BMJ Open

Determinants of undergoing thyroid cancer screening in Korean women: a cross-sectional analysis from the K-Stori 2016

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To cite: Cho HN, Choi E, Seo DH, *et al*. Determinants of undergoing thyroid cancer screening in Korean women: a cross-sectional analysis from the K-Stori 2016. *BMJ Open* 2019;**9**:e026366. doi:10.1136/bmjopen-2018-026366

► Prepublication history and additional material for this paper are available online. To view these files, please visit the journal online (http://dx.doi.org/10.1136/bmjopen-2018-026366).

Received 29 August 2018
Revised 2 March 2019
Accepted 5 March 2019

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ABSTRACT

Objectives Thyroid cancer is the most common cancer among Korean women. Studies suggest that the incidence of thyroid cancer might be associated with overdiagnosis resulting from thyroid cancer screening. The objective of this study was to identify the determinants of participation in thyroid cancer screening in Korean women.

Methods Data were obtained from the 2016 Korean Study of Women's Health-Related Issues, a nationwide cross-sectional survey of women according to the reproductive life cycle. A total of 8697 cancer-free women of ages between 20 and 79 years were included for analysis. Multivariable logistic regression analysis was applied to analyse factors associated with adherence to thyroid cancer screening based on Andersen's health behavioural model.

Results Over the last 2 years, the rate of thyroid cancer screening was 39.2%. In multivariable models, older age, higher household income, high school education level and higher perceived risk of cancer were positively associated with thyroid cancer screening participation. Moreover, women who underwent cervical cancer screening (adjusted OR [aOR] 3.67; 95% CI 2.90 to 4.64) and breast cancer screening (aOR 10.91; 95% CI 8.41 to 14.14) had higher odds of attending thyroid cancer screening than women who did not attend cancer screening.

Conclusions These findings highlight the need to increase awareness of different recommendations on screening for various cancers to improve cost-effectiveness and to prevent unnecessary treatments.

Strengths and limitations of this study

- ► This nationwide cross-sectional study documents the most recent rate of thyroid cancer screening among Korean women.
- ► Data were obtained from the 2016 Korean Study of Women's Health-Related Issues, a population-based, nationwide, cross-sectional survey for a reliable and representative research design.
- ► Experiences of thyroid cancer screening and factors associated with a cancer screening were assessed based on Andersen's behavioural model through face-to-face interviews.
- ► Due to cross-sectional study design, this study could not show the direction of causal relationships for the identified associations between thyroid cancer screening and other factors.
- ► More studies are needed to investigate trends in thyroid cancer screening rates and behaviours for both men and women in order to control current thyroid cancer epidemic issues in Korea.

INTRODUCTION

The incidence of thyroid cancer has increased globally over the last three decades.[1 2] Between 1999 and 2011, the age-standardised rate (ASR) of thyroid cancer incidence in Korea increased dramatically (annual percentage change=22.8%).[3] Although rates have decreased since then, about 25 209 new thyroid cases (11.7% of all malignancies) were registered in 2015: thyroid cancer (ASR, 55.6) was the most common cancer among Korean women, followed by breast (ASR, 49.2), colorectal (ASR, 22.2), stomach (ASR, 20.5) and lung cancer (ASR, 14.3).[3] Despite a steep increase in incidence, the age-standardised mortality rate of thyroid cancer remained stable, with a 5-year relative survival rate of 100.3%.[3]

Suggestive of an epidemic, increases in thyroid cancer incidence in Korea have been deemed the results of early detection of small papillary thyroid cancers, which progress slowly and pose a low risk of mortality.[4] Indeed, previous studies reported that thyroid cancer screening rates in a region are strongly correlated with regional thyroid cancer incidence rates.[5 6] The apparent thyroid cancer epidemic was also explained to be the result of increases in the incidence of small tumours.[7] All of these studies strongly raised the possibility of overdiagnosis caused by thyroid cancer screening.

