al., 1998). Cronbach's alpha was 0.75 in the previous study (Kim & Kim, 2012), and 0.84 in this study.

Cancer Screening. Participants checked all relevant cancer screening items they had done over the last 2 years.

DATA COLLECTION

Data were collected from August 2016 to April 2017 at a tertiary hospital in Seoul, Korea. To recruit participants, notices about the study were posted in the hospital, and the researchers explained the purpose, background, method, and ethics of this study. The participants completed self-administered questionnaires after they voluntarily provided written informed consent. One hundred forty-one people agreed to participate in the study, but three participants were excluded because of incomplete questionnaires. Thus, 138 FDRs of breast and colorectal cancer patients were included for analysis.

DATA ANALYSIS

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 23.0 for Windows (IBM Corp., Armonk, New York). Descriptive statistics and frequencies were used to show the distribution of participants' characteristics as well as the levels of cancer knowledge, attitude toward cancer, cancer worry, perceived cancer risk, cancer prevention behaviors, and cancer screening. Chi-square test, independent *t*-test, and one-way analysis of variance (ANOVA) were used to analyze the association between participants' characteristics, cancer knowledge, attitude toward cancer, cancer worry, perceived cancer risk, cancer prevention behaviors, and cancer screening. Pearson's correlation was used to analyze the correlation between general characteristics and the five main variables except for cancer screening. Multiple regression and logistic regressions were used to identify the factors affecting cancer prevention behaviors and cancer screening. All analyses were two-tailed, and the significance level was set at 0.05.

RESULTS

GENERAL CHARACTERISTICS OF PARTICIPANTS

The participants' characteristics are shown in (Table 1). The mean age was 41.92 ± 12.97 years, 98 (71.0%) were women, and more than half (55.5%) had spouses. Seventy-five (54.3%) had a family history of colorectal cancer, and 98 participants reported a maternal family history of breast or colorectal cancer. The mean length of diagnosis length for a family member with cancer was more than 3 years (41.43 ± 60.11 months).

TABLE 1. Participants' Characteristics

Characteristics	Mean \pm SD	n	%
Age (years)	41.92 \pm 12.97		
Gender			
Men		40	29.0
Women		98	71.0
Marital status ^a			
Spouse (+)		76	55.5
Spouse (-)		61	44.5
Education ^a			
\leq High school		38	27.7
> High school		99	72.3
Job			
Yes		60	43.5
No		78	56.5
Monthly income (USD) ^b			
<2,600		51	37.8
\geq 2,600		84	62.2
Family history			
Breast cancer		63	45.7
Colorectal cancer		75	54.3
Stage ^c			
\leq Stage II		48	44.0
Stage III		36	33.0
Stage IV		25	22.9
Diagnosis length (month) ^a (for family member with cancer)	41.43 \pm 60.11 (median: 12.00, range: 0.5~360)		
Relationship to cancer patients ^{a,d}			
Father		28	17.0(20.4)
Mother		98	59.4(71.5)
Brother		9	5.5(6.6)
Sister		20	12.1(14.6)
Son		1	0.6(0.7)
Daughter		9	5.5(6.6)

Note. SD = standard deviation.

^aN = 137 (number of analyzed participants).

^bN = 135 (number of analyzed participants).

^cN = 109 (number of analyzed participants).

^dMultiple choice.

LEVELS OF CANCER KNOWLEDGE, ATTITUDE TOWARD CANCER, CANCER WORRY, PERCEIVED CANCER RISK, CANCER PREVENTION BEHAVIORS, AND CANCER SCREENING

The levels of cancer knowledge, attitude toward cancer, perceived cancer risk, and cancer prevention behaviors were moderate (cancer knowledge 18.51 ± 4.74 , attitude toward cancer 32.04 ± 3.34 , perceived cancer risk 54.07 ± 22.63 , and cancer prevention behaviors 61.60 ± 9.41). On the other hand, the level of cancer worry was high (30.12 ± 6.87) in this study (Table 2).

