Original Article

Perceptions of Cancer Risk and Cause of Cancer Risk in Korean Adults

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Purpose

The aims of the present study were to assess the prevalence of perceived risk for cancer; to explore associations between sociodemographics and family history of cancer and perceived cancer risk; to identify perceived cause of cancer risk; and to examine the associations between sociodemographics and family history of cancer and perceived cause of cancer risk.

Materials and Methods

This cross-sectional study was conducted among 1,009 participants aged 30-69 years, selected from a population-based database in October 2009 through multiple-stratified random sampling. Information was collected about the participants' perceived cancer risk and perceived cause of cancer risk.

Results

Overall, 59.5% of the respondents thought they had the chance of developing cancer. Female sex, younger age, lower income, and family history of cancer were positively associated with perceived cancer risk. The most important perceived cause of cancer risk was stress. There was a difference between sociodemographics and family history of cancer and perceived cause of cancer risk.

Conclusion

Factors affecting perceptions of cancer risk and cause of cancer risk need to be addressed in risk communications. The results provide important directions for the development of educational strategies to promote awareness and self-appraisal of cancer risk and risk factors.

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Introduction

Individuals possess cognitive representations of various diseases [1]. These representations consist of beliefs about the causes, symptoms, timeline, consequences, and treatment of a given disease. Importantly, the set of beliefs subsumed by the representation motivates, guides, and shapes an individual's health-related behavior [2]. Beliefs about a particular disease can influence whether and how an indi-vidual takes action to reduce the risk for developing that disease. Consequently, the study of these disease-related beliefs is important for the development of interventions targeting risk-reducing health behavior.

Perceived risk is defined as the subjective belief about the likelihood or probability of harm, that is, the probability that a health problem will be experienced if no precautions or behavioral changes occur [3-5]. Perceived risk has been identified as part of the "motivational engine" behind many health-protective actions. Individuals who feel at lower-

than-average risk of a disease are less likely to engage in preventive behavior [5-8]. In relation to the perceived risk for cancer, a higher proportion of people appear to believe that they are at lower than average risk, therefore, it is important to understand the determinants of perceived risk [9].

Several studies have examined perceived risk for cancer and its associated factors [6,7,10-13]. Previous studies have explored demographic, health status, lifestyle, and psychosocial factors associated with perceived risk for breast or colorectal cancer. For example, a population-based study found that higher perceived risk for colorectal cancer was associated with a family history of colorectal cancer, poorer subjective health, more bowel symptoms, higher anxiety, smoking, and not exercising, whereas being male and older were associated with lower perceived risk [10]. These studies have predominantly focused on breast and colorectal cancer and have rarely measured perceived risk in Asians. There were few earlier studies on the correlates of perceived risk for general cancer using a population-based sample.

In the present study, we included sociodemographic factors hypothesized to influence perceived risk, and asked about the reasons for risk judgments. Many studies of attributions of cancer risk have focused on the five groups of determinants first described by Weinstein [7,12,14-16]: actions and behavior patterns (e.g., diet, exercise, smoking, drinking, going for checkups); heredity (e.g., family history); physiological attributes (e.g., age, current perceived health, and health problems); psychological attributes (e.g., stress, being an optimist/pessimist); and environmental factors (e.g., pollution, occupational exposure). Lipkus et al. [12] concluded that the majority of their predominantly African-American sample attributed their cancer risk to psychological factors (35%). This was followed by heredity (20%), personal actions (17%), and physiological factors (12%), with few citing environmental reasons (0.005%). Blalock et al. [15] found that among a sample of adults with a first-degree relative with colorectal cancer, physiology was mentioned most frequently (27%), closely followed by heredity (25%) and personal actions (16%) as determinants of risk, whereas first-degree relatives of surgical patients cited personal actions and physiology with equal frequency (27%) and heredity less often (10%). Robb et al. [7] reported that among adults from the patient lists of two general practices, the most frequently cited reasons for cancer risk were diet, family history, and symptoms/general health. In contrast to the results of Lipkus et al. [12], psychological factors were not mentioned with sufficient frequency for statistical analysis. The difference could be related to ethnicity; the participants in the study by Lipkus et al. [12] were predominantly African-American and had lower sociodemographic status, whereas those of Blalock et al. [15] and Robb et al. [7] were predominantly white, but difference in family