In Korea, the National Cancer Screening Program (NCSP), which was implemented in 1999, provides nationwide screening services free of charge or with a small copayment for gastric, liver, colorectal, breast and cervical cancers.[8] Although thyroid cancer screening is not covered under the NCSP, healthcare providers typically offer ultrasonographic screening for thyroid cancer as an inexpensive add-on at around US$30–US$50.[9] In 2015, a multidisciplinary expert committee was organised to establish recommendations for thyroid cancer screening. This committee determined that thyroid ultrasonography screening should not be routinely recommended for healthy subjects, as current evidence with which to assess the balance of benefits and harms of thyroid cancer screening by ultrasonography is insufficient.[10] Through these efforts, there has been a marked decrease in thyroid operations. Also, the age-standardised incidence rates for thyroid cancer have decreased swiftly.[3 11]

Notwithstanding, the incidence of thyroid cancer in Korea still remains extraordinarily high, especially in women. Thyroid cancer is the most commonly diagnosed cancer in women, and incidence rates are more than 3.6 times higher than those of men.[3] Thus, public concern was raised concerning the potential causes of thyroid cancer, especially in women. However, few studies on thyroid cancer screening behaviours in Korea women have been undertaken.[12 13] Thus, this study was designed to identify factors associated with thyroid cancer screening participation in Korean women based on Anderson's behavioural model.

Anderson's behavioural model has served as a guide in the selection of relevant variables with which to analyse determinants of the healthcare people receive since 1968.[14] The model is widely used in various settings for primary healthcare, general healthcare, outpatient utilisation and services in specific settings, such as mental and oral healthcare.[15] This framework has also been used to identify factors associated with cancer screening utilisation.[16–19] The model is a multilevel model that includes both individual factors and contextual determinants of healthcare use.[20] According to this model, an individual's use of health services is determined by three main components, including predisposing factors, enabling factors and need factors.[16] Based on previous research, Anderson's behavioural model was chosen as the best framework for identifying the determinants of thyroid cancer screening attendance. Accordingly, we chose this model to assess thyroid cancer screening rates and to identify determinants of thyroid cancer screening adherence in Korean women.

MATERIALS AND METHODS

Study population

This study was based on the Korean Study of Women's Health-Related Issues (K-Stori) 2016. The K-Stori is a nationwide survey designed to investigate broad health issues among Korean women according to five stages in the life cycle of women (adolescence, 14–17 years; childbearing, 19–44 years; pregnancy and Post partum, 19–44 years; menopause, 45–64 years and older adulthood, 65–79 years).[21] We randomly sampled 3000 women in each stage of the life cycle for a reliable and representative research design. For random sampling of a multilevel, stratified, probability proportion, a statistics extraction method was used as a sampling framework using the 2010 Population and Housing Census.

Trained interviewers from a professional research agency conducted door-to-door surveys to assess study eligibility. A total of 15 000 women aged 14–79 years completed in-person interview surveys (adolescents completed online surveys) between April 2016 and June 2016. The response rate of K-Stori was 40.4%. The detailed methods of this survey have been explained elsewhere.[21] Of the 15 000 women who participated in the K-Stori survey, we asked about thyroid cancer screening only for women in childbearing, menopause and older adulthood stages. We did not ask women in the adolescence and pregnancy and postpartum stages about thyroid cancer screening, because they are not appropriate for assessing cancer screening behaviour: women in adolescence are too young to assess cancer screening behaviour, and women in pregnancy and post partum are pregnant or have had a birth within less than 1 year. Thus, 6000 women in the adolescence and pregnancy and postpartum stages of life cycle were excluded. Also, 94 women aged 19 years and 209 women who answered that they had been diagnosed with cancer or thyroid disease were excluded. The final study subjects comprised 8697 women aged 20–79 years.

Questionnaires

Study participants were asked about their experiences with health examinations, including cancer screening. Women who answered 'yes' to receiving a health examination were then asked whether they had undergone thyroid cancer screening during the last 2 years.

Factors associated with a cancer screening were assessed via Andersen's behavioural model.[14 15] Final variables were selected from literature reviews of previous studies related to determinants of cancer screening.[16–19] Age (20–29, 30–39, 40–49, 50–59, 60–69 and 70–79), marital status (unmarried, married, divorced/separated), family size (live alone, two to three, four or more people), education level (elementary school or less, middle/high school, university and higher), employment status (unemployed, employed) and health screening belief (weak, moderate, strong) were included as predisposing factors. As enabling factors, we included household income (≤US$1699, US$1700–US$3499, ≥US$3500), private insurance (yes, no), residence area (urban, rural) and accessibility to medical services (yes, no). Finally, self-reported health status (good, average, bad), perceived risk of cancer (low, average, high), chronic disease (yes, no) and other cancer screening behaviours (cervical cancer screening in past 2 years; breast cancer screening in past 2 years) were considered as need factors.

