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한국 중년층의 사회경제적 수준과 이명의 관련성

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The Relationship between Tinnitus and Socioeconomic Status in the Middle-Aged Population of South Korea

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초록

목적: 최근 이명의 발생률이 증가하고 있으나 이명에 대한 정확한 원인 발견이 어려운 실정이다. 한국의 경우도 예외는 아니며, 사회경제적 상태에 따른 이명여부를 분석하고자 한다.

방법: 국민건강영양조사 제 5기(2010-2012)의 원시자료를 이용하였으며, 연구 대상자인 40세 이상 12,041명을 다중 로지스틱 회귀분석을 실시하였다(95% CI).

결과: 40세 이상 중년인구의 사회경제적 상태에 따른 이명여부는 통계학적으로 유의한 차이가 있는 것으로 나타났다. 이명의 발생여부는 연령이 높을수록(p<.0001), 직업군에 따라서(p<.0001), 대사증후군이 있는 자(p<.0001), 교육수준이 낮을수록(p<.0001), 기초생활수급자(p<.0001), 배우자가 없는 자(p<.0001), 스트레스가 많을수록(p<.0001), 우울증이 높을수록(p=.0034) 이명이 발생하였다. 회귀분석 결과 여성의 경우 대상자의 학력이 초등학교 이하인 그룹에서 교차비가 높았으며(OR:1.784, 1.322-2.408) 소득이 하위계층인 그룹에서 교차비가 높았다(OR:1.591, 1.293-19.58). 하지만 남성의 경우에는 유의한 결과가 나오지 않았다.

결론: 본 연구는 40세 이상 중년인구의 사회 경제적 상태에 따른 이명여부를 파악함으로써 남성보다 여성에서 사회경제적 수준에 따라 이명여부에 영향을 많이 받는 것을 밝혀낸 것에 연구의 의의가 있다.

주제어: 국민건강영양조사, 사회경제적 수준, 이명

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Ⅰ. Introduction

Tinnitus is an increasingly prevalent health concern within the general population (Henry et al., 2005). Not a specific disorder, tinnitus is considered "a subjective feeling of noise heard in the ear" (Chae, 2009), or the conscious perception of an auditory sensation in the absence of a corresponding external stimulus (Baguley et al., 2013). Tinnitus can be broken down into categories of objective and subjective (Choi, 2011). Objective tinnitus refers to delivery of internal bodily sounds (e.g., blood flow or muscles convulsions) to the ear; in such cases, patients (and examiners) can hear sounds that have no external auditory stimulation. In contrast, in cases of subjective tinnitus, the sound can only be heard by the patient.

Despite the plethora of studies on this topic, the cause and pathogenesis of tinnitus remain unclear, making it difficult to perform precise diagnosis and treatments. The prevalence of tinnitus has been estimated using data obtained from epidemiologic studies conducted indiffer entcountries; specifically, between 10 and 15% of adults have been reported to experience tinnitus (Hoffman & Reed, 2004; Henry et al., 2008; Knobel & Sanchez, 2008; Khedr et al., 2010; Laskar et al., 2015). In Korea the prevalence of tinnitus is 20.27% very common and the prevalence is increasing year by year(Choi, 2010; Kim, 2015). Not ably, tinnitus has varying effects depending on the population, as illustrated by the "tinnitus pyramid" (Dobie, 2004). This range of needs of tinnitus sufferers is what necessitates a progressive management approach.

Recent studies on health have shown that socioeconomic variables have a clear impact on health (Hallberg et al., 1993; Berg & Serpanos, 2011), and more specifically on tinnitus (Widen & Erlandsson, 2004). The impact of socioeconomic status (SES) on health is often referred to as "health inequality" or "health equity." More broadly, health inequality can be defined as how various population groups show differing health conditions. Although some health inequalities—such as those due to genetics and age—are unavoidable, the health inequality caused by SES is considered avoidable. The mechanism by which socioeconomic inequalities influence health is by preventing certain groups from obtaining the opportunity to improve their health. SES is generally determined using the variables of individual income, education level, and occupation (Johnston et al., 2009; Cundiff et al., 2015). Income is a more direct index of material resources. Hence, while these indicators of SES present unique underlying risks for health (Cundiff et al., 2015), they are also likely to interact with both psychological and material resources, and significantly affect death and disease through independent but interrelated processes (Adler, 2009; Johnston et al., 2009). Income reflects one's standard of living, making it an important indicator of health inequality. Education level is similarly important, as it can be applied to every population group, such as employed or

