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Public Awareness of Stroke in Korea

A Population-Based National Survey

Young Seo Kim, MD; Sang-Soon Park, MD; Hee-Joon Bae, MD, PhD; Ji Hoe Heo, MD, PhD;
Sun U. Kwon, MD, PhD; Byung-Chul Lee, MD, PhD; Seung-Hoon Lee, MD, PhD;
Chang Wan Oh, MD, PhD; Byung-Woo Yoon, MD, PhD

Background and Purpose—To date, no large study has been conducted to investigate baseline stroke awareness within a nationally representative sample of the Korean population.

Methods—A total of 1000 residents were randomly sampled according to regional demographic characteristics and were interviewed in person by trained interviewers. Structured, open-ended and close-ended questions were asked to assess stroke awareness.

Results—Among the respondents, 62% reported at least 1 stroke symptom and 56% reported at least 1 risk factor for stroke in open-ended questioning. Multivariate analysis revealed that completion of ≥12 years of education was independently associated with knowledge of symptoms (OR, 1.527; 95% CI, 1.146–2.034) and risk factors (OR, 1.577; 95% CI, 1.175–2.115). Approximately 31% and 33% of respondents, respectively, had some knowledge of thrombolysis and the proper action (call emergency medical services). Compared with subjects aged 20 to 39 years, those aged 40 to 59 years were more knowledgeable about thrombolysis (OR, 1.433; 95% CI, 1.045–1.964) and proper action (OR, 2.291; 95% CI, 1.646–3.188). The major source of information about stroke was television (59%), and the most reliable source was the respondents' physicians (55%). Among respondents 20 to 39 years of age, the Internet (37%) was the second greatest source of information.

Conclusions—Stroke awareness was suboptimal in Korea, especially among younger citizens and those with less education. To improve their knowledge, physicians should exert greater efforts to educate the public about stroke using mass media and the Internet. (***Stroke***. 2012;43:1146-1149.)

Key Words: national survey ■ public awareness ■ stroke ■ population

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Korea is one of the most rapidly aging countries in the world, and the incidence of stroke in Korea is increasing. Although the number of stroke-related deaths has been decreasing in recent years, stroke is still the leading cause of death in Korea.[1] However, stroke can be prevented with aggressive control of risk factors, and ischemic stroke symptoms can be reversed with thrombolysis.[2] Therefore, stroke awareness in the general public is important for prevention of strokes and provision of proper treatment.

Many researchers in developed and developing countries have studied stroke awareness, and a lack of knowledge of stroke symptoms and risk factors has been documented.[3–8] In Korea, several studies have addressed stroke awareness in the general population; however, these studies were only conducted in limited areas.[7–9] In this study, we aimed to assess stroke awareness in a nationally representative sample and to identify factors associated with stroke-related knowledge.

Methods

A total of 1000 people were interviewed; the sampling error for the survey was ±3.1% at the 95% CI. To ensure that our data were reasonably representative, we conducted random sampling of participants in public spaces (including train stations, bus stations, department stores, and public parks) in proportion to the total number of residents in several demographic categories based on the 2005 census (online-only Supplemental Table 1; http://stroke.ahajournals.org). Fourteen trained interviewers conducted in-person interviews in Korean, and telephone numbers were collected to monitor survey quality. Participation was limited to adults of at least 20 years of age, and consent was obtained before the survey. No public campaigns or educational efforts were launched before or during the study. The Institutional Review Board of the Seoul National University Hospital approved

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Table 1.   Recognition of Stroke Symptoms and Risk Factors (Open-Ended Questions)

Characteristics	Total (N=1000)	Age, y			P
		20–39 (n=449)	40–59 (n=374)	≥60 (n=177)	
Stroke symptoms					
Any paresis (%)	437 (44)	204 (45)	164 (44)	69 (39)	0.341
Language disturbance (%)	269 (27)	121 (27)	103 (28)	45 (25)	0.872
Loss of consciousness (%)	106 (11)	57 (13)	30 (8)	22 (12)	0.077
Dizziness (%)	90 (9)	32 (7)	37 (10)	21 (12)	0.131
Hemiparesis (%)	76 (8)	19 (4)	37 (10)	20 (11)	0.001
Know ≥1 symptom (%)	615 (62)	286 (64)	226 (60)	103 (58)	0.384
Mean correct response (SD)	1.1 (1.0)	1.1 (1.0)	1.1 (1.1)	1.1 (1.1)	0.922*
Risk factors					
Hypertension (%)	312 (31)	137 (31)	120 (32)	55 (31)	0.888
Heavy drinking (%)	232 (23)	116 (26)	86 (23)	30 (17)	0.060
Smoking (%)	212 (21)	102 (23)	78 (21)	32 (18)	0.432
Hyperlipidemia (%)	139 (14)	60 (13)	63 (17)	24 (14)	0.334
Obesity (%)	135 (14)	54 (12)	51 (14)	22 (12)	0.782
Diabetes (%)	86 (9)	36 (8)	38 (10)	12 (7)	0.350
Family history of stroke (%)	81 (8)	27 (6)	20 (5)	6 (3)	0.418
Physical inactivity (%)	81 (8)	42 (9)	30 (8)	9 (5)	0.211
Know ≥1 risk factor (%)	561 (56)	259 (57)	214 (57)	88 (49)	0.167
Mean correct response (SD)	1.3 (1.3)	1.3 (1.3)	1.3 (1.3)	1.2 (1.4)	0.305*

