RESEARCH COMMUNICATION

Cancer Screening Status in Korea, 2011: Results from the Korean National Cancer Screening Survey

Boyoung Park, Kui Son Choi, Yoon Young Lee, Jae Kwan Jun*, Hong Gwan Seo

Abstract

This study was conducted to determine the use of screening for stomach, liver, colorectal, breast, and cervical cancers, which are included in the Korean National Cancer Screening Programme. In 2011 the National Cancer Centre in Korea conducted a nationwide, population-based, cross-sectional interview survey using multi-stage random sampling. Participants included 4,100 cancer-free men 40 years and over of age and women over 30 years of age. The lifetime screening rates for stomach, liver, colorectal, breast, and cervical cancers were 76.2%, 54.3%, 56.1%, 79.0%, and, 74.8%, respectively. The rates of recommended screening for stomach, liver, colorectal, breast, and cervical cancers were 64.6%, 22.9%, 35.3%, 60.4%, and 62.4%, respectively. More than 70% of all screening was attributed to organised cancer screening programmes. The main reason given for non attendance was 'no symptoms'. A greater effort is needed to increase screening rates, especially for liver and colorectal cancers.

Key words: Cancer screening - early detection of cancer - national cancer screening programme

Asian Pacific J Cancer Prev, **13**, 1187-1191

Introduction

In Korea, approximately 178,000 people were diagnosed with cancer in 2009, with 1.6% and 5.5% annual increases in males and females, respectively. Nearly 70,000 cancer deaths were reported that year. Although cancer-related age-standardised mortality rates have decreased since 2002, cancer is the most common cause of death, accounting for 28% of all deaths (Jung et al., 2009).

To reduce the cancer-related social burden, the Korean government initiated a Ten Year Plan for Cancer Control in 1996, which was extended for an additional 10 years in 2006 until 2015. As part of the programme, screening for five types of cancer (stomach, liver, colorectal, breast, and cervix) was provided through the National Cancer Screening Programme (NCSP). Since 2006, Medical Aid recipients and National Health Insurance (NHI) beneficiaries in the lower 50% income level have been provided cancer screenings free of charge. The National Health Insurance Corporation has also provided those with incomes in the upper half with 90% subsidised screening services for these five cancers (Lee et al., 2008; Lee et al., 2010; Shim et al., 2010; Oh et al., 2010; Lee et al., 2011).

However, apart from organised screening programmes, such as the NCSP and the NHI programme, opportunistic screening is widely available in Korea. Although organised screening programmes must follow the guidelines recommended by the government, individuals that use opportunistic screening have a variety of options, depending on their needs. Therefore, this study was conducted to determine the use of screening programmes for stomach, liver, colorectal, breast, and cervical cancers in both organised and opportunistic programmes.

Materials and Methods

Study population and data

This study applied data from the 2011 Korean National Cancer Screening Survey (KNCSS). The KNCSS is an annual nationwide, population-based, cross-sectional survey conducted by the National Cancer Centre in Korea. Multi-stage random sampling based on annual resident registration data was used to obtain a representative sample. The final survey areas were selected randomly based on administrative districts and size. Five to seven households from an urban area and 10–12 households from a rural area were chosen randomly, and one eligible person per household was further selected. The eligible population included cancer-free men aged ≥ 40 years and women aged ≥ 30 years.

*National Cancer Control Institute, National Cancer Centre, Goyang, Korea *For correspondence: jkjun@ncc.re.kr*

In 2011, the survey was conducted from 23 September to 15 October. The subjects were recruited by door-to-door solicitation, and at least three attempts were made at each household. Face-to-face interview surveys were conducted by the professional research agency, with 11,869 people being contacted. Of these 7,722 (65.1%) refused to participate, 47 (0.4%) did not complete the interview, and 4,100 (34.5%) completed interviews and were included in the analysis.

Informed consent was obtained from all participants. A structured questionnaire was used to determine the socio-demographic characteristics of the participants, their screening experience with five cancers (stomach, liver, colorectal, breast, and cervix uteri), the interval between screenings, the payment method, and the reasons for attendance and non-attendance.