unemployed persons, retirees, and housewives. It is also a somewhat stable variable for both sexes that is not influenced by acute situations, unlike income (e.g., income tends to lower for people with some form of illness). Therefore, education level can be very helpful in analyses of cause and effect (Lee & Yoon, 2001). Despite being a common otological problem that can cause various somatic and psychological problems, tinnitus has not been studied to any great degree in the Korean population. Thus, we adopted the following aims: (1) To determine the general characteristics of the study participants; (2) to determine how participants' general characteristics differ by their tinnitus status; and (3) to identify the relationship between SES (i.e., education and household income) and tinnitus, with a particular focus on sex differences (Anderson & Armstead, 1995; Netwon, 2009; Cundiff et al., 2015). Gender may also affect the relationship between social status and health outcomes (Cundiff et al., 2015). For example, social status is an index of one's standing in the social hierarchy, and men and women appear to differ in their sensitivity to hierarchy formation and maintenance (Netwon, 2009). Although gender is often treated as a control variable, there are gender differences in the relationship between SES and psychosocial and behavioral factors contributing to health disparities (Anderson & Armstead, 1995).

Therefore, in this study, we will analyze the relationship between socioeconomic level and tinnitus by gender and prepare basic data for future national health-related policies.

Ⅱ. Methods

1. Study design

We employed a cross-sectional design to identify differences in tinnitus prevalence education and household income among South Korean middle-aged (≥40 years) individuals.

The purpose of this study is to investigate the prevalence of tinnitus according to general characteristics, health behavior, and socioeconomic level and to investigate the risk factors of tinnitus in middle-aged population. Independent variables are general characteristics, socioeconomic level, health behavior and dependent variable is tinnitus.

2. Data collection

Data for this study were extracted from the 5th Korea National Health and Nutrition Examination Survey(KNHANES-V) conducted in 2010–2012. This survey applied a complex, stratified, multi stage probability sampling design based on age, sex, and region to accurately represent the non-institutionalized civilian Korean population. Moreover, a rolling sample survey method was used. To ensure consistent and reliable performance and reduce bias in the interviews and surveys, the KNHANES-V used at echnical investigation team comprising a nurse, a nutritionist, and a health science major, whose investigative performance was regularly verified and maintained through education and field quality control (all of this information is available on the KNHANES homepage). Note

that the details of the KNHANES-V procedure have been described previously(Lee et al., 2013; Park et al., 2014). We excluded individuals who were younger than 40 years of age because these individuals were expected to be more socioeconomically unstable, particularly with regard to income. After further exclusion of participants with missing data regarding household income or education level, the data of 12,014 (5,161 men and 6,853 women) participants were analyzed.

The KNHANES-V receives annual deliberation and approval from the Research Ethics Deliberation Committee of the Korea Centers for Disease Control and Prevention (KCDC), and all participants provided written consent. We submitted a data use plan to the KCDC and posted a written pledge on the KNHANES homepage, and as a result received approval to use the data.

3. Measures

1) Socioeconomic status

Household income and education levels (assessed via an interview in the KNHANES-V) were used as indicators of SES. Household income was calculated by standardizing monthly income according to the number of family members (monthly income/√number of family members), and was then categorized into quartiles (lowest, lower middle, higher middle, and highest). Education level was assessed using the number of years of schooling and classified into four categories: ≤6 years (elementary school), 7–9 years (middle school), 10–12 years (high school), and ≥13 years (university).

2) Diagnosis of tinnitus

This variable was diagnosed using the following question: "Have you heard any ringing, buzzing, roaring, or hissing sounds without an external acoustic source in the past year?" Response options were "Yes," "No," and "I cannot remember." This last group was combined with participants who answered "No" (Kim et al., 2015).