TABLE 2. Levels of Cancer Knowledge, Attitude Toward Cancer, Cancer Worry, Perceived Cancer Risk, Cancer Prevention Behaviors, and Cancer Screening (N = 138)

Main variables	Mean ± SD	n	%
Cancer knowledge (0–30)	18.51 ± 4.74		
Attitude toward cancer (10–50)	32.04 ± 3.34		
Cancer worry (8–40)	30.12 ± 6.87		
Perceived cancer risk (1–100) ^a	54.07 ± 22.63		
Cancer prevention behaviors (18–90)	61.60 ± 9.41		
Cancer screening ^b			
	Yes	92	66.7
	No	46	33.3

Note. SD = standard deviation.

^aN = 133 (number of analyzed participants).

^bMultiple choice.

Ninety-two participants (66.7%) answered that they had undergone cancer screenings over the last 2 years (Table 2). Gastroscopy (25.5%) was the most prevalent type of screening, followed by mammography (18.4%) and pap smear (18.4%). However, the types of cancer screenings, were not associated with family history. Among participants with family history of breast cancer ($n = 63$), twenty participants (31.7%) underwent a mammography during the last 2 years. Among participants with a family history of colorectal cancer ($n = 75$), 20 participants (26.7%) underwent a fecal occult blood test.

ASSOCIATION BETWEEN PARTICIPANT CHARACTERISTICS, CANCER KNOWLEDGE, ATTITUDE TOWARD CANCER, CANCER WORRY, PERCEIVED CANCER RISK, CANCER PREVENTION BEHAVIORS, AND CANCER SCREENING

Cancer Knowledge. The level of cancer knowledge was positively correlated with age ($r = 0.18, p = .032$). Women and those with a higher level of education (>high school) showed a higher level of knowledge ($t = -3.65, p < .001$; $t = -2.65, p = .009$). The other participant characteristics were not significantly associated with knowledge in this study (Table 3).

Attitude Toward Cancer. Participants who completed cancer screenings during the last 2 years showed a more positive attitude toward cancer ($t = -2.14, p = .034$). Attitude toward cancer was not significantly associated with any participants' characteristics (Table 3).

Cancer Worry. The level of cancer worry was significantly associated with education ($t = 2.80, p = .006$), monthly income ($t = 3.11, p = .002$), and family history of cancer ($t = 2.02, p = .046$). Participants with a lower level of education (\leq high school), lower level of monthly income (<2,600 USD), and family history of breast cancer showed higher level of cancer worry (Table 3).

TABLE 3. Differences in the Five Main Variables According to Participant Characteristics and Cancer Screening (N = 138)