Statistical analysis

We calculated cancer screening rates according to two criteria. 'Lifetime screening', defined as having participated in a screening using any method, was calculated using the number of subjects within the target age range for each screening method as the denominator and the number of subjects examined as the numerator. The 'rate of screening according to guidelines' was assigned to participants who had undergone screening according to the recommended cancer screening guidelines, and was calculated by using the number of subjects within the target age for each screening method as the denominator and the number of subjects examined in accordance with guidelines as the numerator. The rates of screening in accordance with the guidelines according to age, education, and monthly household income level were also calculated. Liver cancer was excluded due to the small number of people within the high-risk group in the sub-group analysis. We also calculated the proportion of organised and opportunistic screenings among those who followed the recommended screening guidelines. The proportion of non-attendance was calculated based on the number of individuals who had never been examined.

Results

The basic characteristics of the participants are presented in Table 1. Of the 4,100 respondents, 58.6% were female, 33.5% were 40–49 years old, and 81% were educated to high-school level or above (Table 1). Table 2 shows the lifetime screening rates and the rates of screening performed according to guidelines in 2011 in Korea. The lifetime screening rates for gastric, liver, colorectal, breast, and cervical cancers were 76.2%, 54.3%, 56.1%, 79.0%, and 74.8%, respectively. The rates of screening performed according to the guidelines for gastric, liver, colorectal, breast, and cervical cancers were 64.6%, 22.9%, 35.3%, 60.4%, and 62.4%, respectively. Of the subjects who received gastric cancer screening, 33.4% underwent an upper gastrointestinal series (UGI) and 69.6% underwent endoscopies; 25.2% of the participants who followed the interval recommended in the guideline received UGI, and 58.1% underwent endoscopies. Among those who had received colorectal cancer screening during their lifetimes, the faecal occult blood test (FOBT) was performed in 44.8%, a colonoscopy in 34.3%, and a double-contrast barium enema (DCBE) in 10.0%. The rate of adherence to the guidelines was highest for the FOBT (25.0%), followed by colonoscopy (23.6%) and DCBE (6.0%).

Table 1. Baseline Characteristics of Study Participants in the 2011 National Cancer Screening Programme in Korea

Variables		Male (n = 1,697) n (%)	Female (n = 2,403) n (%)	Total (n = 4,100) n (%)
Age (years)	30–39	-[1]	623 (25.9)	623 (15.2)
	40–49	695 (41.0)	680 (28.3)	1,375 (33.5)
	50–59	571 (33.6)	591 (24.6)	1,162 (28.3)
	60–69	320 (18.9)	361 (15.0)	681 (16.6)
	70–74	111 (6.5)	148 (6.2)	259 (6.3)
Residence	Metropolitan area	748 (44.1)	1,110 (46.2)	1,858 (45.3)
	Urban area	732 (43.1)	963 (40.1)	1,695 (41.3)
	Rural area	217 (12.8)	330 (13.7)	547 (13.3)
Marital status	Without spouse	71 (4.2)	283 (11.8)	354 (8.6)
	With spouse	1,626 (95.8)	2,120 (88.2)	3,746 (91.4)
Education (years)	≤11	257 (15.1)	531 (22.1)	788 (19.2)
	12–14	867 (51.1)	1,281 (53.3)	2,148 (52.4)
	≥15	573 (33.8)	591 (24.6)	1,164 (28.4)
Monthly household income (US dollars)[2]	≤2,499	523 (30.9)	743 (30.9)	1,266 (30.9)
	2,500–3,999	635 (37.5)	946 (39.4)	1,581 (38.6)
	≥4,000	537 (31.7)	713 (29.7)	1,250 (30.5)
Medical insurance	National Health Insurance	1,654 (97.5)	2,308 (96.0)	3,962 (96.6)
	Medical Aid Programme	43 (2.5)	95 (4.0)	138 (3.4)
Private medical insurance	No	371 (21.9)	403(16.8)	774 (18.9)
	Yes	1,326 (78.1)	2,000 (83.2)	3,326 (81.1)

