



Gender Differences in Elders' Participation in the National Cancer Screening Program: Evidence from the Korean National Health and Nutrition Examination Survey 2010–12

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Abstract

Background: Cancer-screening programs are effective in reducing cancer prevalence and mortality; however, cancer remains the leading cause of death in elderly people in Korea. The aim of this study was to identify the factors associated with elders' participation in the National Cancer Screening Program (NCSP) and differences in screening rates by gender.

Methods: Original data from the Korea National Health and Nutrition Examination Survey were analyzed by logistic regression analysis. The sample consisted of 5,505 elderly individuals over age 60. Selected demographic variables, cancer screening participation, physical and psychological health status, and lifestyle were examined.

Results: The NCSP participation rates decreased in both men and women as age increased. Private medical insurance (OR 95% CI: 1.04–1.78), one or more chronic disease (OR 95% CI: 1.07–1.71), and current smoker (OR 95% CI: 0.52–0.94) had the strongest associations with cancer screening participation among men after multivariate adjustment. In contrast, cancer screening participation among women was significantly associated only with living place (OR 95% CI: 1.06–2.203) after multivariate adjustment.

Conclusions: Effective health promoting interventions for elders require individualized programs that address gender-related factors associated with elders' participation in cancer screening programs.

Keywords: Cancer. National Cancer Screening Program. South Korea

Introduction

Given the increases in quality of life and life expectancy as a function of improved hygiene and environmental conditions, Korea's elderly population (aged ≥ 65 years) is expected to increase from 12.2% of the total population, as reported in 2013, to 24.3% in 2030, ultimately reaching 37.4% in 2050 (1). Due to this increase, health problems among the elderly will become a more

serious social concern. Elderly individuals, compared to younger generations, suffer more from chronic diseases such as hypertension, diabetes, and dyslipidemia as opposed to acute diseases. Cancer morbidity is also high. Approximately 178,000 people annually are diagnosed with cancer, and 68,000 people die from cancer each year (2). Cancer is the leading cause of death among

Korean elders, in particular (3). Thus, prevention and early detection of cancer are important for the elderly to prevent and reduce cancer related mortality (4). Accordingly, the government has implemented early cancer screening.

The Korean National Cancer Screening Program (NCSP) provides screening for stomach, liver, colon and rectum, breast, and cervix uteri cancer. However, according to a 2012 survey, the total participation rate in the NCSP was only 36.7% (5). Compared with other age groups, the screening rate among the elderly is similar for gastric and colorectal cancer, but lower for liver, breast, and cervix uteri cancer (5). Cancer screening participation is affected by multiple factors, including socioeconomic status (SES; 6-12), residential region (13-16), type of insurance (13,15,17), unhealthy behavior (e.g., heavy alcohol consumption) (10), and smoking behavior (18,19). A recent report recommending cancer screening for people with chronic diseases (18) suggested that they take good care of their health and are provided more opportunities to do so.

Gender differences in the health status of Koreans have been reported according to marital status, education, income, medical insurance, use of medical services, chronic disease rates, perceived health status, social factors, and alcohol consumption; notably, all of these factors are based on cultural characteristics (20, 21). Therefore, a differential approach based on gender is necessary to promote cancer-screening exams. Most studies on factors associated with participation rates in cancer screening programs in Korea have limitations, as many have analyzed data on only one type of cancer (10,22-25) or investigated all age groups (25,26). However, no studies have examined the gender differences in the factors associated with cancer screening participation among Korean elders. The identification of multidimensional factors affecting the cancer screening participation of Korean male and female elders is necessary in order to promote adherence to the NCSP's health recommendations.