3) General characteristics

Participants provided information on their age, sex, occupation, history of smoking and drinking, having a spouse and physical activity through a self-administered questionnaire. Occupation was categorized as (1) manager or specialist; (2) office work; (3) sales and services; (4) agriculture, forestry, or fishery work; (5) engineering, assembly, or technical work; (6) manual labor; and (7) unemployed, student, or housewife. Smoking status was categorized as current smoker, ex-smoker, or never smoked. The frequency and amount of alcohol consumed per day were also collected and used to categorize participants as non-drinkers (≤1 g/day), moderate drinkers (1–29.9 g/day), or heavy drinkers (≥30 g/day).

Physical activity (regular exercise and walking) was also assessed. Regular exercise was defined as engaging in moderate exercise (e.g., swimming slowly, tennis, or volleyball) for 30 minutes on 5 or more days per week, or engaging in intensive exercise (e.g., running, climbing) for approximately 20

minutes on 3 or more days per week. Regarding walking, participants were classified as walkers if they reported walking for more than 30 minutes at a time for a minimum of 5 days per week.

Several physiological measurements were taken as well, including participants' height, weight, and waist circumference (WC) in everyday clothing; body mass index (BMI); and serum levels of glucose, triglycerides, and high-density lipoprotein (HDL)-cholesterol. Height was measured to an accuracy of 0.1 cm using a portable stadiometer (Seca 225; Seca, Hamburg, Germany), and weight to the nearest 0.1 kg using an electronic scale (GL-6000-20; Caskorea, Seoul, Korea). WC was measured to the nearest 0.1 cm at the end of expiration at the midpoint of the lower margin of the ribcage and iliac crest along the participant's mid-axillary line using a measuring tape (Seca 200; Seca, Hamburg, Germany). BMI was calculated by dividing weight in kilograms by height in meters squared (kg/m2). Blood samples were collected after at least 8hours of fasting. The specimens were immediately centrifuged, a liquoted, frozenat−70°C, and moved to the central laboratory (Neo DIN Medical Institute, Seoul, Korea). Then, serum levels of glucose, triglycerides, and HDL- cholesterol were measured enzymatically using an automatic analyzer (Hitachi7600; Hitachi,Tokyo,Japan).

To calculate the prevalence of metabolic syndrome, we used five criteria: insulin resistance, as per a fasting glucose level of equal to 110 mg/dl or more; a WC or more than 90 cm for men and 85 cm for women; a triglycerides level of 150 mg/dl or more; HDL-cholesterol of less than 40 mg/dl for men and less than 50 mg/dl for women; and systolic and diastolic blood pressures of 130 mmHg and 85 mmHg or more, respectively. Participants who met at least three of these criteria were diagnosed as having metabolic syndrome; otherwise, they were judged as normal. We also assessed stress, whereby participants answered whether they had experienced high or low stress in the past year. Depression was determined by having participants answer whether they had felt sadness or despair such that it hindered their daily life for two consecutive weeks within the past year. Health insurance was categorized into three types: regional health insurance, employee health insurance, and medical benefits. Finally, participants provided one of three answers regarding whether they were the recipient of basic livelihood security: current recipient, former recipient, or non-recipient.

4. Statistical analysis

Complex sample analysis was conducted using SAS version 9.3 (SAS Institute Inc., Cary, NC, USA). The means ± standard errors (SE) for continuous variables and percentages (SEs) for categorical variables were calculated. One-way ANOVAs or Rao-Scott chi-square tests were used to compare tinnitus status according to general characteristics and SES. The SAS survey procedures were used to reflect the complex sampling design, and the sampling weights of the KNHANES V were applied to provide nationally representative

prevalence estimates. We examined the trend of the relationships of household income and education level with tinnitus using p for trend. Multivariate logistic regression analysis was used to estimate the prevalence odds ratios (ORs) and 95% confidence intervals (CIs) for having tinnitus for each SES category. Several models were applied to evaluate the potential effects of the modifiable behaviors from the general characteristics. Specifically, Model 1 was unadjusted; Model 2 was adjusted for age, sex and Model 3 was adjusted further for BMI, smoking, drinking statue, exercise, metabolic syndrome.