Characteristics/Variables	n(%)	Cancer knowledge		Attitude toward cancer		Cancer worry		Perceived cancer risk		Cancer prevention behaviors	
		M ± SD	L/F(t/p)	M ± SD	L/F(t/p)	M ± SD	L/F(t/p)	M ± SD	L/F(t/p)	M ± SD	L/F(t/p)
Age (year)	138(100)	-	0.18(.032)	-	0.14(.101)	-	0.07(.412)	-	-0.13(.145)	-	.38(<.001)
<40	62(44.9)	17.56 ± 5.34	-2.08(.040)	31.68 ± 3.27	-1.17(.246)	30.19 ± 6.48	0.11(.914)	56.73 ± 20.83	1.21(.227)	59.37 ± 7.87	-2.57(.011)
≥40	76(55.1)	19.28 ± 4.07		32.34 ± 3.38		30.07 ± 7.22		51.95 ± 23.90		63.42 ± 10.19	
Gender	40(29.0)	16.30 ± 4.73	-3.65(<.001)	31.95 ± 3.51	-0.21(.834)	28.75 ± 6.96	-1.51(.134)	56.15 ± 21.63	0.68(.496)	58.88 ± 8.68	-2.21(.029)
Men	98(71.0)	19.41 ± 4.47		32.08 ± 3.28		30.68 ± 6.79		53.20 ± 23.09		62.71 ± 9.51	
Women	76(55.5)	19.13 ± 4.51	-1.68(.069)	32.13 ± 3.60	-0.31(.755)	29.59 ± 7.09	1.10(.276)	53.07 ± 23.12	0.54(.593)	63.82 ± 10.16	-3.08(.003)
Marital status ^a	61(44.5)	17.77 ± 4.99		31.95 ± 3.03		30.89 ± 6.59		55.20 ± 22.32		58.98 ± 7.67	
Spouse (+)	38(27.7)	16.79 ± 4.36	-2.65(.009)	32.34 ± 3.73	0.63(.530)	32.74 ± 5.44	2.80(.006)	48.36 ± 20.25	-1.92(.057)	63.76 ± 10.55	1.66(.099)
Spouse (-)	99(72.3)	19.14 ± 4.76		31.94 ± 3.20		29.14 ± 7.16		56.67 ± 22.82		60.79 ± 8.91	
Education ^a	60(43.5)	18.88 ± 4.66	-0.82(.416)	32.22 ± 2.84	-0.55(.582)	30.83 ± 5.79	-1.10(.272)	54.12 ± 20.99	-0.02(.982)	60.65 ± 9.00	1.04(.299)
≤High school	78(56.5)	18.22 ± 4.82		31.91 ± 3.69		29.58 ± 7.59		54.03 ± 24.00		62.33 ± 9.71	
>High school	51(37.8)	19.35 ± 4.38	1.57(.118)	32.35 ± 3.41	0.73(.467)	32.53 ± 5.36	3.11(.002)	50.46 ± 22.36	-1.45(.151)	62.61 ± 10.12	0.80(.423)
Job	84(62.2)	18.02 ± 4.97		31.92 ± 3.34		28.83 ± 7.38		56.33 ± 22.34		61.26 ± 9.00	
Yes	63(45.7)	18.30 ± 5.07	-0.47(.642)	31.78 ± 3.40	-0.86(.393)	31.40 ± 6.92	2.02(.046)	49.55 ± 25.30	-2.18(.031)	61.94 ± 9.07	0.38(.703)
No	75(54.3)	18.68 ± 4.48		32.27 ± 3.29		29.05 ± 6.69		58.01 ± 19.34		61.32 ± 9.74	
Monthly income ^b (USD)	48(44.0)	18.46 ± 4.80	<0.01(.997)	31.40 ± 3.60	0.61(.548)	31.35 ± 6.43	0.88(.417)	51.48 ± 23.90	1.29(.279)	60.73 ± 8.46	0.07(.931)
<2,600	36(33.0)	18.53 ± 4.72		32.17 ± 3.23		29.67 ± 7.05		56.15 ± 22.07		60.97 ± 11.41	
≥2,600	25(22.9)	18.44 ± 4.80		32.0 ± 3.06		29.56 ± 6.96		60.43 ± 20.28		60.08 ± 6.74	
Family history	137(100)	-	0.09(.307)	-	0.09(.304)	-	<0.01(.994)	-	0.09(.317)	-	0.07(.441)
Breast cancer											
Colorectal cancer											
Stage ^c											
≤Stage II											
Stage III											
Stage IV											
Diagnosis length (years) ^a											

(Continued)

TABLE 3. Differences in the Five Main Variables According to Participant Characteristics and Cancer Screening (N = 138) (Continued)

Characteristics/Variables	n(%)	Cancer knowledge		Attitude toward cancer		Cancer worry		Perceived cancer risk		Cancer prevention behaviors	
		M ± SD	t/F/(p)	M ± SD	t/F/(p)	M ± SD	t/F/(p)	M ± SD	t/F/(p)	M ± SD	t/F/(p)
(for family member with cancer)											
≤5	99(72.3)	18.28 ± 4.64	-0.82(.415)	31.85 ± 3.28	-1.42(.158)	30.55 ± 6.55	1.02(.312)	54.29 ± 21.30	0.16(.874)	61.30 ± 9.38	-0.63(.527)
>5	38(27.7)	19.03 ± 5.08		32.74 ± 3.29		29.11 ± 7.71		53.59 ± 26.32		62.45 ± 9.70	
Cancer screening											
Yes	92(66.7)	19.64 ± 4.14	-4.21(<.001)	32.47 ± 3.39	-2.14(.034)	30.47 ± 6.99	-0.83(.407)	53.65 ± 22.15	0.30(.766)	63.36 ± 9.76	-3.21(.002)
(for the last 2 years)	46(33.3)	16.24 ± 5.10		31.20 ± 3.09		29.43 ± 6.65		54.89 ± 23.78		58.09 ± 7.63	

Note. SD = standard deviation.