This study's aim was to provide basic data to establish a gender-specific intervention program to improve participation rates among Korean elders

in the NCSP. The study used data from the 1st, 2nd, and 3rd years (2010, 2011, and 2012) of the Fifth Korea National Health and Nutrition Examination Survey (KNHANES V). These data are representative of the Korean population, as they are statistical data collected as part of a nationwide survey. We hypothesized that (a) the participation rates of Korean elders in the NCSP would differ according to their gender and that (b) demographic, psychological/physical, and lifestyle factors would influence the participation of Korean elders in the NCSP.

Materials and Methods

Study population

Raw data from the KNHANES V (2010–2012) conducted by the Korea Centers for Disease Control and Prevention (KCDC) were used in this study. Our 3-year sample from the KNHANES V was an independent probability sample. A rolling survey sampling method was used to extract samples with similar traits for each year. With the systematic sampling method, 20 final survey target households per plot were extracted from each sample plot through primary stratification for each city and province, and secondary stratification was based on standard variables such as sex and population ratio. Participants were individuals over 1 year old from extracted households. The number of participants was 8,958 of a targeted 10,938 (81.9%) in the first year (2010; 27), 8,518 of 10,589 (80.4%) in the second year (2011; 28), and 7,645 of 10,589 (75.9%) in the third year (2012; 29).

Among the 6,455 individuals over 60 years of age, the data of 5,505 were used for this study's final analysis, excluding 938 elders who had been diagnosed with various cancers and 12 elders with missing information.

Measures

NCSP guidelines for cancer screening

The NCSP (30) recommends cancer screening for the five most prevalent cancers in Korea: gas-

tric, colon, and liver cancers for men and breast and cervical cancers for women. The recommendations for detailed cancer screenings based on the NCSP guidelines are as follows: 1) for gastric cancer screening, endoscopy or upper gastrointestinal series (UGI) every 2 years; 2) for colon cancer screening, yearly fecal occult blood test (FOBT) or colonoscopy; 3) for liver cancer screening, yearly sonography and serum alpha-feto protein tests (AFP) for high-risk individuals (HBsAg positive or diagnosed with liver cirrhosis); 4) for breast cancer screening, mammography every 2 years; and 5) for cervical cancer screening, a pap smear every 2 years.

Demographic characteristics of the study sample

Gender, age, place of residence, educational status, living with a spouse, economic activity, economic status, type of medical insurance, and presence of private medical insurance were used as participants' demographic variables. Residence in a metropolitan area or city was classified as urban, and residence elsewhere as rural. A dichotomous measure was used to categorize those living with a spouse as "Yes" and those not living with a spouse due to never marrying, death, or divorce as "No." Economic activity was classified as "Yes" (i.e., economically active) when the subject was currently employed and "No" in the case of unemployment or being economically inactive. The lowest 25% of equivalent income, which was the adjusted average monthly household income divided by the square root of the number of household members, was classified for analysis. The type of medical insurance was classified as "national health insurance" and "Medicaid," and an analysis of subscriptions to private medical insurance was conducted.

Physical/psychological characteristics

A physician's diagnoses of obesity, dyslipidemia, hypertension, and diabetes and the presence of chronic disease, recognition of stress, experience of depression, and experience of suicidal idea-

tion were used as physical and psychological health-related variables. Among them, chronic disease was defined as having one or more of the following diseases: dyslipidemia, hypertension, or diabetes. With regard to the recognition of stress, "very strong recognition," "strong recognition," and "moderate recognition" were categorized as "Yes," and "little recognition" was categorized as "No." "Yes" and "No" responses were used to answer the question: "Have you ever felt sad or depressed for more than 2 weeks in the past year?" "Yes" and "No" responses were also used to answer the question: "Have you ever thought about killing yourself in the past year?"

Lifestyle characteristics

Smoking, alcohol intake, and regular exercise were used as health behavior variables. Smoking status was categorized based on whether participants had never smoked, had smoked in the past, or were current smokers. Alcohol intake was based on the elders' drinking patterns in the past year. Regular exercise was defined as strenuous physical activity performed for at least 20 min at one time, at least three times a week.

