RESEARCH COMMUNICATION

Cancer Screening in Korea, 2010: Results from the Korean National Cancer Screening Survey

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Abstract

To investigate the participation rates in gastric, liver, colorectal, breast, and cervical cancer screening in Korea, including both organised and opportunistic programmes, a nationwide interview survey using multi-stage random sampling was conducted in 2010. A total of 4,056 cancer-free men aged over 40 years and women aged 30 years participated. Lifetime screening rates ranged from 54.2% (liver cancer) to 79.5% (breast cancer) and rates of screening in accordance with guidelines ranged from 22.9% (liver cancer) to 65.1% (gastric cancer). Upper endoscopy was the preferred method for gastric cancer, whereas the faecal occult blood test was conducted most often for colorectal cancer. The main reason stated for non attendance was 'no symptoms.' To increase attendance at cancer-screening programmes, efforts to increase education and accessibility of screening programmes are necessary.

Key words: Cancer screening - early detection of cancer - Korean national program

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Introduction

In 2008, it was estimated that nearly 12.7 million new cancer cases were diagnosed worldwide and 7.6 million people died of cancer. However, a striking geographic variation characterises the incidence of cancer, with the highest in North America (3.7 million) and the lowest in Micronesia/Polynesia (1800; International Agency for Research on Cancer, 2011). In Korea, 179,000 new cancer cases and 70,000 cancer deaths occur annually (Jung et al., 2011), and Korea has among the highest cancer rates in the world (International Agency for Research on Cancer, 2011). The cancer incidence in Korea has been increasing by 3.3% per year and cancer is now the most common cause of death, although the 5-year survival rate for cancer has also increased, from 41.2% in 1993–1995 to 59.5% in 2004–2008 (Jung et al., 2011).

To reduce the disease burden, cancer screening programmes have been provided in Korea, and in 1999 the government started the National Cancer Screening Programme (NCSP). The NCSP provides free screening services for gastric, liver, colorectal, breast, and cervical cancers to Medicaid beneficiaries and people with National Health Insurance, a mandatory medical insurance system for those within the lower 50% income bracket (Yoo, 2008). People in the higher 50% income bracket can also be screened for these five cancers and 90% of the cost is subsidised. The NCSP guidelines are presented in Table 1. Being screened in accordance with the recommended guidelines is important for detecting cancer at an early stage and in reducing mortality through treatment (Senore et al., 2010).

In addition to these organised screening programmes, opportunistic screening is widely available in Korea. Opportunistic screening programmes involve various options in terms of the items screened, intervals between screening, and costs, depending on individual preferences, but these services are paid for entirely by the users. Although screening programmes are conducted widely in Korea, the utilisation of these screening programmes, including both organised and opportunistic programmes, is unclear.

Thus, in this study, we investigated the utilisation of the five kinds of cancer-screening programmes included in the NCSP, in both organised and opportunistic programmes.

Materials and Methods

Study population and data

Cancer-free men older than 40 years and women older than 30 years were the target population. This study used data from the 2010 Korean National Cancer Screening Survey (KNCSS), which is a population-based, nationwide, cross-sectional interview survey that has

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Table 1. Cancer Screening Guidelines Issued by the National Cancer Screening Programme (NCSP) in Korea

Cancer	Target population	Interval	Test
Stomach	Age 40 and over	2 years	Upper endoscopy or UGI [1]
Liver	High-risk group[2] aged 40 and over	6 months	Ultrasonography and AFP
Colorectal	Age 50 and over	1 year	FOBT [3]
Breast	Age 40 and over, women	2 years	Mammography
Cervix	Age 30 and over, women	2 years	Pap smear

UGI, upper gastrointestinal series; AFP, alpha-fetoprotein; DCBE, double contrast barium enema; FOBT; faecal occult blood test; [1]In the case of an abnormality on the UGI, endoscopy is recommended and a biopsy is performed when an abnormality is found at endoscopy; [2]Those at high risk for liver cancer include patients with chronic hepatitis determined from serological evidence of infection with hepatitis B or C virus in liver cirrhosis; [3]In the case of an abnormality on the FOBT, colonoscopy or a double-contrast barium enema is recommended and a biopsy is performed when an abnormality is found at colonoscopy.