Ⅲ. Results

1. Participants' general characteristics

As shown in 〈Table 1〉, WC and the frequencies for the variables of current smoking, moderate alcohol drinking, engaging in regular exercise, occupation, presence of dizziness, education level, income, whether the participant was a recipient of basic livelihood security, having a spouse, stress in the past year, and depression all significantly differed between the sexes. The mean age of the women was 56.7 years old higher than men. The tinnitus was 24.2% and the metabolic syndrome was 38.5% in women higher than men. The men waist circumference was 85.1cm, which was thicker than the women waist circumference. Men smoking ratio was 38.2% and drinking rate was 18.4%. Men can see that many people smoke and drink more than women. In the occupational group, 22.7% of the men were employed in engineering·assembly·technical work and 49.7% of the women were unemployed·student·housewife. In terms of education level, 40.7% of girls were below elementary school and 20.8% of men. Women were less educated than men. According to the economic level, 24.5% of women and 17.8% of men accounted for the lower class. Women had fewer spouses than men, on the other hand stress and depression rates were higher.

2. Prevalence of tinnitus by general characteristics

We examined differences in participants' general characteristics by their tinnitus status, stratified by gender. Both middle-aged men and women showed significant differences in SES variables (education and income), age, occupation, dizziness, whether the participant was a recipient of the basic livelihood security, stress, and depression according to their tinnitus status. 〈Table 2〉 shows the regarding prevalence of tinnitus according to the various general characteristics. Tinnitus sufferers tended to have lower education, low income, be unemployed, report dizziness, be recipients of social welfare policy, have no regular work, have higher stress, and exhibit depression compared to those without tinnitus. Furthermore, women participants with tinnitus, but not men participants, showed significant differences in prevalence of metabolic syndrome, types of health insurance, and spousal status ($p<.0001$).

〈Table 1〉 General Characteristics of the Study Participants According to Sex

Variables	Men(n=5,161)	Women(n=6,853)	*p*
Age(years)	55±0.2	56.7±0.2	〈.0001
Body mass index(kg/m^2)	24±0.1	24.1±0.1	0.7265
Waist circumference(cm)	85.1±0.2	80.8±0.2	〈.0001
Smoking(current)	38.2(0.9)†	4.1(0.3)	〈.0001
Alcohol intake(moderate)	18.4(0.7)	1.1(0.2)	〈.0001
Regular exercise	21.7(0.8)	16.5(0.7)	〈.0001
Occupation			〈.0001
Manager or specialist	15.7(0.8)	5.8(0.4)	
Office work	8.4(0.5)	3.7(0.3)	
Sales and service	11.1(0.6)	16.3(0.7)	
Agriculture, forestry, or fishery work	13.1(1.1)	7.9(0.7)	
Engineering, assembly, or technical work	22.7(0.8)	3.4(0.3)	
Manual labor	8.5(0.5)	13.2(0.5)	
Unemployed, student, or housewife	20.5(0.8)	49.7(0.8)	
Tinnitus	21.9(0.7)	24.2(0.7)	0.0134
Metabolic syndrome	35.4(0.8)	38.5(0.8)	0.0074
Dizziness	14.3(0.7)	25.0(0.8)	〈.0001
Education (years)			〈.0001
Elementary(≤6)	20.8(0.8)	40.7(0.9)	
Middle school(7–9)	15.7(0.7)	15.2(0.6)	
High school(10–12)	35.3(0.9)	29.9(0.8)	
University(≥13)	28.2(1.0)	14.2(0.7)	
Income (quartiles)			〈.0001
Lowest	17.8(0.7)	24.5(0.8)	
Lower middle	26.3(0.9)	27.2(0.7)	
Higher middle	27.0(0.8)	23.4(0.7)	
Highest	28.8(1.0)	24.9(0.8)	
Recipient of basic livelihood security			0.0033
Current	3.0(0.4)	3.9(0.3)	
Past	2.6(0.3)	3.4(0.3)	
None	94.4(0.5)	92.7(0.4)	
Have a spouse	92(0.5)	76.1(0.7)	〈.0001
With stress	21.2(0.7)	26.7(0.7)	〈.0001
Have depression	2.0(0.2)	6.5(0.4)	〈.0001

† Weighted %(Standard Error)