[1]The criteria for eligibility were that men should be 40 years or older and women 30 years or older; [2]1 US dollar = 1,000 won

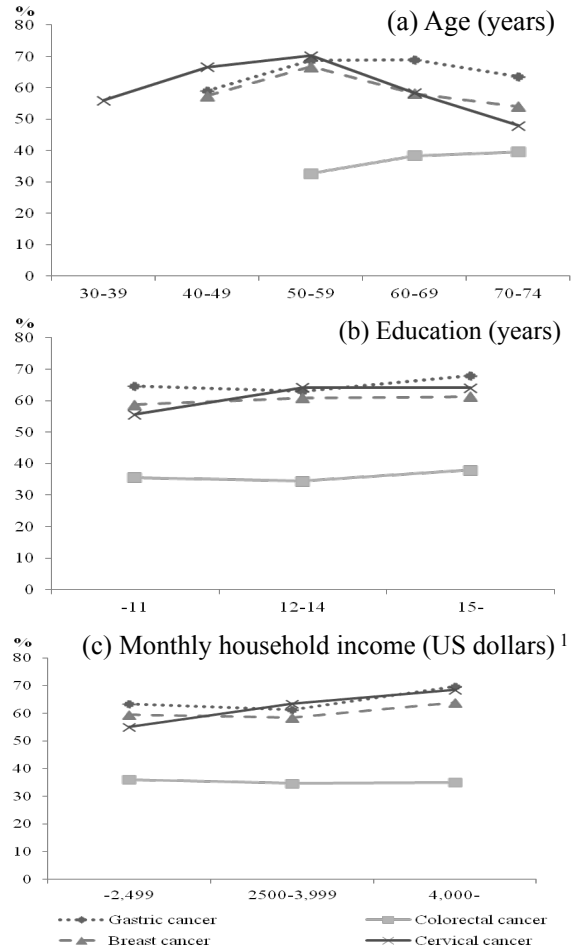

Figure 1. The Screening Rate In Accordance With Guidelines According To Age, Education And Income. [1]1 US dollar=1,000 won

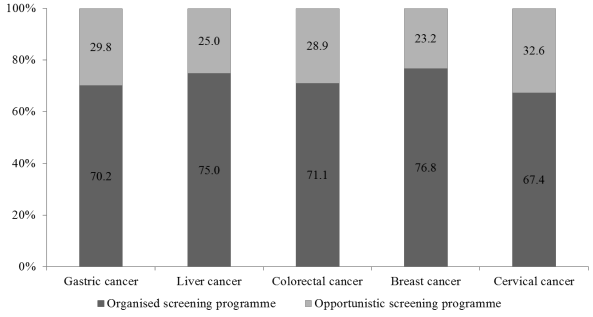

Figure 2. The Proportion of Organised And Opportunistic Screening Programme Among Those Who Got Cancer Screening According To Guidelines

Mammography was performed in 73.3% of those who underwent breast cancer screening, and 49.4% had undergone one or more breast ultrasonograms.

Figure 1 presents the rates of screening performed in accordance with the guidelines according to age, education, and monthly household income level. For gastric cancer, this rate increased in the age range of 60–69 years and then decreased in the 70–74-year age group; for colorectal cancer, the rate increased with age. The rates of screening performed according to the guidelines for breast and cervical cancers increased in the 50–59-year age group, and then decreased; these rates also increased with household income and education levels.

With regard to the relative proportions of organised and opportunistic screening, 70% of participants who underwent screening according to the guidelines for gastric, liver, colorectal, and breast cancers, and 67% of those who received such screening for cervical cancer, attended organised screening programmes (Figure 2).