Symptoms reported by <5% of the total study group are not listed.

Pearson χ^2 test and *analysis of variance test were used.

the study. A questionnaire was developed for assessment of stroke awareness that contained 5 sections (stroke definition, stroke symptoms and risk factors, stroke treatment, information sources, and demographic factors). These sections are described in detail in the online-only Supplemental Methods.

Statistical Analysis

Numbers and proportions are presented to describe baseline characteristics. The χ^2 test was used for assessment of univariate relationships between various factors, and one-way analysis of variance with the Tukey post hoc test was performed to compare mean correct responses. Using multivariable logistic regression analysis, we investigated the effects of demographics and a respondent's personal risk factors on stroke awareness (knowledge of stroke definition, symptoms, risk factors, thrombolysis, and proper action). Explanatory variables, as identified by univariate analysis at $P<0.2$, were used in the model. All significance tests were 2-tailed, and differences were considered statistically significant at $P<0.05$. SPSS Version 12.0 for Windows (SPSS, Inc) was used for data analysis.

Results

To obtain 1000 completed questionnaires, a total of 3960 people were contacted. The response rate was 25.3%. The mean age was 42.8±14.1 years, and participants ranged from 20 to 81 years of age. Demographic characteristics of the respondents are shown in the online-only Supplemental Table 2.

Knowledge of Stroke Symptoms and Risk Factors

Recognition of stroke symptoms and risk factors in the open-ended survey questions are shown in Table 1. The most commonly identified stroke symptom was paresis (44%). When stratifying identification of symptoms by age group,

hemiparesis was identified significantly less frequently among participants 20 to 39 years of age than in the other groups. Hypertension (31%) was the most commonly listed risk factor followed by heavy drinking (23%) and smoking (21%). When the listed symptoms and risk factors were stratified by education, completion of ≥12 years of education generally correlated with greater knowledge. However, we did not find any difference when stratifying by residence population (online-only Supplemental Table 3).

A total of 615 (62%) respondents listed ≥1 symptom, and 561 (56%) respondents listed ≥1 risk factor. The mean (SD) number of correctly listed symptoms was 1.1 (1.0), and the mean number of correctly listed risk factors was 1.3 (1.3). In multivariable logistic regression analysis, completion of ≥12 years of education corresponded with better knowledge of stroke symptoms and risk factors (Table 2).

Knowledge of Thrombolysis and Response to Stroke Symptoms

Of the participants, 305 (31%) had knowledge of thrombolysis. A total of 937 (94%) respondents stated that they would visit the general hospital if they experienced stroke symptoms; however, only 325 (33%) subjects chose the proper action of calling emergency medical services. Multivariable logistic regression analysis for those two factors showed that the older age groups, when compared with participants 20 to 39 years of age, tended to have better knowledge about thrombolysis and proper action on symptom presentation (Table 3).

Table 2. Multivariable Logistic Regression Analysis: Factors Associated With Knowledge of Stroke Symptoms and Risk Factors

	Knowledge of Stroke Symptoms Adjusted OR (95% CI)	P	Knowledge of Stroke Risk Factors Adjusted OR (95% CI)	P
Education				
Completion of >12 y	1.527 (1.146–2.034)	0.004	1.577 (1.175–2.115)	0.002
Risk factors				
Obesity	1.468 (1.032–2.088)	0.033		
Family history of stroke			2.127 (1.401–3.229)	<0.001

Candidate variables were selected from the univariate analysis results with a *P*<0.2.
OR indicates odds ratio; CI, confidence interval.