Table 1. Characteristics of study population

	No. (%) (n=1,009)
Gender	
Male	499 (49.5)
Female	510 (50.5)
Age (yr)	
20-39	429 (42.5)
40-59	393 (38.9)
≥ 60	187 (18.6)
Education	
Middle school or lower	152 (15.1)
High school	432 (42.8)
College graduate	425 (42.1)
Monthly income ($)	
< 2,999	358 (35.5)
3,000-4,999	480 (47.6)
≥ 5,000	165 (16.4)
No response	6 (0.5)
Job	
None	39 (3.9)
Blue color	435 (43.1)
White color	251 (24.9)
Housewife	213 (21.1)
Student	67 (6.6)
No response	4 (0.4)
Residential area	
Metropolitan	479 (47.5)
Small-medium city	350 (34.7)
Rural	180 (17.8)
Family history of cancer	
No	737 (73.0)
Yes	272 (27.0)

history could have played a part. Few previous studies have examined attribution of perceived risk in a population-based sample.

The aims of the present study were to assess the prevalence of perceived risk for cancer; to explore associations between sociodemographics and family history of cancer and perceived cancer risk; to identify perceived cause of cancer risk; and to examine the associations between sociodemographics and family history of cancer and perceived cause of cancer risk. On the basis of previous research, we predicted that higher perceived risk for cancer would be associated with a family history of cancer, whereas being male and older would be associated with lower perceived risk; and that there would be a difference between sociodemographics and family history of cancer and perceived cause of cancer risk.

Table 2. Perceived cancer risk according to sociodemographics and family history of cancer

	Bivariate analysis			Multivariate analysis	
	Yes	No	χ^2 (p-value)	OR	95% CI
Total	600 (59.5)	409 (40.5)			
Gender					
Male	280 (56.1)	219 (43.9)	4.906	1.00	
Female	320 (62.7)	190 (37.3)	(0.027)	1.39	1.17-1.55
Age (yr)					
20-39	286 (66.7)	143 (33.3)	20.366	1.00	
40-59	212 (53.9)	181 (46.1)	(< 0.001)	0.69	0.54-0.93
≥ 60	102 (54.5)	85 (45.5)		0.68	0.41-0.92
Education					
Middle school or lower	100 (65.8)	52 (34.2)	7.316	1.00	
High school	246 (56.9)	186 (43.1)	(0.026)	0.81	0.71-1.13
College graduate	254 (59.8)	171 (40.2)		0.83	0.73-1.17
Monthly income ($)					
< 2,999	234 (65.4)	124 (34.6)	8.669	1.00	
3,000-4,999	273 (56.9)	207 (43.1)	(0.013)	0.87	0.62-1.11
≥ 5,000	90 (54.5)	75 (45.5)		0.73	0.61-0.92
Job					
None	19 (48.7)	20 (51.3)	26.503	1.00	
Blue color	254 (58.4)	181 (41.6)	(< 0.001)	1.18	0.57-2.45
White color	168 (66.9)	83 (33.1)		1.55	0.70-3.41
Housewife	134 (62.9)	79 (37.1)		1.75	0.81-3.80
Student	23 (34.2)	44 (65.8)		0.56	0.22-1.40
Residential area					
Metropolitan	288 (60.1)	191 (39.9)	0.197	1.00	
Small-medium city	207 (59.1)	143 (40.9)	(0.906)	1.10	0.81-1.49
Rural	105 (58.3)	75 (41.7)		1.15	0.74-1.77
Family history of cancer					
No	391 (53.1)	346 (46.9)	46.631		1.00
Yes	209 (76.8)	63 (23.2)	(< 0.001)	2.80	2.01-3.91

CI, confidence interval.

Materials and Methods

1. Design and sample

The participants for this cross-sectional study were chosen from a population-based database through multiple-stratified random sampling. A total of 1,009 participants aged 30-69 years with no history of cancer were engaged in face-to-face interviews by investigators from a professional research agency in October 2009. Information was collected about the participants' sex, age, educational level, monthly income, job, residential area, family history of cancer, perceived cancer risk, and perceived cause of cancer risk. The study was approved by the Institute of Review Board at the Korean National Cancer Center, and informed written consent was obtained from all study participants.

2. Measures

1) Perceived cancer risk

To measure perceived cancer risk, each participant was asked to respond 'yes' or 'no' to the following question: 'Do you think that you have a chance of developing cancer?'