Statistical analyses

X^2 analysis was used to determine the statistical significance of thyroid cancer screening behaviours according to variables selected as predisposing factors, enabling factors and need factors. Since 3000 individuals were sampled for each life cycle, calculating weighted cancer screening rate was needed based on age groups as 8697 women aged 20–79 years were included in the study. Survey weighting adjustments were applied to calculate cancer screening rates in a representative population of Korean women. In addition, in multivariable logistic regression analysis, we applied age-adjusted weighting values for women in Korea. Multivariable logistic regression analysis was conducted in sequential blocks to analyse associations among predisposing factors, enabling resources and health needs in relation to thyroid cancer screening. Model 1 included predisposing factors only; model 2 added enabling factors to model 1 and model 3 added need factors. All reported ORs were considered significant if p<0.05. Data were analysed using SAS V.9.3 (SAS Institute).

Patient involvement

No patients were involved in this study.

RESULTS

Among 8697 women aged 20–79 years, 41.6% had undergone thyroid cancer screening within the last 2 years (table 1). In terms of predisposing factors, women aged 50–59 years (58.0%), married women (48.0%), women with a family size of two to three members (46.3%), women with a middle/high school education (48.2%) and women who had weak belief in the effectiveness of health screening (43.8%) were significantly more likely to undergo thyroid cancer screening. Regarding enabling factors, women who lived in the rural area (43.9%), had private insurance (43.9%) and had no experiences of unmet healthcare needs (42.0%) were more likely to undergo thyroid cancer screening. In terms of need factors, more women who reported that their health status was average (45.4%), had a higher perceived risk of cancer (46.2%), responded as previously or currently having chronic diseases (48.7%) and had previously undergone cervical cancer screening (64.4%) or breast cancer screening (65.5%) attended thyroid cancer screening.

Within the last 2 years, the weighted thyroid cancer screening rate was 39.2%. Women aged 50–59 years exhibited the highest rate of thyroid cancer screening (57.0%), whereas women aged 20–29 years held the lowest thyroid cancer screening rate (11.0%). Along with thyroid cancer screening, breast and cervical cancer screening rates showed similar trends according to age groups (figure 1). Figure 2 depicts the results of our analysis of correlations between thyroid cancer screening rates and other cancer screening rates according to age. Therein, we noted a strong positive correlation between thyroid cancer screening rate and screening for other cancers (breast: r=0.9558, p<0.0001, cervical: r=0.9232, p<0.0001) with significant results.

Table 2 lists the factors associated with thyroid cancer screening according to Andersen's behavioural model. We conducted multivariable logistic regression analysis with predisposing factors only in model 1, with the addition of enabling factors in model 2, and with the addition of need factors in model 3. In model 1, compared with women of ages 40–49 years, those aged less than 40 years were less likely to undergo thyroid cancer screening (20–29: adjusted OR [aOR] 0.26; 95% CI 0.19 to 0.35, 30–39: aOR 0.58; 95% CI 0.47 to 0.71), whereas women older than 50 years were more likely to undergo thyroid cancer screening (aOR 1.78; 95% CI 1.48 to 2.13). Married women had the highest odds of undergoing thyroid cancer screening, compared with women who were not married (aOR 1.74; 95% CI 1.33 to 2.29). Women with higher education showed increased odds of attending thyroid cancer screening (middle/high school: aOR 1.22; 95% CI 1.05 to 1.43, university and higher: aOR 1.26; 95% CI 1.02 to 1.55). Interestingly, women who had a strong belief in the effectiveness of health screening had lower odds of attending thyroid cancer screening than women with weak belief (aOR 0.79; 95% CI 0.68 to 0.91). Employed women were more likely to undergo thyroid cancer screening than those who were unemployed (aOR 1.19; 95% CI 1.05 to 1.34).

In model 2, in which we added enabling factors to model 1, age group, marital status and belief in the effectiveness of health screening showed similar results to those attained in model 1. Meanwhile, larger family size additionally showed a negative association with attending thyroid cancer screening. Regarding enabling factors, women with a household income equal to or more than US$3500 had higher odds of attending thyroid cancer screening than women with income equal to or less than US$1699 (aOR 1.55; 95% CI 1.28 to 1.89). Women who had private insurance had higher odds of attending thyroid cancer screening than women who did not have private insurance (aOR 1.45; 95% CI 1.24 to 1.69). An experience of an unmet healthcare need did not significantly alter results (aOR 0.99; 95% CI 0.81 to 1.21).