Sources of Information About Stroke

The most common source of information about stroke identified by respondents was television (59%) followed by newspapers/magazines (33%; online-only Supplemental Table 4). However, the Internet (37%) was the second most commonly reported source for 20 to 39 years of age. Few subjects, especially among the younger participants, cited their physicians as a source of information. However, physicians were cited as the most reliable source of information (55%) followed by television (34%) and then educational health programs (25%).

Discussion

This study was the first national survey to investigate stroke awareness in the general Korean public using in person interviews. It is representative because participants were randomly selected based on regional demographic characteristics, and selection bias was minimized. Therefore, our study may contain unique information about the Korean population.

Awareness of stroke symptoms and risk factors was significantly higher among participants with more education. Although education level was high among 20 to 39 years of age (online-only Supplemental Table 5), this group did not have more knowledge than older age groups. These findings may be associated with the fact that older adults have more risk factors and visit the hospital regularly and thus receive more information from their physicians. Considering that awareness of stroke in bystanders has been shown to reduce prehospital delays in Korea,[9] educational strategies focused on younger people are necessary.

If more people understand that stroke treatments can reverse symptoms, decisions after symptom occurrence could

possibly occur more quickly.[10] Therefore, knowledge of thrombolysis and the proper actions after the appearance of stroke symptoms are important. In our study, 31% of respondents were familiar with thrombolysis, and 33% stated that using emergency medical services transportation is the correct action. Although the rate of familiarity with thrombolysis was higher than in a previous report,[6] there is great potential for improvements in overall knowledge among Korean residents. Multivariate analysis showed that adults aged 20 to 39 years consistently demonstrated poor knowledge. The lack of knowledge in younger respondents was an interesting finding, and educational efforts should be directed at these individuals.

An important limitation of our study is that the response rate was only 25.3%. The low response rate may have been due to numerous contacts with elderly and poorly educated subjects who chose not to participate. As a result, overestimation of the population's knowledge about stroke is a possibility that should be considered when generalizing these results. However, we believe that older subjects and those with low literacy may provide unclear data and limited information.

In addition to knowledge about stroke symptoms and risk factors, an understanding of the time-sensitive nature of stroke treatments is essential. In our study, we made the important observation that the younger generation had less knowledge of proper stroke treatments. Development of educational strategies should take into consideration the findings that the younger generation tended to obtain information from the Internet and that the most reliable source of information is physicians. After sufficiently educating the general public, a national survey using the

Table 3. Multivariable Logistic Regression Analysis: Factors Associated With Knowledge of Thrombolysis and Proper Action (Call EMS)

	Knowledge of Thrombolysis Adjusted OR (95% CI)	P	Proper Action (call EMS) Adjusted OR (95% CI)	P
Age, y				
20–39	Reference		Reference	
40–59	2.291 (1.646–3.188)	<0.001	1.433 (1.045–1.964)	0.025
≥60	2.146 (1.415–3.255)	<0.001	1.060 (0.698–1.610)	0.786
Risk factor				
Hypertension	1.780 (1.178–2.688)	0.006		

Candidate variables were selected from the univariate analysis results with a *P*<0.2.
EMS indicates emergency medical services; OR, odds ratio; CI, confidence interval.

same methods should be repeated to evaluate stroke awareness.

Sources of Funding

Disclosures

None.

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SUPPLEMENTAL MATERIAL

Supplemental Materials

Supplemental Methods

Questionnaires

The survey, which was developed for assessment of stroke awareness, contained 5 sections. In the first section, subjects were asked close-ended questions about the definition of stroke and their familiarity with the word "stroke". In the second section, respondents were asked to name stroke symptoms and risk factors. Of the responses received, the following were regarded as stroke symptoms: weakness of the arm and leg on one side of the body, sensory loss in the arm and leg on one side of the body, language disturbance, dysarthria, dizziness, gait disturbance, loss of consciousness, vision loss in one eye, visual field defects, double vision, and severe headache. Of the responses received, the following were regarded as risk factors: hypertension, smoking, heavy drinking, diabetes, hypercholesterolemia, obesity, physical inactivity, family history of stroke, old age, and heart disease. In the third section, subjects were asked close-ended questions about thrombolysis and their actions immediately following occurrence of stroke symptoms; calling emergency medical services (EMS) was considered to be the proper action. In the fourth section, subjects were asked in close-ended questions to name the sources of their stroke-related information; the most reliable information sources were listed in subsequent multiple-choice questions. Finally, in the fifth section, characteristics of the participants, including age, sex, home province, education and economic level, habitation status, and the presence of risk factors for stroke were recorded.

