

## RESEARCH ARTICLE

# Effectiveness of Interventions to Increase Screening for Gastric and Colorectal Cancer in Korea

Nam Soo Hong<sup>1,2</sup>, Sin Kam<sup>1\*</sup>

### Abstract

Public health centers in Korea play an important role at the community level in encouraging residents to participate in cancer screening, usually by sending reminders in the mail and by making phone calls. However, there have not been any studies on the effectiveness of these interventions by public health centers in Korea. The purpose of this study was to evaluate this question. The study was limited to male subjects aged 50-59 years living in one district of Daegu, Korea. A total of 923 subjects were selected for the study among the target population for gastric and colorectal cancer screening as part of the National Cancer Screening Program in 2012. The subjects were randomly assigned to one of four groups: control, postal intervention, telephone intervention, and telephone and postal intervention. Three months after the interventions, the results were confirmed by the National Health Insurance Corporation. Logistic regression analyses were performed to find differences in participation rates in cancer screening for each group. Men who received telephone and postal intervention were most likely (40.5%) to undergo gastric cancer screening, in comparison to the men who received telephone intervention only (31.7%), postal intervention only (22.2%) and those in the control group (17.9%). Also, men who received telephone and postal intervention were most likely (27.8%) to participate in colorectal cancer screening, followed by the men who received telephone intervention only (24.3%), postal intervention only (16.5%), and men in the control group (13.5%). Combined telephone and postal intervention and telephone only intervention as well produced significantly increased rates of participation in cancer screening in comparison to the control group. There was no significant difference, however, between the postal intervention only and control groups for either colorectal or gastric cancer screening.

**Keywords:** Cancer screening - effectiveness of intervention - public health center - postal - telephone - Korea

*Asian Pac J Cancer Prev*, 15 (21), 9147-9151

### Introduction

According to the 2014 Annual Report of Cancer Facts and Figures of the Republic of Korea, gastric cancer was the most frequently occurring cancer in males, accounting for 19.4% of all cases, followed by colorectal cancer (15.6% of cases) in 2011. Gastric cancer and colorectal cancer were the third and fourth leading causes, respectively, of death by cancer in 2012 (Korea Ministry of Health and Welfare and Korea National Cancer Center, 2014).

Early detections of cancer are the key component of an overall cancer control plan. It enables cancers to be detected at earlier stages, when treatments are more effective and there are greater chances to be cured (World Health Organization, 2007). It is known that early detection and screening of gastric cancer improve the 5-year survival rate and reduce mortality (Fukao et al., 1995; Tsubono and Hisamichi, 2000). Regular screenings also have benefits in reducing mortality rates of colorectal cancer (American Cancer Society, 2013).

In 1996, the Korean government initiated a ten-year-plan for cancer control. The National Cancer Screening Programme (NCSP) was launched in 1999, targeting stomach, breast and cervical cancers. Since then, the NCSP has expanded to target colorectal and liver cancers as well (Yoo, 2008). When the NCSP was launched the target population was those receiving medical aids, and later expanded to include National Health Insurance (NHI) beneficiaries. Currently, people whose National Health Insurance Corporation (NHIC) premium is within the lowest 50% can undergo gastric and colorectal cancer screenings with no out-of-pocket expense (Kim et al., 2011). The NCSP recommends that adults aged 40 years and older undergo gastric cancer screening every 2 years, either by upper gastrointestinal series or by endoscopy. It is recommended that adults older than 50 years of age undergo fecal occult blood test (FOBT) for colorectal cancer screening every year (Korea National Cancer Center, 2014).

Although people in the low-income group can participate in the NCSP without incurring an economic

<sup>1</sup>Department of Preventive Medicine, School of Medicine, Kyungpook National University, <sup>2</sup>Daegu-Kyungpook Regional Cancer Center, Kyungpook National University Hospital, Daegu, Korea \*For correspondence: kamshin@knu.ac.kr

burden, the overall rate of participation in the NCSP was only 36.7% in 2012. The rates of participation in gastric and colorectal cancer screenings were 43.9% and 25.7%, respectively (Korea Ministry of Health and Welfare and Korea National Cancer Center, 2014). To increase the rate of participation in cancer screening, the government (Ministry of Health and Welfare, Korea National Cancer Center) has employed various strategies including public relations and education. At the community level, public health centers play an important role in improving the rate of participation in cancer screening. Public health centers are responsible for keeping track of the participations and encouraging the target population to get involved in the screenings (Kim et al., 2011). It has been reported that most public health centers try to increase the rate of participation in cancer screening by making phone calls and mailing reminders (Korea Ministry of Health and Welfare, 2010). The effectiveness of these interventions by public health centers to encourage members of the local community to participate in the NCSP, however, has not been evaluated yet. Previous reports related to the cancer screening have concentrated on the factors associated with participation in cancer screening in Korea (Bae et al., 2008; Kwon et al., 2009; Lim et al., 2011; Myong et al., 2012; Myong and Kim, 2012; Shin et al., 2012).