In model 3, after adding need factors to model 2, women of ages of 50–59 (aOR 1.58; 95% CI 1.28 to 1.94), 60–69 (aOR 1.64; 95% CI 1.27 to 2.10) and 70–79 (aOR 2.27; 95% CI 1.68 to 3.07) years were significantly more likely to undergo thyroid cancer screening, compared with women aged 40–49 years. Women who had a middle or high school education, moderate belief in the effectiveness of health screening, household income equal to or more than US$3500, and higher perceived risk of cancer were more likely to attend thyroid cancer. Attending breast or cervical cancer screening was the strongest predictor for undergoing thyroid cancer screening. Women who attended cervical cancer screening (aOR 3.67; 95% CI 2.90 to 4.64) and breast cancer screening (aOR 10.91; 95% CI 8.41 to 14.14) had higher odds of attending thyroid

Table 1 Characteristics of the study subjects according to receipt of thyroid cancer screening within 2 years (n=8697)

		Unweighted, N (%)		Weighted, %	
	Total N (%)	No	Yes	Yes	P value*
Total	8697 (100)	5082 (58.4)	3615 (41.6)	39.2	
Predisposing					
Age group					<0.0001
20–29	1210 (13.9)	1085 (89.7)	125 (10.3)	11.0	
30–39	1182 (13.6)	857 (72.5)	325 (27.5)	28.5	
40–49	1217 (14.0)	664 (54.6)	553 (45.4)	43.0	
50–59	1456 (16.7)	611 (42.0)	845 (58.0)	57.0	
60–69	1703 (19.6)	799 (46.9)	904 (53.1)	51.8	
70–79	1929 (22.2)	1066 (55.3)	863 (44.7)	45.0	
Marital status					<0.0001
Unmarried	1445 (16.6)	1265 (87.5)	180 (12.5)	13.9	
Married	5892 (67.8)	3066 (52.0)	2826 (48.0)	46.7	
Divorced/widowed/separated	1360 (15.6)	751 (55.2)	609 (44.8)	45.4	
Family size					
Live alone	872 (10.0)	512 (58.7)	360 (41.3)	40.0	<0.0001
2–3	4004 (46.0)	2150 (53.7)	1854 (46.3)	43.5	
4 or more	3821 (43.9)	2420 (63.3)	1401 (36.7)	36.2	
Education level					<0.0001
Elementary school or less	1846 (21.2)	1013 (54.9)	833 (45.1)	45.3	
Middle/high school	3964 (45.6)	2052 (51.8)	1912 (48.2)	46.3	
University and higher	2887 (33.2)	2017 (69.9)	870 (30.1)	30.5	
Employment status					0.7695
Unemployed	4757 (54.7)	2773 (58.3)	1984 (41.7)	39.1	
Employed	3940 (45.3)	2309 (58.6)	1631 (41.4)	39.3	
Belief in health screening effectiveness					0.0003
Weak	4233 (48.7)	2381 (56.3)	1852 (43.8)	40.8	
Moderate	2872 (33.0)	1737 (60.5)	1135 (39.5)	39.1	
Strong	1592 (18.3)	964 (60.6)	628 (39.5)	35.8	
Enabling					
Monthly household income (US$)					0.1553
≤1699	2246 (25.8)	1275 (56.8)	971 (43.2)	41.0	
1700–3499	3518 (40.5)	2066 (58.7)	1452 (41.3)	38.4	
≥3500	2933 (33.7)	1741 (59.4)	1192 (40.6)	39.5	
Urbanisation					0.0249
Urban	6911 (79.5)	4080 (59.0)	2831 (41.0)	38.8	
Rural	1786 (20.5)	1002 (56.1)	784 (43.9)	41.6	
Private insurance					
No	2468 (28.4)	1589 (64.4)	879 (35.6)	33.3	<0.0001
Yes	6229 (71.6)	3493 (56.1)	2736 (43.9)	40.8	
Experience of unmet healthcare need					
Yes	837 (9.6)	519 (62.0)	318 (38.0)	39.2	0.0274
No	7860 (90.4)	4563 (58.0)	3297 (42.0)	39.5	
Need					
Self-reported health status					<0.0001
Good	4546 (52.3)	2801 (61.6)	1745 (38.4)	36.4	
Average	2860 (32.9)	1561 (54.6)	1299 (45.4)	43.4	
Bad	1291 (18.4)	720 (55.8)	571 (44.2)	43.5	