2) Perceived cause of cancer risk

Among participants who responded yes to the above question about perceived cancer risk, cause of cancer risk

Table 3. Odds ratios of perceived cause of cancer risk from logistic regression of sociodemographics and family history of cancer

	Stress (n=377, 62.8%)	Unhealthy diet (n=319, 53.2%)	Smoking (n=264, 44.0%)	Drinking (n=204, 34.0%)	Physical inactivity (n=188, 31.3%)	Heredity (n=179, 29.8%)	Environmental pollution (n=134, 22.3%)
Gender							
Male	1	1	1	1	1	1	1
Female	0.84 (0.61-1.15)	1.17 (0.84-1.62)	0.28 (0.19-0.40)***	0.23 (0.14-0.35)***	1.15 (0.77-1.72)	1.25 (0.83-1.87)	1.12 (0.70-1.80)
Age (yr)							
20-39	1	1	1	1	1	1	1
40-59	1.22 (0.87-1.71)	1.26 (0.89-1.79)	1.63 (1.11-2.38)*	1.71 (1.14-2.58)*	1.11 (0.73-1.69)	1.05 (0.68-1.60)	0.64 (0.40-1.03)
≥60	0.78 (0.46-1.31)	0.97 (0.56-1.66)	1.41 (0.78-2.53)	1.93 (1.02-3.67)*	0.96 (0.50-1.86)	1.10 (0.58-2.11)	0.54 (0.26-1.13)
Education							
Middle school or lower	1	1	1	1	1	1	1
High school	1.48 (0.86-2.55)	1.21 (0.70-2.10)	0.72 (0.40-1.31)	1.44 (0.72-2.88)	1.94 (0.98-3.86)	0.94 (0.48-1.85)	0.89 (0.41-1.92)
College graduate	1.23 (0.65-2.29)	1.44 (0.76-2.73)	0.72 (0.36-1.44)	1.42 (0.64-3.18)	2.07 (0.93-4.57)	0.97 (0.44-2.13)	0.64 (0.27-1.56)
Monthly income ($)							
<2,999	1	1	1	1	1	1	1
3,000-4,999	1.15 (0.84-1.58)	1.46 (1.05-2.04)*	1.20 (0.83-1.74)	1.02 (0.68-1.52)	0.75 (0.51-1.11)	1.32 (0.86-2.02)	1.26 (0.80-2.00)
≥5,000	0.99 (0.64-1.52)	1.59 (1.02-2.48)*	1.48 (0.90-2.41)	1.27 (0.75-2.13)	1.01 (0.60-1.70)	2.30 (1.36-3.90)**	1.59 (0.87-2.90)
Job							
None	1	1	1	1	1	1	1
Blue color	0.86 (0.39-1.87)	0.61 (0.28-1.30)	1.46 (0.63-3.41)	1.82 (0.67-4.93)	1.21 (0.40-3.66)	1.13 (0.40-3.22)	0.45 (0.17-1.18)
White color	1.42 (0.63-3.23)	0.64 (0.28-1.43)	1.74 (0.70-4.34)	1.82 (0.63-5.27)	1.52 (0.48-4.77)	1.37 (0.46-4.11)	0.36 (0.13-1.03)
Housewife	1.18 (0.52-2.66)	0.97 (0.44-2.15)	0.86 (0.33-2.24)	1.07 (0.34-3.38)	2.55 (0.82-7.94)	1.40 (0.48-4.08)	0.90 (0.34-2.45)
Student	0.66 (0.24-1.76)	0.38 (0.14-1.04)	0.63 (0.19-2.05)	0.82 (0.21-3.08)	0.75 (0.19-2.96)	0.84 (0.22-3.02)	0.25 (0.07-0.94)*
Residential area							
Metropolitan	1	1	1	1	1	1	1
Small-medium city	0.99 (0.73-1.34)	0.88 (0.64-1.20)	0.71 (0.49-1.01)	0.69 (0.47-1.02)	1.84 (1.25-2.68)**	0.54 (0.36-0.81)**	2.69 (1.77-4.08)***
Rural	1.03 (0.67-1.58)	1.09 (0.70-1.70)	0.89 (0.55-1.43)	0.52 (0.30-0.89)*	2.59 (1.55-4.34)***	0.63 (0.36-1.11)	0.75 (0.35-1.62)
Family history of cancer							
No	1	1	1	1	1	1	1
Yes	1.87 (1.39-2.51)***	1.56 (1.15-2.11)**	1.59 (1.13-2.23)**	1.54 (1.07-2.23)*	1.12 (0.77-1.61)	2.67 (1.87-3.81)***	1.53 (1.01-2.32)*

*p < 0.05, **p < 0.01, ***p < 0.001.

was assessed with a single item: 'What do you think is the cause of cancer risk if you have a chance of developing cancer?' Respondents were encouraged to list three risk factors in seven predefined categories. These included smoking, alcohol consumption, unhealthy diet, physical inactivity, stress, heredity, and environmental pollution.