〈Table 2〉 Distribution of General Characteristics by Tinnitus

Variables	Men		p	Women		p
	No tinnitus	Tinnitus		No tinnitus	Tinnitus	
Age(years)	54.3±0.2	57.5±0.4	<.0001	54.3±0.2	57.5±0.4	<.0001
Body mass index(kg/m^2)	24.1±0.1	23.9±0.1	0.2081	24.1±0.1	23.9±0.1	0.2335
Waist circumference(cm)	85.1±0.2	85.1±0.3	0.9893	85.1±0.2	85.1±0.3	0.3695
Smoking(current)	38.7(1.0)†	36.4(1.7)	0.2496	3.9(0.3)	4.6(0.7)	0.3723
Alcohol intake(moderate)	18.7(0.8)	17.3(1.6)	0.4425	1.2(0.2)	0.8(0.3)	0.3073
Regular exercise	22(0.9)	20.7(1.5)	0.4604	17(0.7)	15(1.1)	0.1375
Occupation			<.0001			<.0001
Manager or specialist	16.4(0.9)	13.4(1.4)		6.5(0.5)	3.6(0.6)	
Office work	8.9(0.6)	6.6(1.0)		4.1(0.4)	2.6(0.5)	
Sales and service	11.5(0.7)	9.5(1.2)		17.5(0.8)	12.4(1.1)	
Agriculture, forestry, or fishery work	12.9(1.2)	14.1(1.7)		7.3(0.8)	9.7(1.1)	
Engineering, assembly, or technical work	23.4(1.0)	20.1(1.7)		3.8(0.4)	2.3(0.4)	
Manual labor	8(0.5)	10.0(1.1)		13(0.6)	13.7(1.0)	
Unemployed, student, or housewife	18.9(0.8)	26.3(1.6)		47.9(1.0)	55.6(1.5)	
Metabolic syndrome	35.3(0.9)	35.7(1.9)	0.8499	36.6(1.0)	44.5(1.6)	<.0001
Dizziness	11.2(0.7)	25.5(1.7)	<.0001	19.7(0.8)	41.6(1.6)	<.0001
Education			<.0001			<.0001
Elementary(≤6)	19.4(0.8)	25.4(1.5)		36.4(1.0)	54.3(1.7)	
Middle school(7–9)	15.2(0.8)	17.6(1.5)		16.2(0.7)	12.2(0.9)	
High school(10–12)	35.5(1.0)	34.4(1.8)		32(0.9)	23.3(1.3)	
University(≥13)	29.8(1.1)	22.6(1.7)		15.4(0.8)	10.2(1.0)	
Income			0.0001			<.0001
Lowest	16.3(0.7)	23.3(1.5)		21.4(0.8)	34.1(1.4)	
Lower middle	26.3(1.0)	26.5(1.7)		27.5(0.9)	26.3(1.3)	
Higher middle	27.6(0.9)	25(1.6)		24.5(0.8)	20(1.1)	
Highest	29.8(1.1)	25.2(1.8)		26.7(0.9)	19.5(1.2)	
Recipient of basic livelihood security			0.0327			0.0001
Current	2.5(0.4)	4.5(0.9)		3.3(0.3)	5.9(0.8)	
Past	2.6(0.3)	2.7(0.6)		3.2(0.3)	3.9(0.5)	
None	94.9(0.5)	92.8(1.0)		93.5(0.4)	90.2(0.9)	
Have a spouse	92.1(0.6)	91.5(1.0)	0.5494	78.2(0.8)	69.8(1.5)	<.0001
With stress	20.2(0.8)	24.6(1.6)	0.0113	24.7(0.7)	33.2(1.3)	<.0001
Have depression	1.4 (0.2)	4.1(0.8)	<.0001	5.8 (0.4)	8.5(0.9)	0.0034

† Weighted %(Standard Error)

3. Prevalence of tinnitus disrupting daily life by socioeconomic status

For educational level, among individuals with tinnitus who had an education level of higher than 13 years, 12.2% of men reported having no difficulty in daily life while 5.4% answered that they had such difficulty; among women, these rates were 14.1% and 3.3%, respectively. As such, for both sexes, fewer participants who had higher education levels reported that the tinnitus disrupted their daily lives. (Fig. 1)