The reasons for non-attendance at screenings for each

Table 2. Participation Rates in the 2011 National Cancer Screening Programme in Korea

Type of cancer	Screening tool	Lifetime screening rate	Screening rate by guidelines
Gastric cancer[1]	Total[7]	76.2%	64.6%
	UGI	33.4%	25.2%
	Upper endoscopy	69.6%	58.1%
Liver cancer[2]	US and AFP	54.3%	22.9%
Colorectal cancer[3]	Total[7]	56.1%	35.3%
	FOBT	44.8%	25.0%
	Colonoscopy	34.3%	23.6%
	DCBE	10.0%	6.0%
Breast cancer	Total	79.0%[4,7]	60.4%[5]
	Mammography	73.3%	60.4%
	Ultrasonography	49.4%	40.6%
Cervical cancer[6]	Pap smear	74.8%	62.4%

UGI, upper gastrointestinal series; US, ultrasonography; AFP, alpha-fetoprotein; DCBE, double-contrast barium enema; FOBT; faecal occult blood test. [1]For those 40 years old and over, upper gastrointestinal series or endoscopy every 2 years. [2]For those 40 years old and over, and diagnosed with liver cirrhosis or positive for hepatitis B or C antigen, ultrasonography and serum alpha-fetoprotein every 6 months. [3]For those 50 years old and over, faecal occult blood test every year, colonoscopy every 10 years, double-contrast barium enema every 5 years. [4]For those 40 years old and over, mammogram or breast ultrasonography. [5]For those older than 40 years, mammogram every 2 years. [6]For those 30 years old and over, Pap smear every 2 years. [7]The counts may overlap because some participants underwent more than two examinations

Table 3. The Distribution of Reasons Stated for Lifetime Non-attendance at Screening in the 2011 National Cancer Screening Programme in Korea

Cause of non-attendance	Gastric cancer	Liver cancer[1]	Colorectal cancer	Breast cancer	Cervical cancer
No symptoms	49.7%	35.3%	47.6%	39.4%	42.7%
Lack of time	25.2%	27.7%	18.9%	24.8%	24.2%
Economic reasons	9.6%	7.3%	11.4%	14.6%	9.5%
Fear of exam procedure	8.3%	9.6%	16.3%	10.8%	13.6%
Fear of detecting cancer	4.5%	12.7%	3.5%	6.2%	6.0%
Ignorance about screening	1.6%	4.8%	0.9%	1.4%	2.0%
Distrust screening	1.0%	2.5%	1.3%	2.7%	1.4%
Other	0.1%	0.0%	0.1%	0.0%	0.6%

[1]Screening tests are recommended for the high-risk group, defined as those 40 years old and over and diagnosed with liver cirrhosis or hepatitis B antigen or C antibody carrier

cancer type are shown in Table 3. The most common reason for all types of cancer was 'no symptoms', followed by 'lack of time'. The third most frequently cited reason was 'economic reasons' for gastric and breast cancers, 'fear of the exam procedure' for colorectal and cervical cancers, and 'fear of detecting cancer' for liver cancer.

Discussion

In 2011, the lifetime screening rates for gastric, liver, colorectal, breast, and cervical cancers were 76.2%, 54.3%, 56.1%, 79.0%, and, 74.8%, respectively, and the screening rates according to the guidelines for gastric, liver, colorectal, breast, and cervical cancers were 64.6%, 22.9%, 35.3%, 60.4%, and 62.4%. Compared with 2010, the rates had decreased slightly with the exception of liver cancer, which was stable (Park et al., 2011). The rates of screening according to the guidelines for gastric, colorectal, and cervical cancers, for which screening services started in 1999, exceeded 60%. In contrast, those for liver and colorectal cancers, for which screening services started between 2003 and 2004, were low.