Statistical analyses

Descriptive and inferential statistical analyses were performed using SAS (ver. 9.3; SAS Institute Inc., Cary NC, USA). Participation in the NCSP based on gender was analyzed using percentages (SE) and chi-square tests to examine differences in cancer screening participation across demographic, physical, and psychological characteristics and lifestyle behaviors. To examine factors related to gender differences in cancer screening participation, logistic regression was performed to calculate the odds ratios (ORs) and 95% confidence intervals (CIs) while adjusting for age and other variables. The other variables included were those with a $p < .15$ in a multivariate logistic regression analysis on cancer screening participation with demographic characteristics, physical/psychological characteristics, and lifestyle behaviors.

Results

Cancer screening rates by gender and age group

The elders' cancer screening participation rates by gender, age group in accordance with the NCSP recommendations for Korean elderly indi-

viduals are illustrated in Fig. 1. The rates of participation in the cancer screening recommendations of the NCSP decreased with increases in age in both men and women.

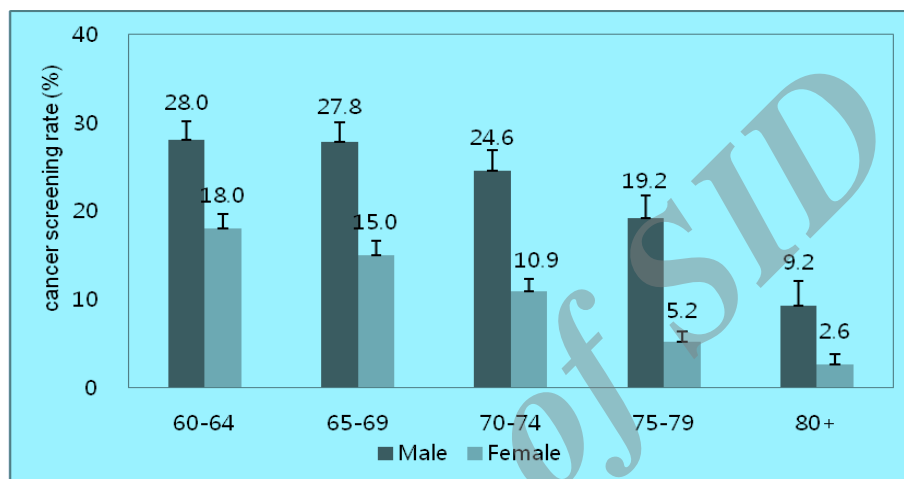


Fig. 1: Cancer screening rates by gender and age group

Gender differences in cancer screening rates across types of cancer

Regarding the screening rate for the five major cancers, the gastric and cervical cancer screening

rates were highest in men and women, respectively, with rates higher than 50%. Rates of screening decreased, in order, for breast cancer, colon cancer, and liver cancer (Fig. 2).