Continued

Table 1 Continued

	Total N (%)	Unweighted, N (%)		Weighted, %	P value*
		No	Yes	Yes	
Perceived risk of cancer					<0.0001
Low	2840 (32.7)	1887 (66.4)	953 (33.6)	31.7	
Average	3378 (33.9)	1861 (55.1)	1517 (44.9)	42.4	
High	2479 (28.5)	1334 (53.8)	1145 (46.2)	44.5	
Chronic disease					<0.0001
Yes	2568 (29.5)	1317 (51.3)	1251 (48.7)	49.5	
No	6129 (70.5)	3765 (61.4)	2364 (38.6)	36.7	
Cervical cancer screening in past 2 years					<0.0001
No	3678 (42.3)	3297 (89.6)	381 (10.4)	7.7	
Yes	5019 (57.7)	1785 (35.6)	3234 (64.4)	63.6	
Breast cancer screening in past 2 years					<0.0001
No	3599 (41.4)	3324 (92.4)	275 (7.6)	5.7	
Yes	5098 (58.6)	1758 (34.5)	3340 (65.5)	65.7	

*P value for unweighted thyroid cancer screening rates.

cancer screening than women who had not undergone screening for either of these other cancers.

DISCUSSION

This study examined recent thyroid cancer screening rates and factors associated with thyroid cancer screening over the last 2 years for women aged 20–79 years according to Andersen's behavioural model. Even though Korean cancer guidelines do not recommend thyroid cancer screening for asymptomatic individuals, the weighted rate of thyroid cancer screening among women was 39.2%, which the highest it has been in Korea. Thyroid cancer screening rates for women were reported at 16.4% by the National Cancer Screening Survey in 2009, at 16% by the Korean Community Health Survey in 2010 and at 31.3% by the National Evidence-Based Healthcare Collaborating Agency in 2011.[6 12 13] These three studies were all nationwide surveys, although they used different questionnaires, age ranges and screening intervals. Due to these differences, we could not confirm an increase in thyroid cancer screening rates by comparing our results with previous studies. However, it can be inferred that the rate of screening has increased.

Studies in Korea are reporting correlations between increased incidences of and screening rates for thyroid cancer.[7 9] In the present study, we noted that more than

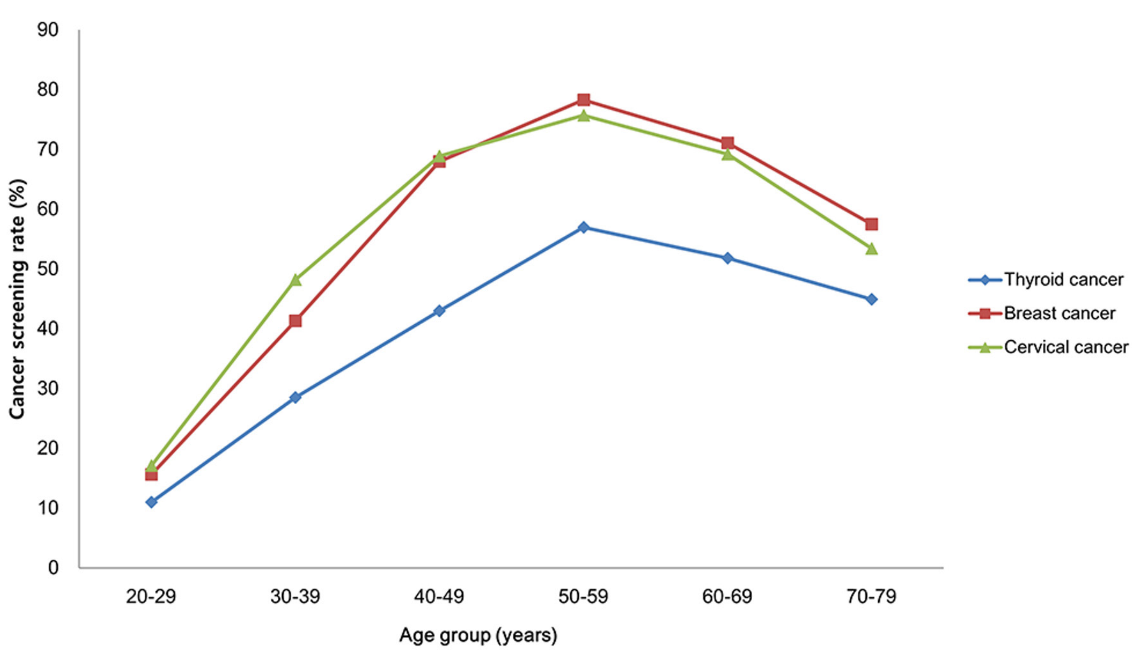

Figure 1 Weighted cancer screening rates for three types of cancer according to age groups.