Although the complexity of screening has been suggested to be a factor in low screening rates (Han et al., 2010), the rates of gastric cancer screening using UGI and endoscopy were high for both lifetime screening and screening according to the guidelines, unlike those for liver and colorectal cancer screenings, which used more than one screening method. When we compared the two options (endoscopy and UGI) for gastric cancer screening, the rate of endoscopy testing was nearly twice that of UGI, agreeing with the report of Choi et al. (2009) that endoscopy is the preferred gastric cancer screening method. Although UGI and endoscopy were both offered as an initial screening method, endoscopy was recommended to those with abnormal UGI results to confirm the diagnosis. This might have affected the overall preference for endoscopy. The fact that endoscopy facilitates the diagnosis of gastric ulcers and Helicobacter pylori infections (Kim et al., 2009) may also have contributed to the preference for endoscopy as a screening method.

In the Korean organised cancer screening programme, liver cancer screening is offered to the high-risk population, such as patients with liver cirrhosis, carriers of hepatitis B virus (HBV) or hepatitis C virus (HCV), or those with HBV- or HCV-induced chronic hepatitis. Although the target population for liver cancer screening is a high-risk group, this screening rate was lowest among the five types of cancer. However, given the result of Lee et al. (2010), who analysed the database managed by the National Health Insurance Cooperation and found a 32.6% rate of participation in liver cancer screening, the screening rate we obtained may have been an underestimation.

For colorectal cancer screening, the FOBT screening rate was highest of the three options. In Korea, FOBT use for colorectal screening has increased significantly, unlike colonoscopy, which has shown a lower and insignificant increase (Choi et al., 2010). One study suggested that discomfort was an important factor for people who choose FOBT, a non-invasive test (Janz et al., 2007). In contrast, a study conducted in the USA showed a two-fold higher rate of preference for colonoscopy or flexible sigmoidoscopy than for FOBT screening (Smith et al., 2008).

Only mammography is recommended for breast cancer screening in the Korean cancer screening guidelines. Thus, breast ultrasonography was included when we calculated lifetime screening rates, but not in the rate of screening according to the guidelines. Nearly 40% of women had received both mammograms and breast ultrasonograms within the last 2 years. The proportion of high-density breasts is higher in Korean women than in Western women, and thus the necessity of breast ultrasonography is increased (Cho et al., 2006). This might explain the high breast ultrasonography screening rate in Korean women, although it was not recommended.

The age-based rate of screening according to the guidelines for gastric, breast, and cervical cancers peaked at 60–69 years for gastric cancer and at 50–59 years for breast and cervical cancers, and then decreased. In contrast, this rate for colorectal cancer screening increased with age. The variations in cancer screening rates according to education level were less than 5% for gastric, colorectal, and breast cancers and 8.6% for cervical cancer. These differences were much smaller than in the USA, where differences of 7.5% for colorectal cancer, 18.8% for breast cancer, and 14.2% for cervical cancer have been documented (National Cancer Institute, 2010).

More than 70% of those who received cancer screening according to the guidelines participated in the organised screening programme, with the exception of cervical cancer screening (67.4%). Previous studies conducted in Korea have reported that opportunistic programmes offered higher-quality medical services in terms of detailed explanation about the test procedure and results, education, and follow-up examinations (Shin et al., 2006). However, this study showed that despite these perceptions, more than two-thirds of people attended the organised cancer screening programme.

For all five types of cancer, the most commonly cited reason for non-attendance was 'no symptoms'. Compared with 2010, that proportion was relatively unchanged (Park et al., 2011). Therefore, the importance of cancer screening should be emphasised in the general population, as screening according to guidelines facilitates early detection at pre-clinical stages and timely treatment. The second most commonly cited reason was 'lack of time', followed by 'economic reasons' or 'fear of the exam procedure'. Thus, efforts to overcome time limitations need to be introduced, including the operation of cancer screening units at weekends.

Although this study has several limitations, including

the low response rate and the inclusion of self-reported data without matching medical records, we believe that the bias was minimal (Park et al., 2011) and the results represent the Korean population. The Ten Year Plan for Cancer Control was implemented by the Korean government in 1996 to reduce the economic burden of cancer, and one objective was to increase the rate of screening according to guidelines to 70% by 2015 (Han et al., 2011). This study demonstrated that the screening rates for gastric, breast, and cervical cancers are approaching this goal (>60%), but a greater effort is needed to increase the screening rates to the recommended levels for liver and colorectal cancers.