^aN = 137 (number of analyzed participants).

^bN = 135 (number of analyzed participants).

^cN = 109 (number of analyzed participants).

Perceived Cancer Risk. The level of perceived cancer risk was significantly associated with a family history of cancer ($t = -2.18, p = .031$), and the participants with a family history of colorectal cancer showed a higher level of it (Table 3).

Cancer Prevention Behaviors. The level of cancer prevention behaviors was positively correlated with age ($r = 0.38, p < .001$) and was statistically significant. Women showed a significantly higher level of cancer prevention behaviors than men ($t = -2.21, p = .029$), and participants with a spouse showed a significantly higher level ($t = -3.08, p = .003$). Participants who underwent cancer screenings during the last 2 year reported significantly higher level of cancer prevention behaviors ($t = -3.21, p = .002$) (Table 3).

Cancer Screening. Participants aged 40 years or older showed a higher rate of cancer screening ($\chi^2 = 11.48, p = .001$), women showed a higher rate of cancer screening than men ($\chi^2 = 9.31, p = .002$), and participants with a spouse showed a higher rate of cancer screening ($\chi^2 = 10.76, p = .001$). The rate of cancer screening differed significantly by the diagnosis length for a family member with cancer ($\chi^2 = 7.46, p = .006$). Also, the rate of cancer screening was significantly different by the level of knowledge, attitude, and cancer prevention behaviors ($\chi^2 = 7.67, p = .006$; $\chi^2 = 8.41, p = .004$; $\chi^2 = 9.18, p = .002$) (Table 4).

CORRELATION BETWEEN CANCER KNOWLEDGE, ATTITUDE TOWARD CANCER, PERCEIVED CANCER RISK, AND CANCER PREVENTION BEHAVIORS

Knowledge was positively correlated with attitude ($r = 0.20, p = .017$), and attitude was positively correlated with cancer prevention behaviors ($r = 0.32, p < .001$). In other words, participants with a higher level of cancer knowledge had a more positive attitude toward cancer, and participants with a more positive attitude toward cancer had a higher level of cancer prevention behaviors. There were no significant correlations between other variables.

TABLE 4. Differences in Cancer Screening by Participant Characteristics and Five Main Variables (N = 138)

Characteristics/ Variables		Cancer screening		
		Yes	No	$\chi^2(p)$
		n(%)	n(%)	
Age (year)	<40	32(51.6)	30(48.4)	11.48(.001)
	≥40	60(78.9)	16(21.1)	
Gender	Men	19(47.5)	21(52.5)	9.31(.002)
	Women	73(74.5)	25(25.5)	
Marital status ^a	Spouse (+)	60(78.9)	16(21.1)	10.76(.001)
	Spouse (-)	32(52.5)	29(47.5)	

(Continued)

TABLE 4. Differences in Cancer Screening by Participant Characteristics and Five Main Variables (N = 138) (Continued)