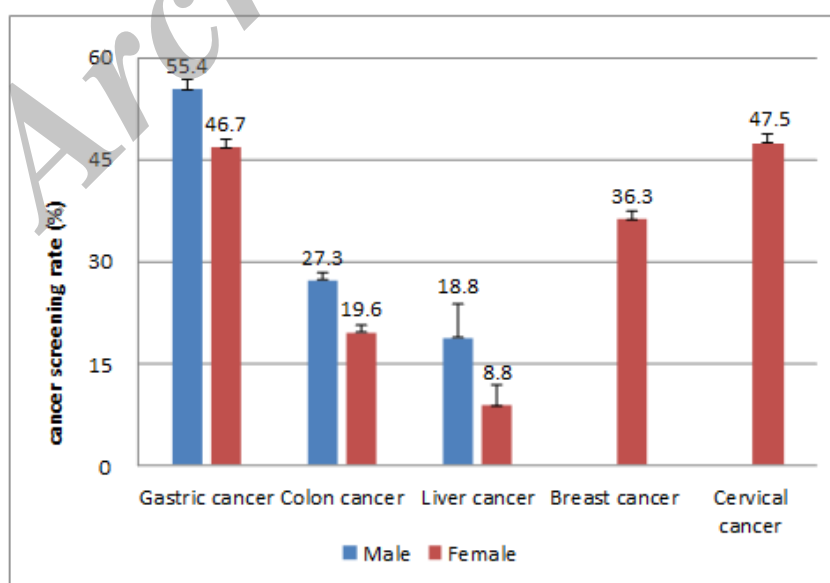


Fig. 2: Gender differences in cancer screening rates across types of cancer

Gender difference in cancer screening participation by demographic, physical/psychological, and lifestyle characteristics

Differences in cancer screening participation by gender, demographic, physical/ psychological, and lifestyle variables are presented in Table 1. Among men, the cancer screening participation was higher for those who had at least graduated middle school, those who were economically active, those who had an economic status of 1Q or higher, those with private medical insurance, those diagnosed with obesity, those diagnosed with dyslipidemia, those diagnosed with at least one chronic disease, those with no experience of suicidal ideation, and those who were non- or ex-smokers. Among women, the cancer screening participation was higher among those who lived in urban areas, had at least graduated middle school, were living with their spouse, had an economic status of 1Q or higher, had private medical insurance, had a diagnosis of dyslipidemia, had no stress, had no experience of suicidal ideation, and were current alcohol drinkers.

Results of logistic regression analysis on gender differences in the factors associated with cancer screening participation

As presented in Table 2, the age-adjusted logistic regression analyses revealed that the odds of cancer screening participation among men were significantly associated with educational status, economic status, private medical insurance, diagnosis of dyslipidemia, chronic disease, experience of suicidal ideation, and current smoker. In the multivariate model, after adjusting for these potential confounders, the odds of cancer screening participation among men were significantly associated with private medical insurance, chronic diseases, and current smoker. The age-adjusted logistic regression analysis revealed that the odds of cancer screening participation among women were significantly associated with living place, economic activity, dyslipidemia, recognition of stress, and experience of depression. In the multivariate model, after adjusting for these potential confounders, the odds of cancer screening participation among the women were significantly associated only with liv-

ing place.

Discussion

Cancer screening programs are effective in reducing the prevalence and mortality of cancer. Despite the prevalence of chronic disease and cancer in Korea, no studies have examined cancer screening participation among Korean elders. Cancer screening is clinically effective and the most cost-effective way of reducing cancer mortality. Accordingly, many countries have organized cancer-screening programs via healthcare providers or medical care systems (31). To improve accessibility, quality, and accountability, organized cancer screening programs have been developed, providing a broad range of services to the general population (31).

In this study, men with private medical insurance and those with more than one chronic disease had higher participation in cancer screening. However, men who were current smokers had lower rates. Women living in urban areas were more likely to be screened. SES is the most commonly studied variable when examining influences on participation rates. Most studies have found that individuals with a high SES are more likely to participate in screening programs than are those with low SES (7, 9, 23). Such information might help promote participation among those with a lower SES and provide information for routine monitoring of screening services (12). However, studies among Koreans—including our study—have found that SES factors, including educational level and economic status, are not associated with cancer screening (15). In the case of NCSP in Korea, there was no correlation between SES and participation in cancer screening, probably because most healthcare plans covered cancer screening at no cost for medical care recipients and low-income health insurance beneficiaries. Furthermore, as we assumed that elderly patients are more likely to be categorized as low-income health insurance beneficiaries, it is likely that they were also more likely to participate in the NCSP than were young patients. However, studies on Caucasian participants have also found that SES is not a barrier to breast

cancer screening among women (11). Thus, prospective studies are needed to clarify the relationship between SES and cancer screening rates while considering, in addition to gender, cultural background and use of Medicare and various healthcare delivery systems.