been conducted annually by the Korean National Cancer Centre since 2004, and multi-stage random sampling was applied. First, we stratified the sample according to geographic area, age, and sex. We designated the number of enumeration districts in proportion to their size and selected the final study areas randomly. Five to eight households were randomly chosen in each urban area and 10–12 households were randomly chosen in each rural area, and one eligible person in each household was selected as a participant. Face-to-face interviews by door-to-door contact were used for study recruitment. The 2010 KNCSS was conducted from October 10 to November 12, 2010, and we sampled and contacted 11,742 people. Of these, 7,613 refused to participate (64.8%), 47 (0.4%) did not complete the interview, and 4,082 completed interviews (34.8%).

We used a structured questionnaire to collect information on sociodemographic characteristics, lifetime screening experience, knowledge and experience of screening methods, interval between screenings, and reasons for non-attendance. Of those interviewed, 26 participants were missing key information, so 4,056 were ultimately analysed.

Table 2. Baseline Characteristics of Study Participants

Variables	Male (n= 1681) n (%)	Female (n= 2375) n (%)	Total (n= 4056) N (%)
Age (years)			
30–39	-[1]	643 (27.1)	643 (15.9)
40–49	725 (43.1)	689 (29.0)	1414 (34.9)
50–59	556 (33.1)	552 (23.2)	1108 (27.3)
60–69	320 (19.0)	362 (15.2)	682 (16.8)
70–74	80 (4.8)	129 (5.4)	209 (5.2)
Residence			
Metropolitan	732 (43.6)	1065 (44.8)	1797 (44.3)
Urban	730 (43.4)	981 (41.3)	1711 (42.2)
Rural	219 (13.0)	329 (13.9)	548 (13.5)
Marital status			
Without spouse	74 (4.4)	271 (11.4)	345 (8.5)
With spouse	1607 (95.6)	2104 (88.6)	3711 (91.5)
Education (years)			
≤11	248 (14.8)	526 (22.2)	774 (19.1)
12–14	853 (50.7)	1259 (53.0)	2112 (52.1)
15≤	580 (34.5)	590 (24.8)	1170 (28.9)
Monthly household income (US dollars) [2]			
≤2,499	506 (30.1)	730 (30.8)	1237 (30.5)
2,500–3,999	634 (37.7)	934 (39.3)	1568 (38.7)
>4,000	540 (32.1)	709 (29.9)	1249 (30.8)
Medical insurance			
National Health Insurance	1638 (97.4)	2278 (95.9)	3916 (96.6)
Medical Aid Programme	43 (2.6)	97 (4.1)	140 (3.5)
Private medical insurance			
No	366 (21.8)	404 (17.0)	770 (19.0)
Yes	1315 (78.3)	1971 (83.0)	3286 (81.0)

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

Statistical analyses

Lifetime screening rates were calculated by 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 screening rate according to guidelines 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 (Table 1). The proportion of non-attendance was calculated based on the number who had never been examined.

Results

Table 2 shows the characteristics of the participants, such as age group, residential area, marital status, education, income, medical insurance, and private medical insurance, by sex.

The lifetime screening rates were 76.7% for gastric cancer, 54.2% for liver cancer, 57.1% for colorectal cancer, 79.5% for breast cancer, and 75.0% for cervical cancer. The rates for screening in accordance with guidelines for gastric, liver, colorectal, breast, and cervical cancer were 65.1%, 22.9%, 33.5%, 61.1%, and 62.9%, respectively (Table 3). Of the subjects, 33.0% underwent an upper gastrointestinal series (UGI) and 70.6% underwent endoscopies; 58.9% of the participants followed the recommended interval for UGI, as did 58.9% of those who underwent endoscopies. The faecal occult blood test (FOBT) was performed in 46.3%, a colonoscopy in 34.9%, and a double-contrast barium enema (DCBE) in 10.4%. Adherence to the guidelines was highest in the order DCBE (25.9%) > colonoscopy (23.3%) > FOBT (6.1%).