Therefore, the aim of this study is to compare the effectiveness of various interventions used by public health centers to encourage participation in cancer screening and to investigate the differences of effectiveness depending on whether the screening is for stomach or colorectal cancer.

## Materials and Methods

### *Subjects and data*

This study was conducted in one district of Daegu City, Korea. The public health center of the district was given a list about the target subjects residing in the district by the National Cancer Center. The target subjects were eligible to participate in free cancer screening since they were within the lowest 50% of the National Health Insurance Corporation (NHIC) premium. The study was restricted to male subjects aged 50-59 years, who were targeted for screening about only two types of cancer: stomach cancer and colorectal cancer (subjects with liver cancer were excluded). Medical Aid recipients were excluded from this study. Subjects who had already received cancer screening tests before August 31, 2012 were identified by NHIC and excluded from the study as well.

A total of 2,361 men were considered eligible for the study. Subjects were randomly assigned to one of the four groups: control (n=223), postal intervention (n=230), telephone intervention (n=985), and telephone& postal intervention (n=923). The response rates among the telephone intervention group and the telephone plus postal intervention group were expected to be about 20% based on the experiences of the public health center officers. The actual response rates for those groups were 24.7%(243/985) and 24.6%(227/923), respectively. A total of 923 men were chosen as the final subjects of this study.

### *Methods*

The interventions were carried out from September 3, 2012 to September 28, 2012. The outcome measure was defined as a participation in stomach and colorectal cancer screening before December 31, 2012. Subjects who participated in stomach or colorectal cancer screening were identified by the NHIC in March, 2013 because clinics or hospitals that are certified as NCSP screening centers usually enter the results onto the web-based database of the NHIC within one or two months.

The mailing sent to the study subjects included the following information: *i*) the subject is eligible to participate in stomach and colorectal cancer screening without charge, *ii*) stomach and colorectal cancers are the most and the second most common cancers in Korean men, but these cancers are curable if detected at early stages by cancer screening, *iii*) information about the procedures of stomach and colorectal cancer screening; it was especially emphasized that the fecal occult blood test (FOBT) is simple, effective and used worldwide, *iv*) information about financial aid programs for cancer patients when detected through the NCSP *v*) information about the clinics and hospitals in the district that are certified as screening centers of the NCSP. Phone counseling was done by a counselor working for the public health center. The counselor was educated about cancer and cancer screening test at Daegu-Kyungpook Regional Cancer Center and she encouraged subjects to participate in cancer screening, providing same information that was included in the letters. She tried to make phone calls up to three times. In the case of telephone and postal intervention group, letters were sent about two weeks after the phone calls.

### *Statistical analysis*

ANOVA test was performed to examine age differences between the four groups. The chi-square test was used to find differences in the participation rates between each intervention group. For each intervention group, we used the McNemar's chi-square test to investigate whether there was a difference in the rate of participation in gastric and colorectal cancer screening. Multiple logistic regression analysis was also conducted to estimate effectiveness of the interventions. After age-adjustment, each intervention group was compared to the reference group (control). SAS version 9.2 (SAS Institute, Cary, NC, USA) was used for all of these analyses. A  $p$  value < 0.05 was considered statistically significant.

## Results

The mean ages and standard deviations of each intervention group were as follows: 54.5±2.7 (control group), 54.2±2.6 (postal intervention), 54.5±2.6 (telephone intervention) and 54.3±2.8 (postal intervention after telephone intervention). The  $p$ -value from ANOVA analysis was 0.60, indicating that there was no significant difference in ages between the four groups.