Distance from a metropolitan area also is associated with participation in cancer screening, especially in women (13, 16, 32). Several studies have reported a positive correlation between urbanization and participation rates (14, 16). However, the relationship between urbanization and participation rates in health-screening programs is unclear. Some Asian studies found that those who live in metropolitan or urban areas had decreased participation rates in comparison to those in rural areas (8, 10, 33). The relationship between residential region and participation in cancer screening also differs by age. The level of urbanization was positively associated with participation in the NCSP among people aged 40 years, but participation among 66-year-old participants was higher in rural than in urban areas (16), similar to what was found in a US study (7). Locality is also a significant factor promoting elderly patients' participation in cancer screening. Furthermore, there was a relationship between region and gender, especially in women, in this study. Women living in rural areas often lack appropriate financial, social, or educational supports. Moreover, in addition to the out-of-pocket expenses, women in rural areas have little access to healthcare services due to their poor proximity to facilities, such as long traffic hours (34). This possibly explains why we found higher rates of cancer screening among women in urban areas, as they would have greater ease of access to clinicians and more gynecologists available than in rural areas in Korea.

Having health insurance generally is associated with positive changes in preventive care, such as increased colorectal screening, mammography, Pap smear, and prostate cancer screening (13, 17). This trend, also noted in the present study, is mostly due to increased care utilization, which reduces barriers to screening. Patients with some form of health insurance are more likely to receive a health maintenance visit every 2 years and up-to-date

screening for cervical, breast, or colorectal cancers (13, 15). However, for elderly men, having private health insurance was associated with greater cancer screening in this study. Especially in Korea, participation rates in national and private (i.e., out-of-pocket) screening programs are increasing (35). This appears to be similar with a previous study wherein wealthy elderly men tended to use private medical institutes rather than public institutes. This phenomenon was not observed in women.

Smoking behavior also affects screening participation among men, but not among women. This result is perhaps because of the fact that cultural backgrounds in Korea tend to be more permissive towards smoking behavior among men than among women. As in the present study, current smokers have been found to be less likely to participate in cancer screening in past studies (18, 37). This might be because of smokers' fear for their own health status. Many current smokers know that smoking is the leading cause of various cancers (38), thus causing them to avoid health screenings because they fear potentially negative results (39). Education for reducing fear of cancer screening and promotion of participation in such screening is needed for smokers.

Many studies, including the present one, have examined the relationship between chronic diseases and participation in cancer screening. The relationship between diabetes mellitus and cancer or cancer mortality is well known (32, 40-42). Some studies have reported contradictory results in that people with chronic diseases are more likely to participate in cancer screening. Although the effect of chronic diseases on cancer screening is controversial, individuals with chronic diseases participate in more cancer screening tests, such as breast examinations, pap smears, and FOBTs (43, 44). This finding might be explained by an increase in the frequency of office visits, resulting in increased opportunities for cancer screening. In general, health professionals cannot recommend cancer screening due to limited time and busy clinical settings (45). However, individuals with chronic disease visit healthcare providers more often, thereby increasing the probability that they will be recommended for screening. In this study, only men

showed an association between chronic diseases and screening participation, a deviation from the results of past studies. We assumed that this was due to the increase in participation as a function of scheduled cancer screening times, which are offered to men in South Korea (46, 47). However, individuals with at least one chronic disease may experience barriers to receiving cancer screening, as evidenced by other studies (48, 49). The controversy in this relationship might result from different settings, geographic locations, and periods related to changing recommendations for cancer screening (19).

This study has some limitations. First, as this was a cross-sectional study, we cannot discern the causal relationship between participation in cancer screenings and other factors. Second, the data were based on self-reported health surveys; thus, recall bias could have introduced error. Third, this study did not include information about health-seeking behaviors, unlike other studies. Fourth, we only considered diabetes, hypertension, and dyslipidemia as chronic diseases. Some studies have demonstrated significant relationships between screening participation and other chronic diseases such as arthritis, digestive disorders, and respiratory diseases (19). Finally, we did not adjust for clustering effects.