3) Analysis

The χ^2 test was used to assess the relationships between sociodemographics and family history of cancer and perceived cancer risk. Binary logistic regression was subsequently performed, with perceived cancer risk as the dependent variable and all individual characteristics as independent variables. To examine the relationship between sociodemographics and family history of cancer and perceived cause of cancer risk, binary logistic regression analysis was conducted, with perceived cause of cancer risk as the dependent variable and all individual characteristics as independent variables. Data were analyzed using SPSS ver. 15.0 (SPSS Inc., Chicago, IL).

Results

Table 1 shows the characteristics of the study population. Among the respondents, 49.5% were male and 42.1% had a college-level education, whereas 15.1% had not completed high school. Nearly two-thirds of the participants were employed and 27.0% had a family history of cancer.

Perceived cancer risk according to the sociodemographics and family history of cancer is summarized in Table 2. Overall, 59.5% of the respondents thought they had the chance of developing cancer. Significant bivariate differences in perceived cancer risk were observed for sex, age, education, monthly income, job, and family history of cancer. These variables were entered into a multivariate logistic model. Women were more likely to perceive cancer risk than men (odds ratio [OR], 1.39). Younger age and lower income were associated with greater perception of cancer risk (OR, 0.68 to 0.69 and 0.73, respectively). Family history of cancer was associated with perceived cancer risk (OR, 2.80).

Table 3 shows the perceived cause of cancer risk according to the sociodemographics and family history of cancer. Taken as a whole, respondents thought that the most important cause of cancer risk to themselves was stress, followed by unhealthy diet, smoking, alcohol consumption, physical inactivity, heredity, and environmental pollution. Family history of cancer was a significant predictor of identifying any of the perceived causes of cancer risk, except physical

inactivity (OR, 1.53 to 2.67). Women were less likely to perceive that smoking or alcohol consumption was the cause of cancer risk than men were (OR, 0.23 to 0.28). With regard to unhealthy diet, higher income was associated with greater perception of cause of cancer risk (OR, 1.46 and 1.59, respectively). Respondents aged 40-59 years were more likely to perceive that smoking was a cause of cancer risk than those aged 20-39 years (OR, 1.63). As age increased, respondents perceived more that alcohol consumption was a cause of cancer risk (OR, 1.71 and 1.93). Respondents residing in a rural area were less likely to perceive that alcohol consumption was a cause of cancer risk (OR, 0.52). Respondents living in a smaller area, had a greater perception that physical inactivity was a cause of cancer risk (OR, 1.84 and 2.59). Respondents who earned > 5,000 dollars a month were more likely to perceive that heredity was a cause of cancer risk (OR, 2.30). Respondents residing in a small-medium–sized city were less likely to perceive heredity as a cause of cancer risk, and at the same time, were more likely to perceive environmental pollution as a cause (OR, 0.54 and 2.69, respectively). With regard to job status, students were less likely to perceive environmental pollution as a cause of cancer risk than those who had no job (OR, 0.25).

Discussion

The current study used a national representative sample to assess the prevalence of perceived risk of cancer, to explore associations between sociodemographics and family history of cancer and perceived cancer risk; to identify perceived cause of cancer risk; and to examine the associations between sociodemographics and family history of cancer and perceived cause of cancer risk. We found that respondents who were female, aged 20-39 years, had low income, and a family history of cancer viewed their cancer risk as higher than that of their peers. Stress was the most frequently mentioned as the perceived cause of cancer risk, followed by unhealthy diet, smoking, alcohol consumption, physical inactivity, heredity, and environmental pollution, and there were diverse relationships between health behavior and perceived cause of cancer risk.

It was interesting to find that being male and older were both associated with lower perceived cancer risk, because these two factors have consistently been linked to higher risk of cancer. These findings highlight the need for future risk communications to address any misperceptions surrounding age and sex. The inverse relationship between age and perceived risk is consistent with a previous study using a representative female sample in the United Kingdom [17], in

which 35% of those aged > 65 years reported reduced perception of personal risk of breast cancer in comparison to the general population, which is higher than the average of 17%. This may reflect existing evidence regarding participants' barriers, including poor knowledge and lack of awareness of age-related breast cancer risk among older women [17]. For example, only 30% of women knew that advanced age is a risk factor for developing breast cancer and older women were less able to identify risk factors correctly [17].

In line with a previous study [18], another noteworthy finding was a link between income level and perceived cancer risk. Socioeconomically disadvantaged persons may feel more likely to be exposed to certain environmental hazards or have lower literacy skills, thus increasing their sense of vulnerability. There is a growing body of evidence that social position is an important factor that drives the widening disparities in cancer outcomes [19]. Further research on the interaction of risk perceptions and cancer preventive behavior among minorities may prove useful.