The rate of participation in gastric cancer screening was the highest in the telephone& postal intervention group (40.5%), followed by the telephone intervention group (31.7%) and the postal intervention group (22.2%),

which showed all higher rates than that of the control group (17.9%). The rate of participation in colorectal cancer screening showed a similar pattern. In the telephone and postal intervention group the participation rate was the highest (27.8%), followed by the telephone intervention group (24.3%), and the postal intervention group (16.5%). These were also all higher compared to the participation rate of the control group (13.5%). The results of the McNemar's chi-square test which examined the differences of participation rates in gastric and colorectal cancer screenings showed that participation rate of gastric cancer screening was significantly higher compared to that of colorectal cancer in every intervention group as well as the control group. (Table 1)

Table 2 shows the results of multiple logistic regressions estimating odds ratio of participation rate in cancer screening within each intervention group compared to the control group (reference). It was statistically significant (OR=2.13) in that the subjects who received telephone counseling were about twice as likely to participate in gastric cancer screening than those in the control group. Men who received mailing after telephone counseling were 3.16 times more likely to undergo gastric cancer screening than those in the control group. In the case of colorectal cancer screening, the odds ratios are similar to those underwent gastric cancer screening with the postal intervention (OR=1.29) and telephone intervention (OR=2.07). However, the odds ratio for the telephone and postal intervention group (OR=2.50) compared to the control group was lower than that of gastric cancer screening (OR=3.16). For both gastric and colorectal cancer screenings, there were statistically significant effects of the telephone intervention and the telephone and postal intervention. The participation rate of the postal intervention group is not significantly different

from that of the control group for both cancer types.

## Discussion

In this study, the effectiveness of the public health center's three different interventions which are believed to improve the participation rate in cancer screening was examined. The results showed that the rates of participation in both gastric and colorectal cancer screening were not significantly affected by postal intervention in comparison to the control group. The telephone intervention did show a significantly increased rate of participation. Using both telephone and postal intervention was the most effective technique, resulting in the highest screening participation rate. Many previous studies have examined effectiveness of various interventions to improve participation rates in cancer screening. According to the systematic review evaluating previous researches, when given with printed reminders and additional components or contact by telephone resulted in higher cancer screening participation rate than given printed information only (Baron et al., 2008). The other study in Korea reported that postcard reminder after telephone counseling was effective to increase participate in gastric cancer screening among men who had never been screened (Lee et al., 2012). The results of this study were consistent with previous studies.

According to a survey of public health centers, 94% of public health centers make phone calls to encourage local residents to undergo cancer screening and 68.8% of public health centers send out mails or informational brochures for the same purpose (Korea Ministry of Health and Welfare, 2010). However, there has not yet been any study of the effectiveness of these interventions. Public health centers have been playing an important role in health promotions and disease prevention and quantitatively and qualitatively positive developments were achieved. However, the reality is that the effectiveness of these services had not been quantified and any scientific evidence of the processes had not been presented either. To accomplish their purpose, establishing health promotion for local residents, public health centers should take a step forward in the scientific evaluation of effectiveness of these services. Likewise, evidence-based approach is required for increases in cancer screening participation rate. With limited manpower and budget, it is essential to push ahead with plans based on scientific effectiveness evaluation.

According to previous studies, tailored interventions were more effective than non-tailored interventions in improving participation in health-maintenance activities, including cancer screening (Noar et al., 2007; Albada et al., 2009; Krebs et al., 2010). It is difficult, however, to carry out tailored interventions that take into account each person's individual characteristics such as cancer risk factors, knowledge about cancer screening, attitudes facing cancer screening, and individual obstacles to screening. This is due to the fact that the public health centers only have basic information about local people such as their names, ages, addresses, and telephone numbers. Therefore, in this study, not materials that meet each subject's needs but general information encouraging

**Table 1. Participation Rates in Gastric and Colorectal Cancer screenings for Each Intervention Group and the Control Group**

	N of subject	Stomach cancer N(%)	Colorectal cancer N(%)	p value
control	223	40 (17.9%)	30 (13.5%)	0.01
Postal intervention	230	51 (22.2%)	38 (16.5%)	<0.01
Telephone intervention	243	77 (31.7%)	59 (24.3%)	<0.01
Postal intervention after telephone intervention	227	92 (40.5%)	63 (27.8%)	<0.01
p-value		<0.01	<0.01	

\*N; Number of subjects who participated in screening. 1) differences regarding cancer types within each group, McNemar chi-square test is used. 2) differences regarding intervention groups within each cancer type, chi-square test is used

**Table 2. Multiple Logistic Regression analysis for Participation Cancer Screening**

	Odds Ratio(95% CI)	
	Stomach cancer	Colorectal cancer
Control	1.00(ref)	1.00(ref)
Postal intervention	1.32(0.83-2.10)	1.29(0.77-2.17)
Telephone intervention	2.13(1.38-3.29)	2.07(1.28-3.36)
Postal intervention after telephone intervention	3.16(2.05-4.87)	2.50(1.55-4.06)

\*Adjusted for age

cancer screening was distributed. The information was assembled using Health Belief Model which is often used in identifying factors that affect people's motivations and tailored interventions in participation of cancer screening (James et al., 2002; Champion et al., 2003; Hay et al., 2003; Marcus et al., 2005; Glazebrook et al., 2006; Skinner et al., 2007).