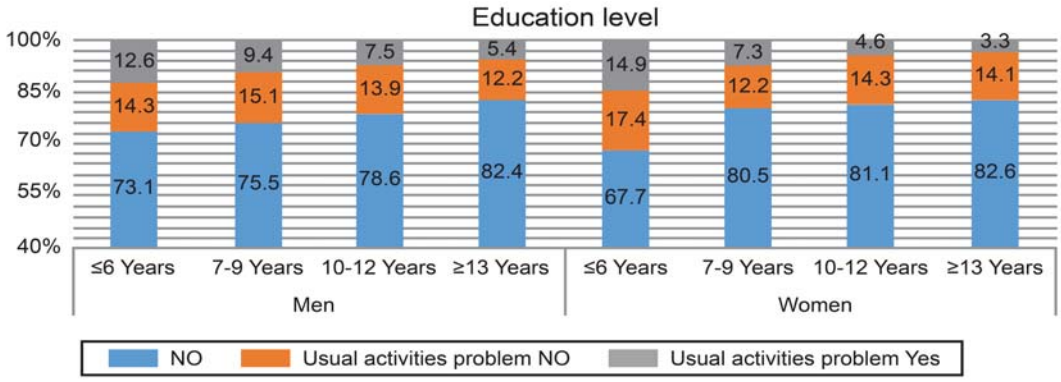

Fig 1. The prevalence of tinnitus disrupting daily life according to education level

For household income, among men with tinnitus in the highest income quartile, 13.2% reported having no difficulty in daily life and 6.0% reported having difficulty in daily life; for women, these rates were 13.3% and 5.7%, respectively. Thus, for both sexes, participants with tinnitus with higher economic status are more likely to report having no difficulty in their daily life caused by the tinnitus. (Fig.2) In summary, a higher socioeconomic status was linked with a lower likelihood of having tinnitus that disrupts daily life.

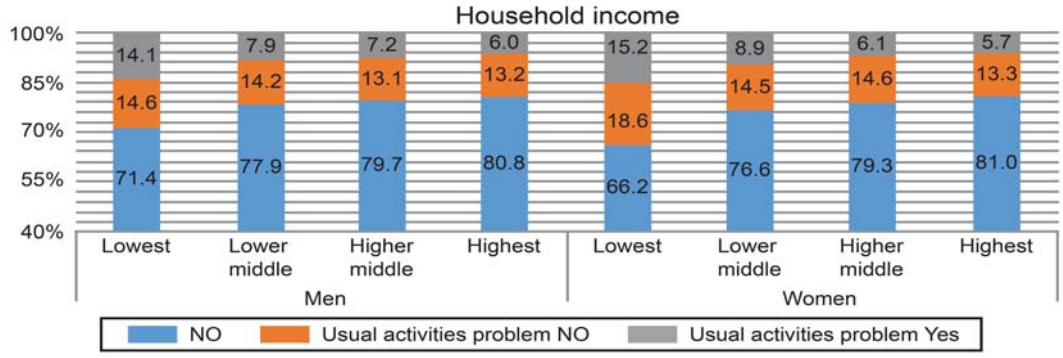

Fig 2. The prevalence of tinnitus disrupting daily life according to household income

4. Influence of socioeconomic status on tinnitus

To analyze the influence of participants' SES on their odds of having tinnitus, we performed a multiple regression analysis while controlling for certain variables, the results of which are shown in 〈Table 3〉.

Model 1 indicated that individuals with lower education level and lower income were more likely to have tinnitus (p〈.0001), while in Model 2(which controlled for age and gender), among the whole sample, participants with≤6years of education had 1.479 times the odds of having tinnitus than did those with≥13 years of age. Notably, men did not report having a greater odds of tinnitus for education level or income in this model, while women did.

Finally, in Model 3, wherein BMI, marital status, smoking, alcohol intake, and regular exercise were controlled, among the whole sample and women, participants with ≤6 years of education had 1.476 and 1.784 times the odds of having tinnitus, respectively, compared to those with ≥13 years. For income, among the whole sample and women, those in the lowest income quartile had 1.443 and 1.591 times the odds of having tinnitus compared to those in the highest income quartile. Men again showed no significant relations of education level and income with the odds of tinnitus.