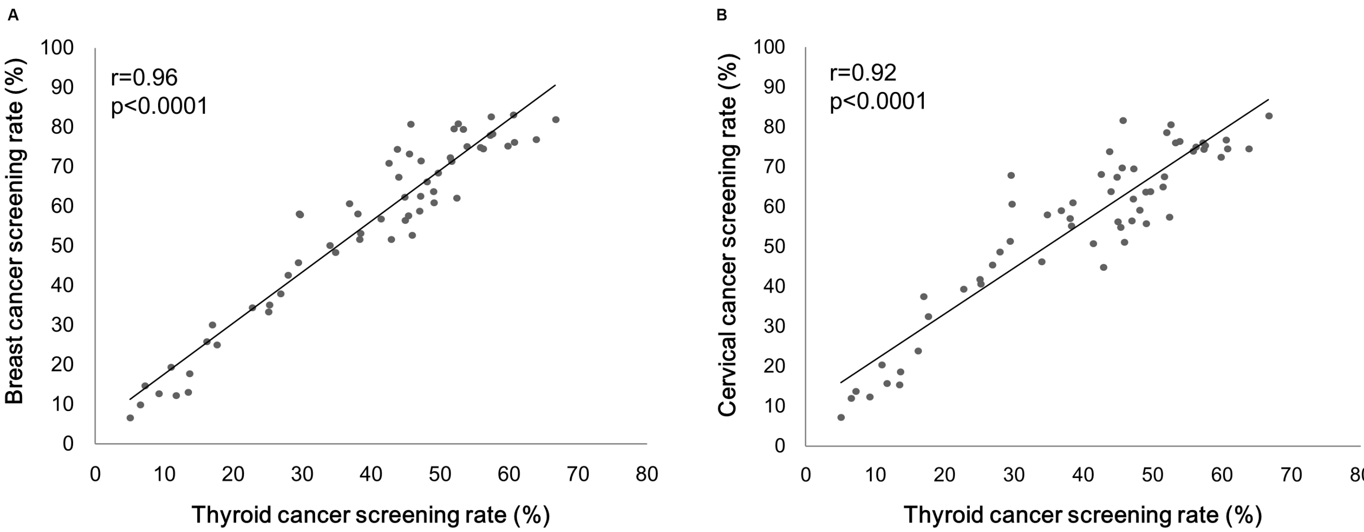

Figure 2 Correlations between thyroid cancer screening rate and (A) breast and (B) cervical cancer screening rate according to age (a year). Each dot represents age.

half of women aged 50–59 (57.0%) and 60–69 (51.8%) years attended thyroid cancer screening over the last 2 years. Consistent with these results, previous studies have also indicated that women aged 50–59 years exhibit the highest thyroid cancer screening rate.[12 22] Meanwhile, the age-specific incidence of thyroid cancer in 2013 peaked in Korean women aged 50–59 years.[7] Additionally, when we compared thyroid cancer incidence in data from the Korean Central Cancer Registry in 2014 and thyroid cancer screening rates from our study, we noted strong correlations between them (online supplementary 1). These results support the association between thyroid cancer incidence and thyroid cancer screening. Indeed, many hospitals and clinicians in Korea encourage routine health checks that include the option of screening for thyroid cancer (for an additional fee, as this is not covered by national health insurance).[6 7]

As factors associated with thyroid cancer screening in multivariable logistic regression analysis, women with older age, middle or high school education level, moderate belief in health screening effectiveness, household income equal to or more than US$3500, average or high levels of perceived risk of cancer and prior experience with breast or cervical cancer screening were more likely to undergo thyroid cancer screening. Women who attended cervical cancer screening (aOR 3.67; 95% CI 2.90 to 4.64) or breast cancer screening (aOR 10.91; 95% CI 8.41 to 14.14) had higher odds of attending thyroid cancer screening than women who did not attend cancer screening. Our results are similar to those in previous studies on the association between participation in screening for other cancers and thyroid cancer screening.[12 13] In particular, it has been reported that women who have undergone breast cancer screening are prone to undergo thyroid cancer screening.[17 18]