Supplemental Results

Knowledge of the definition of stroke

A total of 978 subjects (98%) had some familiarity with the word "stroke". When asked for a definition of stroke, 816, 87, and 45 subjects (82%, 9%, and 5%) responded that stroke is a vascular disease of the brain, a degenerative disease of the brain, and a convulsive disease of the brain, respectively. According to multivariable logistic regression analysis, respondents aged 40-59, compared to respondents aged 20-39 (OR 1.513, 95% CI 1.024-2.235), those with hypertension (OR 2.442, 95% CI 1.209-4.933), those with hyperlipidemia (OR 3.361, 95% CI 1.308-8.636), and those with a family history of stroke (OR 2.126, 95% CI 1.124-4.021) were more likely to know the definition of stroke.

Supplemental discussion

Almost all of the subjects (97%) replied that they had heard about stroke, and more than 80% knew the correct definition of stroke. Compared to reports from France (77%),[1] Ireland (60%),[2] and India (46%),[3] knowledge of the definition of stroke was more common in this study. This may be due to the fact that the Korean word for stroke, "noejoljoong", includes the word "noe", which means brain. Thus, people may understand that stroke is a disease of the brain. In addition, the question regarding stroke definition was a close-ended question, and respondents were asked to choose one answer. However, the majority of respondents identified stroke as a vascular disease rather than a degenerative or convulsive disease of the brain, which could reflect a relatively high level of stroke knowledge among members of the general Korean public.

Approximately 62% of subjects identified more than one stroke symptom, and this result is comparable to other studies in which 33-82% of respondents identified more than one symptom.[1-12] A previous Korean study reported that more than 74% of subjects correctly identified at least one stroke symptom.[12] However, the study was conducted only in Seoul, which could have introduced a selection bias.

Patients who recognize risk factors are more likely to comply; therefore, knowledge of stroke risk factors is important.[13] In our study, 56% of subjects knew at least one risk factor; other studies have shown that 57-90% of respondents knew at least one factor.[1-12] However, previous studies were administered in hospitals or large cities, and the results may not be representative of national data. In addition, awareness of stroke risk factors was nearly 10% greater in this study than in a previous Korean study.[12] The most commonly identified risk factor was hypertension, and results are similar to those of other studies.[2, 4-9, 11, 12, 14] Risk factors identified after hypertension were heavy drinking (23%), smoking (21%), and mental stress (18%), all of which are often associated with poor lifestyle behaviors. This may imply that Koreans tend to regard strokes as a result of poor lifestyle behaviors rather than as an actual disease. Therefore, we suggest that educational efforts be more focused on stroke-related diseases, such as diabetes and heart disease, which are not commonly recognized as stroke risk factors by the general public.

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Supplemental Table 1. Comparison of the study population and the Korean population

	Study population	Korean population[*]
Size	1000	35.0 million
Sex		
Male (%)	492 (49.2)	17.2 million (49.1)
Female (%)	508 (50.8)	17.8 million (50.9)
Age, years		
20-39 (%)	449 (44.9)	15.5 million (44.5)
40-59 (%)	374 (37.4)	13.2 million (37.6)
≥60 (%)	177 (17.7)	6.3 million (17.9)
Residence, region		
Capital city, Seoul (%)	216 (21.6)	7.5 million (21.5)
Six metropolitan cities (%)	269 (26.9)	9.1 million (26.1)
Gyeonggi province (%)	214 (21.4)	7.5 million (21.3)
Gangwon province (%)	30 (3)	1.1 million (3.1)
Chungcheong province (%)	69 (6.9)	2.5 million (7.1)
Jeolla province (%)	79 (7.9)	2.7 million (7.7)
Gyeongsang province (%)	123 (12.3)	4.2 million (12.0)
Jeju province (%)	0 (0)	0.4 million (1.1)

[*] Members of the Korean population based on the 2005 Korean census who were more than 20 years old.

Supplemental Table 2. Baseline respondent characteristics.

	Total (N = 1,000)
Male sex (%)	492 (49)
Age, years	
20-39 (%)	449 (45)
40-59 (%)	374 (37)
≥60 (%)	177 (18)
Education, years	
<6 (%)	16 (2)
6-9 (%)	83 (8)
9-12 (%)	491 (49)
>12 (%)	411 (41)
Household income, $	
<10,000 (%)	112 (11)
10,000-30,000 (%)	502 (50)
30,000-50,000 (%)	231 (23)
≥50,000 (%)	100 (10)
Do not wish to answer (%)	55 (6)
Residence, population	
≥1,000,000 (%)	485 (49)
50,000-1,000,000 (%)	444 (44)
<50,000 (%)	71 (7)
Living alone (%)	126 (13)
Risk factors	
Stroke (%)	11 (1)
Hypertension (%)	134 (13)
Diabetes mellitus (%)	39 (4)
Hyperlipidemia (%)	93 (9)
Heart disease (%)	19 (2)
Family history of stroke (%)	143 (14)
Obesity (%)	200 (20)
Current smoker (%)	184 (18)
Heavy drinker (%)	102 (10)