Characteristics/ Variables		Cancer screening		
		Yes	No	$\chi^2(p)$
		n(%)	n(%)	
Education ^a	≤ High school	22(57.9)	16(42.1)	2.04(.153)
	>High school	70(70.7)	29(29.3)	
Job	Yes	41(68.3)	19(31.7)	0.13(.716)
	No	51(65.4)	27(34.6)	
Monthly income ^b (USD)	<2,600	36(70.6)	15(29.4)	0.38(.539)
	≥2,600	55(65.5)	29(34.5)	
Family history	Breast cancer	38(60.3)	25(39.7)	2.10(.147)
	Colorectal cancer	54(72.0)	21(28.0)	
Stage ^c	≤Stage II	29(60.4)	19(39.6)	2.26(.323)
	Stage III	27(75.0)	9(25.0)	
	Stage IV	18(72.0)	7(28.0)	
Diagnosis length (years) ^a (for family member with cancer)	≤5	59(59.6)	40(40.4)	7.46(.006)
	>5	32(84.2)	6(15.8)	
Cancer Knowledge	<20	39(55.7)	31(44.3)	7.67(.006)
	≥20	53(77.9)	15(22.1)	
Attitude toward cancer	<33	42(56.0)	33(44.0)	8.41(.004)
	≥33	50(79.4)	13(20.6)	
Cancer worry	<31	41(60.3)	27(39.7)	2.45(.118)
	≥31	51(72.9)	19(27.1)	
Perceived cancer risk ^d	<55	52(70.3)	22(29.7)	1.26(.262)
	≥55	36(61.0)	23(39.0)	
Cancer prevention behaviors	<63	43(55.8)	34(44.2)	9.18(.002)
	≥63	49(80.3)	12(19.7)	

Note. SD = standard deviation.

^aN = 137 (number of analyzed participants).

^bN = 135 (number of analyzed participants).

^cN = 109 (number of analyzed participants).

^dN = 133 (number of analyzed participants).

FACTORS AFFECTING CANCER PREVENTION BEHAVIORS

To identify the factors affecting cancer prevention behaviors, five variables (age, gender, marital status, attitude toward cancer, and cancer screening), which were statistically associated with cancer prevention behavior, were simultaneously entered into the regression model. The regression model with five factors explained 23.1% of the variance in cancer prevention behaviors. Age, attitude, and gender significantly affected participant's cancer prevention behaviors (*Std. β* = 0.30, *p* = .001; *Std. β* = 0.27, *p* = .001; *Std. β* = 0.16, *p* = .044). Older participants, participants with a more positive attitude toward cancer, and women showed a higher level of cancer prevention behavior. Marital status and cancer screening were not statistically significant factors in terms of cancer prevention behaviors (Table 5).

FACTORS AFFECTING CANCER SCREENING

To identify the factors affecting cancer screening, seven variables (age, gender, marital status, diagnosis length, cancer knowledge, attitude toward cancer, and cancer prevention behaviors), which were statistically associated with cancer screening, were simultaneously entered into the logistic regression model. Gender, age, and diagnosis length (for a family member with cancer) were statistically significant factors affecting cancer screening (odds ratio [OR] = 3.81, 95% confidence interval [CI] = 1.46–9.93; OR = 3.61, 95% CI = 1.42–9.19; OR = 3.94, 95% CI = 1.33–11.65). Women were more likely to get cancer screening than men, the participants aged 40 or more were likely to get cancer screening than the those aged under 40, and the participants with a family member diagnosed of cancer over 5 years ago (>5 years) were more likely to get cancer screening than those with a family member diagnosed of cancer within 5 years (\leq 5 years). Marital status, knowledge, attitude, and cancer prevention behaviors were not significant factors for cancer screening (Table 6).

TABLE 5. Factors Affecting Cancer Prevention Behaviors (N = 138)

	β	SE	Std. β	<i>t</i> (<i>P</i>)	<i>R</i> ²	Adj <i>R</i> ²	<i>F</i> (<i>P</i>)
Constant	24.64	7.12		3.46 (.001)	0.259	0.231	9.15 (<.001)
Age	0.22	0.07	0.30	3.31 (.001)			
Gender	3.33	1.64	0.16	2.03 (.044)			
Marital status	1.68	1.61	0.09	1.04 (.299)			
Attitude toward cancer	0.76	0.22	0.27	3.51 (.001)			
Cancer screening	0.36	1.75	0.02	0.21 (.836)			

Note. Durbin–Watson: 1.929, Tolerance: 0.680–0.959, VIF: 1.042~1.471.