We designed the interventions to increase people's perceived susceptibility to cancer, focusing the fact that gastric and colorectal cancers are the most common cancers in Korean men. Additionally, we informed them about the benefits of cancer screening by emphasizing the fact that cancer screening and early detection may offer men with cancers the opportunity to be cured and to restore their health. They are also told that they are supported by financial aid program when a cancer is detected only through the National Cancer Screening Program, not by other routes. We also tried to minimize barriers of cancer screening by informing subjects that cancer screening is free of charge and about the certified screening centers of the NCSP in the district. Especially, it was emphasized that FOBT is one of the most simple and effective verified screening tests for colorectal cancer and is widely used around the world, in order to remove one of the barriers of practicing colorectal screening. Considering that the control group of this study also received information of NCSP from National Health Insurance Corporation by mails, even though the postal intervention group showed no significance, the observed increase in screening rates both in gastric cancer, 32%, and colorectal cancer, 29%, is probably caused by the detailed contents of the mail sent by the public health centers. Therefore, in order to increase cancer screening rate, it would be more effective to construct mail contents based on the factors known as those affecting people to get involved in cancer screening, instead of just informing people that they are recipients of the NCSP.

A larger percentage of people participated in gastric cancer screening than colorectal cancer screening. As mentioned earlier, the NCSP targets screening of five different types of cancer. Even though participants of cancer screening program are supported with no out-of-pocket expenses, the participation rates are different depending on cancer types. According to the data from the Korean National Cancer Screening Survey in 2012, the screening rates with recommendation in gastric cancer was 70.9%, while that of colorectal cancer was 44.7%, indicating a large difference (Suh et al., 2013). As Koreans' life styles are increasingly westernized, the incidence rate and mortality rate of colorectal cancer continue to grow while the rate of colorectal cancer screening is still very low (Korea Ministry of Health and Welfare and Korea National Cancer Center, 2014). It is, therefore, really necessary to try to increase the participation rate in colorectal cancer screening. The low rate of participation may be explained by poor compliance to FOBT and the two-step screening procedure (first receiving a stool collection bottle and then bring it back to the cancer screening centers) which requires people to visit the cancer screening centers at least two times (Korea Ministry of Health and Welfare, 2010). It is necessary to advertise

and educate people to spread out the belief that FOBT is a meaningful test for colorectal cancer screening. And it may be possible to increase the participation rate by sending out stool collection bottles along with colorectal screening brochures (Church et al., 2004).

One of the limitations of this study is that several variables affecting participation in cancer screening were not considered. Since each subject was randomly assigned to one of the four intervention groups, however, we could assume that these variables are similarly distributed in each group without affecting the study results. Another limitation is the choice of the subjects. They were limited to men in their 50s living in a large city. It is possible that a similar study with women or people in different age groups may have results that are different from this study. Also, since the subjects selected for this study were men, for whom the cancer screening centers were easily accessible, it could be possible for a similar study conducted for men living in rural areas or in smaller cities to produce different results.

Regardless of those limitations, the results of this study will provide important information that public health centers may find useful as they seek to improve screening participation rates. We found that the telephone intervention group resulted in a significantly higher rate of participation while the telephone and postal intervention groups showed the highest screening participation rate. Even so, the participation rate of gastric cancer screening in the telephone and postal intervention group was only 40.5%, which means that even telephone calls failed to motivate almost 60% of the subjects to participate. This is the reason why different strategies and plans to include people who do not get involved in examinations through promotions by telephone or mail are required. Additional study is required regarding markedly low colorectal screening rate compared to gastric cancer.

## References

- Albada A, Ausems MG, Bensing JM, van Dulmen S (2009). Tailored information about cancer risk and screening: a systematic review. *Patient Educ Couns*, **77**, 155-71.
- American Cancer Society (2013). Cancer prevention and Early Detection Facts and Figures 2013. Atlanta: American Cancer Society.
- Bae SS, Jo HS, Kim DH, et al (2008). Factors associated with gastric cancer screening of Koreans based on a socio-ecological model. *J Prev Med Public Health*, **41**, 100-6.
- Baron RC, Rimer BK, Breslow RA, et al (2008). Client-directed interventions to increase community demand for breast, cervical, and colorectal cancer screening: a systematic review. *Am J Prev Med*, **35**, 34-55.
- Champion V, Maraj M, Hui S, et al (2003). Comparison of tailored interventions to increase mammography screening in nonadherent older women. *Prev Med*, **36**, 150-8.
- Church TR, Yeazel MW, Jones RM, et al (2004). A randomized trial of direct mailing of fecal occult blood tests to increase colorectal cancer screening. *J Natl Cancer Inst*, **96**, 770-80.
- Fukao A, Tsubono Y, Tsuji I, et al (1995). The evaluation of screening for gastric cancer in Miyagi Prefecture, Japan: A population-based case-control study. *Int J Cancer*, **60**, 45-8.
- Glazebrook C, Garrud P, Avery A, Coupland C, Williams H (2006). Impact of a multimedia intervention "Skinsafe" on