With the promotion of cancer screening by the government and media, participation rates in the NCSP have increased dramatically over the last two decades.[8 23] Although thyroid cancer screening is not included in the NCSP, the rate of screening for thyroid cancer seems to have been affected by the NCSP. In general, people who participate the NCSP can receive thyroid cancer screening additionally based on their own needs or their physician's recommendations by paying an extra fee. In support of this notion, researchers reported that, in Korea, the incidence of thyroid cancer increased slowly beginning in 1990; however, after the NCSP was launched for gastric, breast, cervical, liver and colorectal cancer, it rapidly increased.[8] According to cancer statistics, the incidence of thyroid cancer in 2011 was 15-fold higher than that in 1993.[9]

In recent decades, the incidence of thyroid cancer has increased steadily and consistently in many developed countries. According to a recently reported article, the highest rates (>25 cases per 100 000 women) were observed in Korea, Israel, Canada, USA, Italy, France and low-income and middle-income countries (LMICs), such as Turkey, Costa Rica, Brazil and Ecuador.[24] This international comparison study confirmed the very high thyroid cancer incidence rates in some, but not all, high-income countries in 2008–2012 and also showed very high incidence rates in several LMICs, particularly in urban areas.[24] The very high thyroid cancer incidence and low mortality rates in some LMICs also strongly suggest a major role for overdiagnosis. Ultrasound examinations have become increasingly available, and encouraging opportunistic screening has increased detection of smaller, asymptomatic nodules. Overdiagnosis is more likely to occur under privately oriented healthcare systems in the absence of a gatekeeping role in primary care for referral to secondary care and under systems where doctors are paid by a fee for service. Also, the absence of thyroid cancer screening guidelines may contribute diagnosis of indolent tumours. Thus, special concern is needed for these countries to reduce overdiagnosis.

Table 2 Associations among predisposing, enabling and need factors in relation to thyroid cancer screening within the last 2 years (n=8697)

	Model 1		Model 2		Model 3	
	aOR	95% CI	aOR	95% CI	aOR	95% CI
Predisposing						
Age group						
20–29	0.26	(0.19 to 0.35)	0.26	(0.19 to 0.37)	0.71	(0.51 to 1.01)
30–39	0.58	(0.47 to 0.71)	0.60	(0.48 to 0.73)	1.01	(0.79 to 1.28)
40–49	1.00		1.00		1.00	
50–59	1.78	(1.48 to 2.13)	1.74	(1.45 to 2.09)	1.58	(1.28 to 1.94)
60–69	1.53	(1.25 to 1.88)	1.62	(1.32 to 1.98)	1.64	(1.27 to 2.10)
70–79	1.30	(1.04 to 1.62)	1.51	(1.19 to 1.90)	2.27	(1.68 to 3.07)
Marital status						
Unmarried	1.00		1.00		1.00	
Divorced/widowed/separated	1.52	(1.10 to 2.11)	1.58	(1.14 to 2.21)	1.07	(0.74 to 1.55)
Married	1.74	(1.33 to 2.29)	1.73	(1.31 to 2.28)	0.88	(0.65 to 1.20)
Family size						
Live alone	1.00		1.00		1.00	
2–3	0.81	(0.62 to 1.07)	0.74	(0.55 to 0.98)	0.93	(0.69 to 1.25)
4 and more	0.78	(0.58 to 1.03)	0.66	(0.48 to 0.89)	0.85	(0.62 to 1.17)
Education						
Elementary school or less	1.00		1.00		1.00	
Middle/high school	1.22	(1.05 to 1.43)	1.07	(0.91 to 1.26)	1.28	(1.02 to 1.59)
University and higher	1.26	(1.02 to 1.55)	0.99	(0.80 to 1.24)	1.27	(0.96 to 1.68)
Employment status						
Unemployed	1.00		1.00		1.00	
Employed	1.19	(1.05 to 1.34)	1.1	(0.97 to 1.24)	0.91	(0.79 to 1.06)
Belief of health screening effectiveness						
Weak	1.00		1.00		1.00	
Moderate	0.99	(0.87 to 1.12)	1.00	(0.87 to 1.13)	1.25	(1.07 to 1.45)
Strong	0.79	(0.68 to 0.91)	0.80	(0.69 to 0.92)	1.14	(0.94 to 1.38)
Enabling						
Monthly household income (US$)						
≤1699			1.00		1.00	
1700–3499			1.16	(0.98 to 1.37)	1.23	(0.99 to 1.51)
≥3500			1.55	(1.28 to 1.89)	1.44	(1.13 to 1.84)
Urbanisation						
Rural			1.00		1.00	
Urban			0.88	(0.77 to 1.01)	0.95	(0.81 to 1.12)
Private insurance						
No			1.00		1.00	
Yes			1.45	(1.24 to 1.69)	1.17	(0.96 to 1.42)
Experience of unmet healthcare need						
Yes			1.00		1.00	
No			0.99	(0.81 to 1.21)	0.93	(0.74 to 1.16)
Need						
Self-reported health status						
Good					1.00	
Average					0.84	(0.65 to 1.09)
Bad					0.96	(0.82 to 1.12)