TABLE 6. Factors Affecting Cancer Screening (N =137)

		β	SE	OR	95% CI	
					Lower	Upper
Age	≥40 years	1.28	0.48	3.61**	1.42	9.19
Gender	Women	1.34	0.49	3.81**	1.46	9.93
Marital status	Spouse (+)	0.74	0.47	2.10	0.84	5.24
Diagnosis length (for family member with cancer)	>5 years	1.37	0.55	3.94 [†]	1.33	11.65
Cancer knowledge	≥20	0.51	0.45	1.67	0.69	4.05
Attitude toward cancer	≥33	0.95	0.49	2.58	0.98	6.79
Cancer prevention behaviors	≥63	0.70	0.49	2.01	0.76	5.29

Note. CI = confidence interval; OR = odds ratio. Reference group: age: < 40 years, gender: men, marital status: no spouse, diagnosis length: ≤ 5 years, knowledge: < 20, attitudes: < 33, cancer prevention behaviors: < 63. Cox and Snell R-Square: 0.289, Nagelkerke R-Square: 0.401

[†] $p < .05$. ** $p < .01$.

DISCUSSION

The aim of this study was to describe the levels of cancer knowledge, attitudes toward cancer, cancer worry, perceived cancer risk, and cancer prevention behaviors and cancer screening in FDRs of breast and colorectal cancer patients, and to identify factors affecting cancer prevention behavior and cancer screening. This study showed that attitude toward cancer is a modifiable factor that could increase cancer prevention behaviors among individuals who have a family history of breast and colorectal cancer. The findings showed men and younger FDRs of breast or colorectal cancer patients may practice fewer cancer prevention behaviors.

Attitude toward cancer was a modifiable factor affecting improved cancer prevention behaviors in breast and colorectal cancer patients' FDRs, and their attitudes toward cancer were generally related with their degree of cancer knowledge. Attitude is an important factor affecting behavioral intention in the theory of planned behavior (Ajzen, 1991). According to the theory, "attitude toward the behavior," "subjective norm," and "perceived behavioral control" lead to the formation of "behavioral intention," and people are subsequently expected to carry out these intentions when the opportunity arises. Therefore, healthcare providers need to find ways to change attitudes toward cancer among high-risk cancer groups. For example, an education program might change attitudes toward cancer and improve cancer prevention behaviors because this study found that there was a positive correlation

between attitude toward cancer and cancer knowledge, even though knowledge was not a significant factor affecting cancer prevention behavior. A previous study, where 542 community-dwelling adults in Korea participated, reported that cancer-related knowledge was a significant predictor of cancer prevention behavior (Son et al., 2017), and it was confirmed the use of theory-based educational interventions increased the rates of cervical cancer screening among women at risk of cervical cancer in a systematic review study (Musa et al., 2017).

Gender and age were also affecting factors for cancer prevention behaviors and cancer screening. Female and older FDRs had better cancer prevention behaviors and showed a higher rate of cancer screening. Because more than two-thirds of participants were women and the participants were relatively young in this study, further investigations are needed to understand the factors influencing cancer prevention behaviors, including among FDRs. Nonetheless, a previous study supports these results. Choi, Um, and Lee (2018a) identified factors related to cancer screening by analyzing data of the 2014 Korean Community Health Survey, which is sponsored by the Korea Centers of Disease Control and Prevention. Although the study included adults aged ≥ 19 years and it was not specific to FDRs of cancer patients, the results showed that gender and age were factors influencing cancer screening along with marital status, educational level, income, employment type, alcohol consumption, and smoking (Choi et al., 2018a). Particularly, men were less likely to undergo cancer screening than women, the participants aged 50–69 years old were more likely to undergo cancer screening than those aged 70 years old or more, while the participants aged 30–49 years old were less likely to undergo cancer screening (Choi et al., 2018a). Healthcare providers should perceive the family members of cancer patients not only as caregivers but also a high-risk group. Therefore, they should conduct more studies to identify the modifiable factors affecting their cancer prevention behaviors so as to develop targeted interventions.