The screening rates in accordance with guidelines

Table 3. Participation Rates in the 2010 National Cancer Screening Programme in, Korea

Type of cancer	Screening tool	Lifetime screening rate	Screening in accordance with guidelines
Gastric cancer[1]	Total[6]	76.70%	65.10%
	UGI	33.00%	24.90%
	Upper endoscopy	70.60%	58.90%
Liver cancer[2]	US and AFP	54.20%	22.90%
Colorectal cancer[3]	Total[6]	57.10%	35.50%
	FOBT	46.30%	25.90%
	Colonoscopy	34.90%	23.30%
	DCBE	10.40%	6.10%
Breast cancer[4]	Mammography	79.50%	61.10%
Cervical cancer[5]	Pap smear	75.00%	62.90%

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

according to age, education, and income level are presented in Figure 1. The rates of adherence to the guidelines for gastric and liver cancer screening increased until age 60–69 years and then decreased in the 70–74 age group, whereas rates of adherence to the guidelines for breast and cervical cancer screening increased until the 50s and then decreased significantly. The screening rates in accordance with guidelines for gastric and cervical cancer screening differed according to education and income, but the difference was minimal for gastric cancer screening.

Table 4 shows the stated reason for lifetime non-attendance at screening for each cancer type. Across all cancer types, the reason most often stated was "no symptoms," which accounted for more than 40% of gastric, colorectal, and cervical cancer screening, and then "lack of time." For gastric and breast cancer screening, the third most common reason for non-attendance was "economic reasons," whereas "fear of the exam procedure" was stated as the third most common reason in regard to liver, colorectal, and cervical cancer screening.

Discussion

Although the use of organised cancer-screening programmes is well understood and attendance rates have been increasing rapidly (Choi et al., 2010; Lee et al., 2010; Lim et al., 2010), the use of opportunistic programmes is unclear. The NCSP has been expanded since it started in 1999 and more than 50% of the population is now targeted, although only 31.7% of the target population participate in the programme. Most of the costs of opportunistic programmes are covered entirely by users, yet the percentage attending has been increasing rapidly because satisfaction with the screening procedures and with the reliability of the results is high in terms of sufficient education, follow-up, diagnostic tools and treatment, and rapid test results (Shin et al., 2006). This is reflected by the fact that more than 80% of the participants in this study had private medical insurance in addition to the National Health Insurance and Medical Aid Programme, which covered all participants.

As a result of government efforts to increase cancer-screening rates, the lifetime screening rates ranged between 54.2% and 79.5% and screening rates based on the guidelines ranged between 22.9% and 65.1%. Several screening options exist for gastric and colorectal cancer, such as an UGI and endoscopy for gastric cancer; and FBOT, colonoscopy, and DCBE for colorectal cancer; other cancer-screening programmes emphasise a single test. Although one study suggested that the relative complexity of screening was one reason for the low screening rates (Han et al., 2010), gastric cancer screening had both a high lifetime screening rate, similar to those for breast cancer and cervical cancer screening (>75.0%) and a higher screening rate in accordance with guidelines (>60.0%).