Continued

Table 2 Continued

	Model 1		Model 2		Model 3	
	aOR	95% CI	aOR	95% CI	aOR	95% CI
Perceived risk of cancer						
Low					1.00	
Average					1.21	(1.03 to 1.42)
High					1.27	(1.06 to 1.53)
Chronic disease						
No					1.00	
Yes					1.13	(0.93 to 1.38)
Cervical cancer screening in past 2 years						
No					1.00	
Yes					3.67	(2.90 to 4.64)
Breast cancer screening in past 2 years						
No					1.00	
Yes					10.91	(8.41 to 14.14)

Model 1: Adjusted with predisposing factors. Model 2: Adjusted with predisposing and enabling factors. Model 3: Adjusted with predisposing, enabling and need factors.
aOR, adjusted OR.

In previous studies, socioeconomic status was identified as a significant risk factor affecting the prevalence of thyroid cancer.[22 25] In one of these studies, women with higher levels of household income were found to have attended thyroid cancer screening more.[25] This is consistent with our study. In Korea, thyroid cancer screening is provided via opportunistic screening,[13] and opportunistic screening is more commonly used by people with higher income in Korea.[26] Meanwhile, we also found perceived risk of cancer to be a significant factor in thyroid cancer screening attendance. While there are no studies related to perceived cancer risk and thyroid cancer screening, a significant association between breast cancer risk and mammography has been reported.[27] We suspect that recent reports of steep increases in thyroid cancer incidence may have increased fears and perceived risk of thyroid cancer.

The current study reports the most recent thyroid cancer screening rate and factors associated therewith in women using data from a nationwide survey. This was the first study to focus on women's health-related issues concerning thyroid cancer screening. However, there are some limitations to this study. Due to the cross-sectional study design, this study could not show the direction of causal relationships for the identified associations between thyroid cancer screening and other factors. Also, information on thyroid cancer screening and other independent variables could contribute to recall bias because the data were obtained from a self-reported survey (K-Stori). Previous research has shown that screening rates from self-reported surveys can be under or overestimated depending on individual characteristics.[28 29] Notwithstanding, the survey was conducted by trained interviewers, and professional research agencies provided quality control for interviewers and ensured missing values and data errors were minimal.

Although this study reports current thyroid cancer screening rates and factors associated therewith, further studies are needed to investigate and to control current thyroid cancer epidemic issues in Korea. In particular, since the National Cancer Screening Guidelines only recently announced that thyroid cancer screening is not recommended in asymptomatic adults, it is necessary to assess changes in thyroid cancer screening behaviour as a result thereof. Also, further study is needed to determine potential causes of thyroid cancer and thyroid cancer screening behaviour for both men and women.

CONCLUSIONS

In conclusion, even though thyroid cancer screening is not recommended for asymptomatic populations, about 40% of Korean women attended thyroid cancer screening over the last 2 years. Women who attended breast or cervical cancer, which are nationally recommended for Korean women, were more likely to attend thyroid cancer screening. These findings highlight the need to increase awareness of different recommendations for various cancer screenings in order to minimise poor cost-effectiveness and risk of overdiagnosis. Increasing awareness of the benefits and risks of thyroid cancer screening may require targeted intervention.

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Funding This research was supported by a fund from the Research of Korea Centers for Disease Control and Prevention (#2015ER630300) and a Grant-in-Aid for Cancer Research and Control from the National Cancer Center of Korea (#1610401).

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval This study was approved by the Institutional Review Board of the National Cancer Center, Korea (NCC2016-0062).

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement The data collected from the study are owned by research funding agencies (KCDC). Thus, the official request channel for datasets used and/or analysed in the current study is the Korea Centers for Disease Control and Prevention. Thus, the datasets used and/or analysed during the current study are available from the Korea Centers for Disease Control and Prevention upon reasonable request. The contact information for access is as follows; Division of cardiovascular Diseases, Center for Biomedical Science Korea National Institute of Health, Korea Center for Disease Control & Prevention wnddus7361@korea.kr.

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