There was one less surprising finding. Family history of cancer was the most influential determinant of perceived cancer risk, consistent with previous studies [10,11,13,18]. This result might indicate that participants are aware of the objective medical and environmental effects of family history of cancer. At the same time, however, this finding is of some concern. Several studies showed that overestimation of cancer risk and associated heightened psychological distress have been documented among individuals with a family history of cancer [20,21]. The problem with individuals using family history of cancer to judge their own risk is that the genetic link for most cancer is limited. Given the fact that genetics plays a relatively small part in cancer causation compared to lifestyle factors [22], the public does not seem to have sufficient knowledge about cancer, especially in genetics [23]. Thus, this study may suggest future efforts to maintain further assessment and interventions to promote accurate understanding of cancer risk.

Somewhat striking was the high attribution of risk placed on relatively uncontrollable factors, such as stress. The most frequently mentioned perceived cause of cancer was stress, followed by unhealthy diet, smoking, alcohol consumption, physical inactivity, heredity, and environmental pollution. Kristeller et al. [24] found that cancer patients and their relatives cited stress as the most important cause of their cancer, followed by bad luck, heredity, and environmental pollution, and, to a lesser extent, modifiable risk factors, such as diet and alcohol. Attributing higher risk to external or uncontrollable factors than to personal behavior supports the "defensiveness" hypothesis. Such a belief pattern may present a barrier to concerted efforts for behavior change.

With regard to the associations between sociodemograph-ics and family history of cancer and perceived cause of cancer risk, there was an adverse pattern between health-promoting and health-threatening behavior. Specifically, in the health-promoting behavior such as diet and physical activity, the more that people indulged in healthy behavior, the more sensitive to cause of cancer risk they became. Individuals with a higher income were more likely to perceive unhealthy diet as a cause of cancer. Kye et al. [25] revealed that respondents with a higher income consumed a healthy diet more often. Also, people who lived in a small-medium–sized city or rural area where manual labor that requires heavy work was common were more likely to perceive physical inactivity as a cause of cancer. In contrast, in the health-threatening behaviors such as smoking, alcohol consumption, and pollution, the more that people engaged in unhealthy behavior, the less concerned they were about cause of cancer risk. In the present study, men were more likely to perceive smoking and alcohol consumption as causes of cancer. It is well known that men have a higher prevalence of smoking and alcohol consumption than women have. Finally, except for physical inactivity, all respondents mentioned a family history of cancer as a determinant of perceived risk. As mentioned above, excessive worry about family history of cancer could lead to unhealthy behavior, such as avoidance of cancer screening, thus further intervention to help people achieve an appropriate perception of cancer risk is necessary.

In interpreting the results, it is appropriate to consider several limitations. First, because data for this study were cross-sectional, it is beyond the scope of this research to establish causality. Longitudinal studies would be needed to track changes in risk perceptions associated with changes in cancer prevention practices. Second, the data for this study lacked information on risk perceptions by cancer site, thereby undermining precision in guiding educational strategies for specific types of cancer. Cancer is a set of heterogeneous diseases. Perceived cancer risk could be different by cancer type. Previous studies have mainly focused on breast cancer, cervical cancer, colorectal cancer, or skin cancer, respectively. More studies are needed to identify the difference of perceived cancer risk by cancer site in a single target. However, despite these limitations, we identified the prevalence of perceived risk for cancer, explored associations between sociodemographics and family history of cancer and perceived cancer risk, identified perceived cause of cancer risk, and examined the associations between sociodemo-graphics and family history of cancer and perceived cause of cancer risk using a national representative sample. These results will provide important directions for the develop-ment of educational strategies to promote awareness and self-appraisal of cancer risk.

Conclusion

To our knowledge, this is the first study to investigate factors associated with perceived risk for general cancer and cause of cancer risk in a population sample in an Asian country. Several factors tended to be associated with lower levels of perceived cancer risk: male sex, older age, higher income, and no family history of cancer. The most important perceived cause of cancer was stress. These results may serve as barriers to preventive health behavior. In general, people who believe themselves to be at lower risk than others for an adverse health outcome and attribute risk to uncontrollable factors are less enthusiastic about engaging in healthy preventative behavior such as screening. In practical terms, the evaluation of perceived risk for cancer and perceived cause of cancer risk may be useful to clinicians in recommending screening tests and incorporating an intervention to educate people about the actual risk and risk factors. The results from this survey highlight the need for health communication and education aimed at increasing the ability of individuals in Korea to perceive their personal risk for cancer and risk factors.

Conflicts of Interest

Conflict of interest relevant to this article was not reported.

Acknowledgments

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