Despite these limitations, this study had some noteworthy strength. To the best of our knowledge, it is the first study to use a large, nationally representative sample to examine cancer-screening rates among elderly Koreans. Moreover, we adjusted our analyses for many covariates to minimize their potential influence.

Conclusion

In this study, men who had private medical insurance and those who had more than one chronic disease and women living in urban areas had higher rates of cancer screening. However, men who were current smokers had lower rates. Health professionals should attend to the gender differences observed in South Korea's NCSP in order to promote participation in cancer screening.

Ethical considerations

Ethical issues regarding plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy have been completely observed by the author.

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Table 1: Gender differences in cancer screening participation by demographic, physical/psychological, and lifestyle characteristics (n = 5,505)

Variables		Male (n = 2,390)			Female (n = 3,115)		
		n (%)	Participation %	P	n (%)	Participation %	P
Living place	Rural	737 (30.5)	24.3	0.814	978 (32.9)	7.7	<0.001
	Urban	1,653 (69.5)	24.9		2,137 (67.1)	13.6	
Educational status	≤ Elementary school	982 (43.4)	20.6	<0.001	2,385 (80.5)	10.4	<0.001
	≥ Middle to University	1,405 (56.6)	28.0		718 (19.5)	17.3	
Living with spouse	None	185 (8.2)	17.6	0.050	1,337 (46.3)	8.9	<0.001
	Have	2,196 (91.8)	25.3		1,764 (53.7)	14.1	
Economic activity	None	1,112 (45.5)	21.6	<0.001	2,111 (67.1)	11.8	0.959
	Have	1,275 (54.5)	27.4		993 (32.9)	11.7	
Economic status	1Q	1,476 (63.0)	20.0	<0.001	1,577 (49.6)	9.9	<0.001
	≥ 2Q	888 (37.0)	27.7		1,498 (50.4)	13.7	
Medical insurance	National health insurance	2,320 (97.2)	24.3	0.154	2,911 (94.1)	11.3	0.050
	Medicaid	61 (2.8)	0.4		168 (5.9)	0.4	
Private medical insurance	None	1,428 (59.7)	20.9	<0.001	1,934 (64.4)	9.4	<0.001
	Have	934 (40.3)	30.9		1,139 (35.6)	16.0	
Obesity	None	1,657 (68.2)	23.1	0.047	1,904 (60.9)	11.8	0.766
	Have	725 (31.8)	28.1		1,206 (39.1)	11.4	
Dyslipidaemia	None	2,037 (85.3)	22.5	<0.001	2,416 (77.8)	10.6	0.002
	Have	353 (14.7)	37.8		699 (22.2)	15.6	
Hypertension	None	1,302 (55.4)	23.2	0.103	1,467 (45.5)	12.9	0.101
	Have	1,088 (44.6)	26.6		1,648 (54.5)	10.7	
Diabetes	None	1,932 (81.4)	24.8	0.921	2,596 (82.9)	12.1	0.194
	Have	458 (18.6)	24.5		519 (17.1)	9.7	
Chronic disease	0	1,048 (44.8)	22.1	0.023	1,159 (35.8)	11.4	0.725
	≥ 1	1,342 (55.2)	26.9		1,956 (64.2)	11.8	
Recognition of stress	No	2,067 (87.7)	25.6	0.143	2,261 (72.1)	12.8	0.023
	Yes	312 (12.9)	20.4		829 (27.9)	9.1	
Experience of depression	No	2,134 (89.2)	25.3	0.301	2,505 (80.1)	12.6	0.011
	Yes	245 (10.7)	21.6		589 (19.9)	8.5	
Experience of suicidal ideation	No	2,057 (86.1)	26.0	0.020	2,351 (74.5)	13.0	0.004
	Yes	321 (13.9)	18.1		741 (25.5)	8.3	
Current smoker	No	1,780 (73.3)	27.1	<0.01	2,997 (96.5)	12.0	0.099
	Yes	599 (26.7)	18.9		98 (3.5)	4.9	
Current drinker	No	1,799 (75.3)	23.6	0.515	2,712 (87.1)	10.4	0.024
	Yes	591 (24.7)	25.6		403 (12.9)	13.7	
Regular exercise	No	1,931 (81.3)	24.6	0.474	2,677 (87.8)	12.1	0.244
	Yes	444 (18.7)	26.5		414 (12.2)	9.8	