Supplemental Table 3. Recognition of stroke symptoms and risk factors (open-ended questions)

Characteristics	Total (N = 1,000)	Education, years			P	Residence, population		P
		<9 (n = 99)	9-12 (n = 490)	≥12 (n = 411)		<1 million (n = 515)	≥1 million (n = 485)	
Stroke symptoms								
Any paresis (%)	437 (44)	34 (34)	192 (39)	201 (49)	0.003	229 (44)	208 (43)	0.615
Language disturbance (%)	269 (27)	18 (18)	128 (26)	123 (30)	0.052	144 (28)	125 (26)	0.436
Loss of consciousness (%)	106 (11)	7 (7)	41 (8)	58 (14)	0.009	47 (9)	59 (12)	0.112
Dizziness (%)	90 (9)	4 (4)	41 (8)	45 (11)	0.077	36 (7)	54 (11)	0.022
Hemiparesis (%)	76 (8)	9 (9)	36 (7)	31 (8)	0.835	38 (7)	38 (8)	0.786
Know more than 1 symptom (%)	615 (62)	47 (47)	287 (59)	281 (68)	<0.001	316 (61)	299 (62)	0.925
Mean correct response (SD)	1.1 (1.0)	0.8 (1.0)	1.0 (1.0)	1.3 (1.1)	<0.001[**]	1.1 (1.0)	1.1 (1.1)	0.560[*]
Risk factors								
Hypertension (%)	312 (31)	27 (27)	147 (30)	138 (34)	0.346	173 (34)	139 (29)	0.092
Heavy drinking (%)	232 (23)	10 (10)	101 (21)	121 (29)	<0.001	116 (23)	116 (24)	0.602
Smoking (%)	212 (21)	14 (14)	111 (23)	97 (24)	0.120	114 (22)	98 (20)	0.456
Hyperlipidemia (%)	139 (14)	9 (9)	63 (13)	67 (16)	0.114	73 (14)	66 (14)	0.796
Obesity (%)	135 (14)	12 (12)	57 (12)	66 (16)	0.140	72 (14)	63 (13)	0.647
Diabetes (%)	86 (9)	7 (7)	36 (7)	43 (10)	0.213	43 (8)	43 (9)	0.771
Family history of stroke (%)	81 (8)	3 (3)	52 (11)	26 (6)	0.009	58 (11)	23 (5)	<0.001
Physical inactivity (%)	81 (8)	2 (2)	43 (9)	36 (9)	0.006	43 (8)	38 (8)	0.766
Know more than 1 risk factor (%)	561 (56)	40 (40)	246 (50)	265 (64)	<0.001	290 (56)	271 (56)	0.890
Mean correct response (SD)	1.3 (1.3)	0.9 (1.2)	1.1 (1.3)	1.4 (1.3)	<0.001[**]	1.3 (1.4)	1.3 (1.3)	0.377[*]

Symptoms reported by fewer than 5% of the total study group are not listed.

Pearson χ^2 test, [*]Student's *t* test and [**]ANOVA test were used.

Supplemental Table 4. Information sources about stroke

Source of information	Total (N = 1,000)	Age, years		
		20-39 (n = 449)	40-59 (n = 374)	≥60 (n = 177)
Televisions (%)	591 (59)	242 (54)	231 (62)	118 (67)
Newspapers/magazines (%)	331 (33)	110 (24)	150 (40)	67 (38)
Internet (%)	278 (28)	166 (37)	87 (23)	25 (14)
Friends/colleagues (%)	277 (28)	83 (18)	129 (34)	65 (37)
Health brochures (%)	199 (20)	59 (13)	99 (26)	41 (23)
Lectures about health (%)	171 (17)	41 (9)	80 (21)	50 (28)
Physicians (%)	171 (17)	39 (9)	71 (19)	61 (34)

Supplemental Table 5. Education status according to age groups

Education, years	Total (N = 1,000)	Age, years		
		20-39 (n = 449)	40-59 (n = 374)	≥60 (n = 177)
<6 (%)	16 (2)	0 (0)	5 (1)	11 (6)
6-9 (%)	83 (8)	8 (2)	35 (9)	40 (23)
9-12 (%)	490 (49)	185 (41)	215 (58)	90 (51)
>12 (%)	411 (41)	256 (57)	119 (32)	36 (20)