Overall, the rate of endoscopy testing was higher than that of upper GI series testing. The results are similar

Table 4. The Distribution of the Reasons Stated for Lifetime Non-attendance at Screening

Cause of non-attendance	Gastric cancer (n = 796) n (%)	Liver cancer [1] (n = 38) n (%)	Colorectal cancer (n = 857) N (%)	Breast cancer (N = 356) N (%)	Cervical cancer (N = 593) N (%)
No symptoms	394 (49.5)	14 (36.8)	412 (48.1)	141 (39.6)	247 (41.7)
Lack of time	202 (25.4)	10 (26.3)	164 (19.1)	87 (24.4)	146 (24.6)
Economic reasons	79 (9.9)	3 (7.9)	102 (11.9)	55 (15.5)	58 (9.8)
Fear of exam procedure	67 (8.4)	4 (10.5)	133 (15.5)	36 (10.1)	82 (13.8)
Fear of detecting cancer	37 (4.7)	4 (10.5)	30 (3.5)	22 (6.2)	37 (6.2)
Ignorance about screening	9 (1.1)	4 (10.5)	5 (0.6)	5 (1.4)	11 (1.9)
Distrust screening	7 (0.9)	2 (5.3)	10 (1.2)	10 (2.8)	8 (1.4)
Other	1 (0.1)	1 (2.6)	1 (0.1)	0 (0.0)	4 (0.7)

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

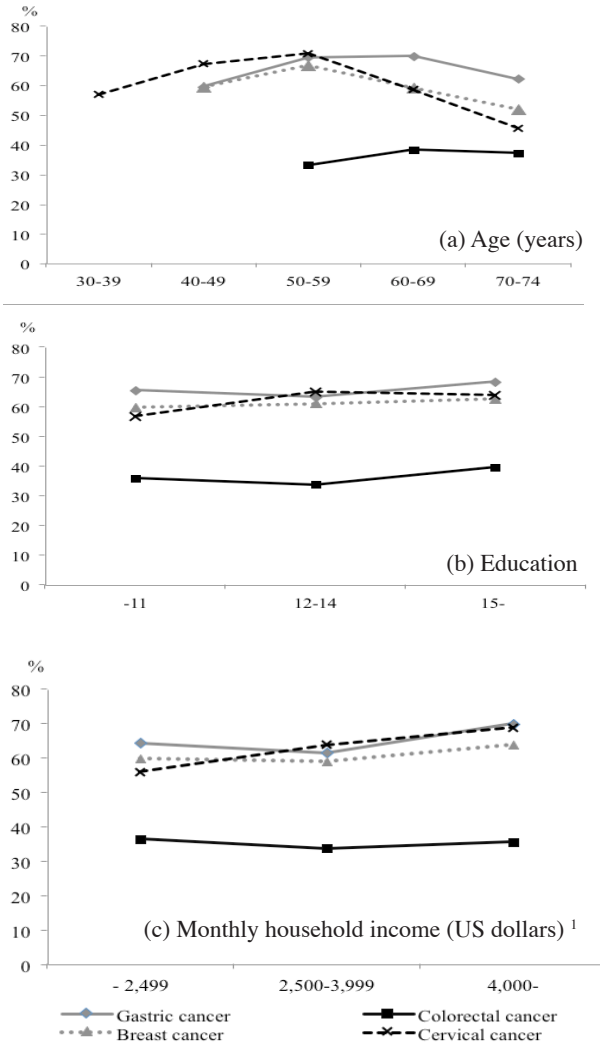

Figure 1. Screening Rate with Recommendation According to Age, Education and Income. [1]1 US dollar=1,000 won

to those of a previous population study in Korea (Choi et al., 2009). It may be that upper endoscopy is widely applied because it not only screens for gastric cancer, at almost the same cost as an upper GI series, but also allows diagnosis of gastric ulcer and Helicobacter pylori infection (Kim et al., 2009), thus affecting the preference for endoscopy (Choi et al., 2009).

The breast cancer screening rate is higher in the United States of America (USA), whereas the cervical cancer screening rate is lower (Smith et al.). The breast cancer screening rate has been increasing rapidly in Korea (Lim et al., 2010; Choi et al., 2010) and the cervical cancer screening rate has also been increasing, but less rapidly. The incidence of breast cancer has been increasing rapidly, whereas that of cervical cancer has been decreasing (Jung et al., 2011), and these patterns may be responsible for the more rapid increase in breast cancer screening.