- patients' knowledge and protective behaviors. *Prev Med*, **42**, 449-54.
- Hay JL, Ford JS, Klein D, et al (2003). Adherence to colorectal cancer screening in mammography-adherent older women. *J Behav Med*, **26**, 553-76.
- James AS, Campbell MK, Hudson MA (2002). Perceived barriers and benefits to colon cancer screening among African Americans in North Carolina: how does perception relate to screening behavior? *Cancer Epidemiol Biomarkers Prev*, **11**, 529-34.
- Kim Y, Jun JK, Choi KS, Lee HY, Park EC (2011). Overview of the National Cancer Screening Programme and the cancer screening status in Korea. *Asian Pac J Cancer Prev*, **12**, 725-30.
- Korea Ministry of Health and Welfare (2010). Evaluation of organized cancer screening program in Korea. Seoul: Korea Ministry of Health and Welfare.
- Korea Ministry of Health and Welfare, Korea National Cancer Center (2014). Cancer Facts and Figures 2014 in the Republic of Korea. Seoul: Korea Ministry of Health and Welfare, Korea National Cancer Center.
- Korea National Cancer Center. National Cancer Screening Program.
- Krebs P, Prochaska JO, Rossi JS (2010). A meta-analysis of computer-tailored interventions for health behavior change. *Prev Med*, **51**, 214-21.
- Kwon YM, Lim HT, Lee K, et al (2009). Factors associated with use of gastric cancer screening services in Korea. *World J Gastroenterol*, **15**, 3653-9.
- Lee MH, Lee YY, Jung DW, et al (2012). Effectiveness of interventions to increase the participation rate of gastric cancer screening in the Republic of Korea: a pilot study. *Asian Pac J Cancer Prev*, **13**, 861-6.
- Lim JH, Kim SY (2011). Factors affecting colorectal cancer screening behaviors: based on the 4th Korea national health and nutrition examination survey. *Korean J Health Education Promotion*, **28**, 69-80.
- Marcus AC, Mason M, Wolfe P, et al (2005). The efficacy of tailored print materials in promoting colorectal cancer screening: results from a randomized trial involving callers to the national cancer institute's cancer information service. *J Health Commun*, **10**, 83-104.
- Myong JP, Kim HR (2012). Impacts of household income and economic recession on participation in colorectal cancer screening in Korea. *Asian Pac J Cancer Prev*, **13**, 1857-62.
- Myong JP, Shin JY, Kim SJ (2012). Factors associated with participation in colorectal cancer screening in Korea: the Fourth Korean National Health and Nutrition Examination Survey (KNHANES IV). *Int J Colorectal Dis*, **27**, 1061-9.
- Noar SM, Benac CN, Harris MS (2007). Does tailoring matter? Meta-analytic review of tailored print health behavior change interventions. *Psychol Bull*, **133**, 673-93.
- Shin JY, Lee DH (2012). Factors associated with the use of gastric cancer screening services in Korea: the fourth Korea national health and nutrition examination survey 2008 (KNHANES IV). *Asian Pac J Cancer Prev*, **13**, 3773-9.
- Skinner CS, Kobrin SC, Monahan PO, et al (2007). Tailored interventions for screening mammography among a sample of initially non-adherent women: when is a booster dose important? *Patient Educ Couns*, **65**, 87-94.
- Suh M, Choi KS, Lee YY, Park B, Jun JK (2013). Cancer screening in Korea, 2012: Result from the Korean national cancer screening survey. *Asian Pac J Cancer Prev*, **14**, 6459-63.
- Tsubono Y, Hisamichi S (2000). Screening for gastric cancer in Japan. *Gastric Cancer*, **3**, 9-18.
- World Health Organization (2007). Early Detection (Cancer control: knowledge into action: WHO guide for effective programmes ; module 3). Geneva: World Health Organization.
- Yoo KY (2008). Cancer control activities in the Republic of Korea. *Jpn J Clin Oncol*, **38**, 327-33.