Acknowledgement

This study was supported by a Grant-in-Aid for Cancer Research and Control from the National Cancer Center of Korea (#1010201-2).

References

Cho JJ, Song HJ, Koh EY, et al (2006). Mammographic breast density and risk factors of breast cancer in Korean Women using multicenter study. *J Korean Acad Fam Med*, **27**, 33-41.

Choi KS, Kwak MS, Lee HY, et al (2009). Screening for gastric cancer in Korea: population-based preferences for endoscopy versus upper gastrointestinal series. *Cancer Epidemiol Biomarkers Prev*, **18**, 1390-8.

Choi KS, Lee S, Park EC, et al (2010). Comparison of breast cancer screening rates between Korean women in America versus Korea. *J Womens Health (Larchmt)*, **19**, 1089-96.

Han MA, Choi KS, Jun JK, et al (2011). Factors associated with the intention to have colorectal cancer screeing in Korean adults. *Eur J Cancer Care*, **20**, 475-82.

Han MA, Choi KS, Park J-H, Moore MA, Park E-C (2011). Midcourse evaluation of the second-term 10-year plan for cancer control in Korea. *Asian Pac J Cancer Prev*, **12**, 327-33.

Janz NK, Lakhani I, Vijan S, et al (2007). Determinants of colorectal cancer screening use, attempts, and non-use. *Prev Med*, **44**, 452-8.

Jung K-W, Park S, Kong H-J, et al (2009). Cancer statistics in Korea: incidence, mortality, survival, and prevalence in 2009. *Cancer Res Treat*, **44**, 11-24.

Kim N, Kim JJ, Choe YH, et al (2009). Diagnosis and treatment guidelines for Helicobacter pylori infection in Korea. *Korean J Gastroenterol* , **54**, 269-78.

Lee EH, Han MA, Lee HY, et al (2010). Liver cancer screening in Korea: a report on the 2008 National Cancer Screening Programme. *Asian Pac J Cancer Prev*, **11**, 1305-10.

Lee KS, Oh DK, Han MA, et al (2011). Gastric cancer screening in Korea: report on the National Cancer Screening Program in 2008. *Cancer Res Treat*, **43**, 83-88.

National Cancer Information Center (NCIC). Cancer Statistics in 2009. Available at http://www.cancer.go.kr/ncic/index.html. Accessed on January 31, 2012.

National Cancer Institute. Cancer trends progress report—2009/2010 update. Breast cancer screening. Available at http://progressreport.cancer.gov/doc_detail.asp?pid=1&did=2009&chid=92&coid=916&mid=#trends. Accessed on January 5, 2012.

Oh DK, Shim JI, Han M, et al (2010). Breast cancer screening in Korean women: report of the National Cancer Screening Program in 2008. *J Breast Cancer*, **13**, 299-304.

Park B, Lee HY, Choi KS, et al (2011). Cancer screening in Korea, 2010: results from the korean national cancer screening survey. *Asian Pac J Cancer Prev*, **12**, 2123-8.

Shim JI, Kim Y, Han MA, et al (2010). Results of colorectal cancer screening of the National Cancer Screening Program in Korea, 2008. *Cancer Res Treat*, **42**, 191-8.

Shin YS, Park CY, Jung SH, Jung YJ, Kang HY (2006). Comparion of customer satisfaction with health examination programs provided by the Korea National Health Insurance and private healthcare organizations in Korea. *J Korean Soc Qual Assur Health Care*, **12**, 40-51.

Smith RA, Cokkinides V, Brooks D, Saslow D, Brawley OW (2008). Cancer screening in the United States, 2010: a review of current American Cancer Society guidelines and issues in cancer screening. *CA Cancer J Clin*, **60**, 99-119.

Lee YH, Choi KS, Lee H-Y, Jun JK (2009). Current status of the National Cancer Screening Program for cervical cancer in Korea. *J Gynecol Oncol*, **23**, 16-21.