Table 2: Logistic regression analysis on gender differences in the factors associated with cancer screening participation (n = 5,505)

Variables (yes, %)	Male (n=2,390) Age adjusted OR (95 CI%)	Multivariate OR (95 CI%)	Women (n=3,115) Age adjusted OR (95 CI%)	Multivariate OR (95 CI%)
Living place (urban)	0.97 (0.72, 1.31)		1.63 (1.14, 2.33)	1.53 (1.06, 2.20)
Educational status (\geq middle to University)	1.40 (1.11, 1.76)	1.25 (0.98, 1.60)	1.24 (0.92, 1.67)	
Living with spouse (Yes)	1.48 (0.92, 2.38)	1.28 (0.78, 2.09)	1.03 (0.77, 1.38)	
Economic activity (Yes)	1.18 (0.91, 1.52)		0.74 (0.56, 0.99)	0.87 (0.65, 1.17)
Economic status (1Q)	0.74 (0.57, 0.97)	0.87 (0.65, 1.16)	0.92 (0.68, 1.25)	
Medical insurance (National health insurance)	1.60 (0.73, 3.49)		1.25 (0.68, 2.29)	
Private medical insurance (Yes)	1.47 (1.14, 1.90)	1.36 (1.04, 1.78)	0.90 (0.68, 1.20)	
Obesity (yes)	1.20 (0.93, 1.56)		0.86 (0.66, 1.13)	
Dyslipidaemia (yes)	1.99 (1.48, 2.68)		1.37 (1.02, 1.84)	
Hypertension (yes)	1.24 (1.00, 1.55)		1.00 (0.77, 1.31)	
Diabetes (yes)	0.97 (0.72, 1.30)		0.86 (0.59, 1.24)	
Chronic disease (\geq 1)	1.31 (1.05, 1.65)	1.35 (1.07, 1.71)	1.26 (0.96, 1.64)	1.24 (0.93, 1.60)
Recognition of stress (yes)	0.72 (0.48, 1.07)	0.82 (0.54, 1.25)	0.69 (0.49, 0.97)	0.76 (0.54, 1.06)
Experience of depression (yes)	0.81 (0.55, 1.20)		0.65 (0.46, 0.94)	
Experience of suicidal ideation (yes)	0.66 (0.44, 0.98)	0.75 (0.51, 1.17)	0.69 (0.48, 1.00)	0.80 (0.55, 1.15)
Current smoker (yes)	0.60 (0.45, 0.79)	0.70 (0.52, 0.94)	0.40 (0.11, 1.39)	
Current drinker (no)	0.98 (0.76, 1.28)		1.10 (0.83, 1.46)	
Regular exercise (yes)	1.04 (0.78, 1.39)		0.69 (0.47, 1.03)	0.74 (0.49, 1.11)

In case of multivariate OR, variables with 0.15 or smaller p-value for the age-adjusted OR were adjusted. However, dyslipidaemia and hypertension, which had p-values of 0.15 or smaller, were not included as variables for adjustment because adjustment for chronic disease (\geq 1) was performed. In males, multivariate ORs are adjusted by educational status, living with spouse, economic status, private medical insurance, chronic disease, recognition of stress, experience of suicidal ideation, and current smoker. In females, multivariate ORs are adjusted by economic activity, chronic disease, recognition of stress and depression, experience of suicidal ideation, and regular exercise