The screening rate and the screening rate in accordance with guidelines were lower for liver and colorectal cancer screening than was the case for other types of cancer screening. In colorectal cancer screening, the lifetime FOBT rate was higher than that for colonoscopy or DCBE. Moreover, the number of subjects undergoing FOBT for colorectal screening has been increasing, whereas the number undergoing colonoscopy has not changed, although the total rate of colorectal screening has increased (Choi et al., 2010). In contrast, in the USA, the rate of colorectal screening using sigmoidoscopy or colonoscopy is much higher than that of FOBT, and screening using endoscopy has increased but use of FOBT has decreased (Smith et al., 2008).

Liver cancer screening is recommended for patients with liver cirrhosis, chronic hepatitis due to hepatitis B virus (HBV) or hepatitis C virus (HCV), or serological evidence of HBV or HCV infection. Although these are high-risk groups for liver cancer compared with the normal population, the lifetime screening rate and the rate in accordance with guidelines was the lowest among the five types of cancer. A study conducted in Korea indicated that less than 60% of HBV or HCV carriers had ever been tested using ultrasonography, and of those who had been examined by ultrasonography, less than 30% had been tested within the previous year, although they knew their carrier status (Cho et al., 2010).

According to age, the rates of screening in accordance with guidelines for gastric and colorectal cancer screening increased until the 60s and then decreased, whereas those for breast and cervical cancer screening increased until the 50s and then decreased. Although controversy as to whether socioeconomic status is associated with screening rates exists (Richardson et al., 1990; Cho et al., 2004; Zackrisson et al., 2004; Han et al., 2010), the differences were less than 6%, except in the case of cervical cancer, in our results. Kwak et al. (Kwak et al., 2005) also reported that in Korea income was associated with screening rates only in the case of cervical cancer.

The main reason given for non-attendance for all five kinds of cancer screening was no symptoms. This is a common reason in both developing (Basu et al., 2006) and developed (Matthews et al., 2007) countries. In one study, the presence of symptoms was the main reason for undergoing a screening test (Puschel et al., 2010). Because the goal of screening is early detection of disease at a preclinical or early clinical stage in order to reduce morbidity and mortality, education is needed to increase participation rates in screening programmes. The second reason given for non-attendance was a lack of time, and the third and fourth reasons were economic reasons and fear of the examination procedure, respectively. Thus, efforts to increase the accessibility of screening tests in diverse ways should be combined with education about the importance of screening tests.

This study conducted a nationwide survey to investigate participation rates in cancer screening for five kinds of cancers in Korea and reported the current status. However, this study has several limitations. First, our

results relied on self-reported data. Some tests may have been performed following a physician's order for other purposes because screening tools such as endoscopies are used not only for cancer but also for the diagnosis and follow-up of other diseases. Although the survey data from self-reported interview may have introduced a bias, many studies have shown the reliability of self-reported histories of cancer screening, which have been shown to agree well with medical records (Caplan et al., 2003; Hoffmeister et al., 2007; Jones et al., 2008). Second, the response rate in our study was only about 35%, which may have distorted our sample. However, compared with other nationwide studies conducted in Korea (Jeong et al., 2007; Kwon et al., 2009; Park et al., 2008), our response rate is considered acceptable in the Korean context.

The Korean government instituted a national health-promotion programme for cancer control that includes strategies such as strengthening cancer prevention by managing cancer risk factors, achieving early cancer screening among all Koreans by improving medical coverage and expanding support for cancer patients, strengthening support for rehabilitation and palliative care for cancer patients, building an infrastructure for active national cancer control, developing world-class medical treatments and techniques, educating and advertising to improve our understanding of cancer, and registering cancer patients and evaluating their care systematically. One of the goals is to achieve a cancer screening rate with related recommendations for 70% of the Korean population by the year 2015 (Han et al., 2011). According to our results, screening rates for gastric, breast, and cervical cancer are approaching this goal (>60%), but greater effort is still needed to increase screening rates and recommendations for liver and colorectal cancer.

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