The level of cancer worry of FDRs of breast and colorectal cancer patients was high, but it was not related to cancer prevention and screening behaviors in this study. However, some previous studies have shown that cancer worry influenced the rate of cancer screening. Nationwide cohort data were analyzed to examine the factors associated with breast MRI scans among 17,894 women with a family history of breast cancer, women with a higher level of cancer worry underwent double the breast MRI scans (White et al., 2018). Separately, Koreans older than 50 years old with a higher cancer worry were 1.53 times more likely to undergo colorectal cancer screening, even though the data were collected from randomly selected, cancer-free adults (Choi et al., 2018b). On the other hand, cancer worry and cancer screening were investigated in 901 women who had a family history of breast cancer and the study found that women with either a low or high level of cancer worry underwent fewer mammograms than women with a moderate level of cancer worry (Zhang et al., 2012). Notably, the relationship between cancer worry and cancer screening was not consistent in the previous study. Further researches should be conducted to clarify the relationship between cancer worry of individuals with a family history of cancer and cancer prevention behaviors including cancer

screening. Moreover, the cancer worry scale used in this study (Champion et al., 2004) has limitations in measuring the level of cancer worry because the scale has only eight items. The development of a cancer worry scale for high-risk cancer groups should also be considered.

In this study, participants reported high rates of cancer screenings during the last 2 years. One reason why is because of the presence of free cancer screening services for low-income medical aid recipients provided by the Korean government reduced the inequity of cancer screening (Suh et al., 2016). Also, this finding could also be related to perceptions of cancer risk. A previous study found 2,000 Korean adults without a cancer history overestimated the perceived lifetime cumulative incidence rate of cancer (Kim et al., 2016). According to the results of the study based on Korean Health Panel Survey in 2011, either an extremely low or extremely high level of cancer risk perception could be associated with fewer cancer screenings, even though the results were not statistically significant (Kim et al., 2014). However, the type of cancer screening was not properly related to the screening method to detect high-risk cancer based on family history. Healthcare providers should educate individuals to undergo appropriate cancer screenings earlier based on family history, and the recommendations for the high-risk familial cancer groups should be reflected in the NCSP.

LIMITATIONS

This study has some limitations. First, since the results of this study were limited to research on the level of the phenomena, further research will be necessary to confirm the reasons for this. A qualitative research method should be used to perform an in-depth study of a high-risk for cancer group's experience to understand why variables affecting cancer prevention and screening that were previously reported in the literature were not noted in this study.

The reliability of attitude toward cancer was quite low in this study and it is necessary to carefully interpret these results. The instrument for attitude consisted of items for attitude toward cancer literally, and for attitude toward both early detection and cancer prevention. Its reliability could be low because participants had the attitude that cancer was a severe disease and they simultaneously had an attitude that cancer could be cured if it was detected and treated early. Consequently, the development of valid and reliable instruments to measure concepts such as attitude, perceived risk, and cancer-related worry for familial cancer should be considered in future studies.

Also, this study used a convenience sampling method and a small number of participants from one hospital. This affects the representativeness of the sample and the results should not be generalized to other groups. The data were collected from the FDRs of breast cancer and colorectal cancer together and this might affect the results as well. For this reason, further large-scale studies should be conducted for each cancer group.

CONCLUSIONS

The study identified factors affecting cancer prevention behaviors and cancer screening in a high-risk group for breast and colorectal cancers, and the results can be used as fundamental data for the development of education and intervention initiatives.

FDRs of cancer patients compose a high-risk group for cancer. The change in attitude toward cancer is an important factor to increase cancer prevention behaviors in the FDRs of breast and colorectal cancer patients and attitude toward cancer is correlated with cancer knowledge. The education program and counseling interventions to change attitudes toward cancer and improve cancer prevention behaviors should be planned by nursing professionals.

Family members of cancer patients are not only patients' caregivers, but also at a high-risk for cancer. Nurses should understand this risk and they, in particular, should inform young family members or male family members about cancer prevention behaviors and cancer screening appropriately.

It is important that the FDRs of cancer patients engage in proper cancer screenings based on their family history. In addition to the public cancer screening project currently being conducted in Korea, this study can contribute to the development of policies for customized cancer screening programs for high-risk groups. Healthcare providers should advocate for developing cancer screening programs for high-risk groups of cancer.

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