〈Table 3〉 Odds Ratios (95% CIs) of Tinnitus for Men and Women by Socioeconomic Status

Variables	Model 1			Model 2			Model 3		
	Total OR(95%CI)	Men OR(95%CI)	Women OR(95%CI)	Total OR(95%CI)	Men OR(95%CI)	Women OR(95%CI)	Total OR(95%CI)	Men OR(95%CI)	Women OR(95%CI)
Education level									
≤6years	2.077 (1.784,2.419)	1.726 (1.394,2.136)	2.269 (1.781,2.892)	1.479 (1.229,1.778)	1.236 (0.966,1.58)	1.715 (1.288,2.284)	1.476 (1.221,1.782)	1.215 (0.942,1.568)	1.784 (1.322,2.408)
7–9years	1.325 (1.096,1.601)	1.524 (1.163,1.997)	1.151 (0.878,1.51)	1.142 (0.938,1.39)	1.282 (0.968,1.699)	1.023 (0.772,1.357)	1.118 (0.912,1.371)	1.267 (0.95,1.691)	1.022 (0.758,1.378)
10–12years	1.193 (1.018,1.399)	1.278 (1.021,1.6)	1.108 (0.855,1.434)	1.142 (0.972,1.343)	1.203 (0.954,1.517)	1.07 (0.827,1.385)	1.14 (0.964,1.35)	1.209 (0.952,1.536)	1.084 (0.826,1.422)
≥13years	1	1	1	1	1	1	1	1	1
Household income									
Lowest	1.972 (1.7,2.287)	1.689 (1.331,2.144)	2.184 (1.822,2.617)	1.46 (1.239,1.72)	1.265 (0.967,1.654)	1.637 (1.345,1.992)	1.443 (1.216,1.712)	1.285 (0.969,1.705)	1.591 (1.293,1.958)
Lower middle	1.252 (1.073,1.46)	1.192 (0.937,1.516)	1.308 (1.085,1.577)	1.159 (0.99,1.358)	1.099 (0.857,1.411)	1.222 (1.011,1.477)	1.185 (1.003,1.398)	1.159 (0.896, 1.5)	1.22 (0.998,1.491)
Higher middle	1.094 (0.938,1.277)	1.072 (0.846,1.359)	1.118 (0.911,1.371)	1.077 (0.922,1.259)	1.061 (0.834,1.349)	1.096 (0.893,1.345)	1.1 (0.934,1.294)	1.085 (0.85,1.386)	1.122 (0.902,1.395)
Highest	1	1	1	1	1	1	1	1	1

Reference variables: education ≥ 13 years; highest
Model 1: Non controlled , Model 2: Control age and sex
Model 3: Control age, sex, BMI, smoking and drinking status, exercise, and metabolic syndrome

IV. Discussion

We investigated the relationship between SES and tinnitus and the prevalence of tinnitus disturbing daily life according to SES and general characteristics among 12,041 middle-aged adults using KNHANES V data. Notably, we found that participants showed significant differences in occupation, dizziness, education level, income, whether the participant was the recipient of the basic livelihood security, stress, and depression by their tinnitus status.

Among the general characteristics, for occupation, 20.1% of the men with tinnitus worked in the engineering, assembly, or technical sectors, which was higher compared to other occupations. This suggests that men working in these sectors are relatively more likely to be exposed to loud noises compared to women, therefore leading to higher likelihood of tinnitus. Previous studies have similarly noted that tinnitus is closely linked to occupation. Particularly, blue-collar workers (e.g., manufacturing occupations), who are exposed excessive noise, were found to be more vulnerable to tinnitus compared to white-collar workers (National Institute for Occupational Safety and Health, 1998; Sri wattanatamma & Breysse, 2000).

Both stress and depression were more common among those with tinnitus. Previous studies have shown that tinnitus is associated with loneliness, isolation, and feelings of being alienated from others and the community, thereby making normal interactions and forging amicable relationships difficult(Dobie, 2003; Cho, 2008).

In cases of metabolic syndrome, receiving medical benefits, and having a spouse, we found only significant differences by tinnitus status among women. This suggests that women with tinnitus may be more economically vulnerable, due to their higher likelihood of receiving medical benefits and not having a spouse. This result coincides with previous studies showing that, among women, poverty and low SES had a stronger influence on health than among men (Adler et al., 1993; Son, 2002).

Regarding SES, we observed clear differences between tinnitus sufferers and otherwise normal individuals for education and income, with a higher number of tinnitus suffers having ≤6 years of education and being in the lowest income quartile. Furthermore, more individuals in these groups reported having difficulty in daily life due to their tinnitus. It is possible that people with higher SES are better able to overcome their tinnitus symptoms, either by seeking treatment or by improving their environments, thereby allowing them to adjust to daily life (Jun, 2016).

After controlling for the confounding variables of age, sex, BMI, smoking and drink status, exercise, and metabolic syndrome, we found that income and education level influenced the odds of having tinnitus among both the whole sample and among women. Notably, however, education level and

income did not apparently influence the odds among men. This suggested that women are more influenced by education level and economic status than are men(Jun, 2016). In previous studies women complain higher rates of tinnitus than men (Gomaa, 2014). This study also found the prevalence of tinnitus in women was higher than that in men. In addition, 50.4% of elementary school education level was female. Women with low education levels were found to have a high prevalence of tinnitus. It is difficult to explain the mechanism of the occurrence of tinnitus according to socioeconomic level. However, the lower socioeconomic level makes stress, depression, and noisey occupational environment that occurs tinnitus

Overall, our study illustrated the severity of health inequality according to SES. Many previous studies have investigated health inequalities due to socioeconomic conditions, with a particular focus on lifestyle factors such as smoking, diet, and exercise, as well as on health indicators such as diabetes and high blood pressure. These studies showed that there was a clear lack of health equity between social classes. Particularly, groups with low SES showed poorer health and frequency of healthy behaviors. This study adds to the literature by showing that lower SES is linked to tinnitus, which is compatible with previous studies on health inequality (Woodward et al., 2003). Although there has been research on the symptoms and treatments of tinnitus, few studies have looked at the prevalence of tinnitus by SES. Having investigated this relationship, our study may be considered preliminary data for devising a solution to overcome tinnitus and minimize its disruption of daily life.

Through this study, it was shown that the tinnitus sufferers by age, occupation, metabolic syndrome, education level, income level, spouse, stress, depression. Tinnitus patients have fear, melancholy, and anxiety about their tinnitus. They eliminating negative thoughts and anxiety through counseling including detailed explanation will be effective in post management and rehabilitation. And tinnitus needs to be approached through community coordination, away from the therapeutic approach of conventional treatment practices. Tinnitus is correlated with various socioeconomic and psychological factors. Therefore, information collection and education should be carried out for the socioeconomic level who do not use the medical institution by raising the education and utilization of the community health worker. In conclusion, this study is meaningful to suggest various institutional management is needed to ensure that the tinnitus of low socioeconomic level is not alienated from health equity

Ⅴ. Conclusion

This study analyzed the tinnitus according to the socioeconomic level of the middle aged population from the 5th Korea National Health and Nutrition Examination (2010-2012). We

used complex sample cross analysis and logistic regression analysis on 12,041 over 40 years of age. The old age(p<.0001), depending on the occupations(p<.0001), Metabolic syndrome(p<.0001), the low level of education(p<.0001), the low income(p<.0001), not having a spouse(p<.0001), stress(p<.0001), depression(p<.0001) occurred tinnitus.

Logistic regression analysis showed that there was a statistically significant difference in tinnitus according to the socioeconomic status of middle-aged people over 40 years of age. Moreover, lower education and income were found to result in higher odds of having tinnitus. Furthermore, women appeared to be more influenced by educational or economic levels compared to men.

This study also has limitations. As the data were limited to the middle-aged population, the study cannot be generalized to the whole population. Since economic status was evaluated with household income, it is not applicable to cases where the individual family members' income is largely varied. This study also limited socio-economic status to income and educational level. Moreover, the self-reported survey, which questioned subjective symptoms of tinnitus, is not an objective indicator. There are these limitations, but these findings suggest that socioeconomic factors might influence individuals' health, indicating that governmental interventions via health policies would be required to buffer the adverse impact of socioeconomic factors on health equity and to complement their effects on people's health.

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