

Prevalence and trends of pain associated with chronic diseases and personal out-of-pocket medical expenditures in Korea

Department of Nursing, Joongbu University, Geumsan, Korea

Sun Mi Shin

Background: There have been few studies about pain using a big data. The purpose of this study was to identify the prevalence of pain, and trends of pain associated with chronic diseases and personal out-of-pocket medical expenditures over time.

Methods: Subjects were 58,151 individuals, using the Korea Health Panel from 2009 to 2013. Chi-square and multinomial logistic regression were conducted to identify the prevalence and odds ratios (ORs) of pain. Repeated measures ANOVA was used to find the trend over these 5 years.

Results: Prevalence of mild and severe pain was 28.1% and 1.7% respectively. The ORs of mild and severe pain were 1.6 and 1.4 in females compared with males. From 2009 to 2013, numbers of chronic diseases producing mild pain were 2.1, 2.4, 2.8, 2.9, and 3.1 and those producing severe pain were 3.0, 3.4, 3.9, 4.2, and 4.4, respectively. After applying the average South Korean inflation rate by year over 5 years, the annual, personal out-of-pocket medical expenditures (unit: ₩1,000) for mild pain were 322, 349, 379, 420, and 461, and those for severe pain were 331, 399, 504, 546, and 569, respectively ($P < 0.0001$).

Conclusions: The pain prevalence was 29.8%. The numbers of chronic diseases and the personal out-of-pocket medical expenditures revealed increasing trends annually, especially in those with pain. Therefore, to eliminate and alleviate the pain, there needs to be further study for developing a systemic approach. (Korean J Pain 2017; 30: 142-50)

Key Words: Chronic disease; Out-of-pocket; Pain; Personal expenditure; Prevalence.

INTRODUCTION

Pain is an unpleasant sensation and emotional experience due to actual or potential tissue injury [1]. Chronic

pain can limit daily life in the workplace and home, and reduced physical mobility. In addition, it decreases productivity due to declines in job performance. Chronic pain affects the economy negatively, deteriorates mental

Received February 6, 2017. Revised March 20, 2017. Accepted March 20, 2017.

Correspondence to: Sun Mi Shin

Department of Nursing, Joongbu University, 201 Daehak-ro, Chubu-myeon, Geumsan 32713, Korea

Tel: +82-41-750-6255, Fax: +82-41-750-6416, E-mail: healthteam@joongbu.ac.kr

© This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Copyright © The Korean Pain Society, 2017

health, and induces discomfort to decrease quality of life [2,3]. So, chronic pain is usually used as an indicator to measure quality of life. There is an increased interest about pain in the medical field all over the world. In 2004, the WHO defined Dec. 11th as ‘The first global day against pain’ [4].

The biggest reason for visiting the hospital is pain [5–7]. Therefore, there needs to be an academic interest in pain prevention, management, treatment, and re-habilitation beforehand. Nonetheless, there are a lot of people, who think that pain is only a symptom. However, chronic pain can be not only a symptom, but also a disease.

It is difficult for patients to explain their pain, which has its subjective character. In particular, there are many people who endure pain in Korea because the culture teaches that endurance is virtue. In addition, there are side effects because people use Korean traditional management, health foods, and unverified products due to insufficient knowledge about pain. So medical consumers are attracted to very expensive, unreasonable medical products rather than reasonable and scientific medical treatment [8]. Therefore, it is important to consider that pain is a disease to be treated.

In an era of increasing life span and elderly population, to manage pain, medical policy and providing service become more important. In as of 2012, the expected life span in Korea was 84.6 years for females and 77.9 years in males. Both of them were higher than the mean expected life span in the OECD [9]. It is necessary to avoid social problems arising from patients with pain. Therefore, there is a need to investigate the current status of pain in the Korea population, especially the prevalence and chronic diseases and personal out-of-pocket medical expenditures. However, there were few studies about the representative prevalence of pain using big data [10]. In particular, study of personal out-of-pocket medical expenditures was insufficient. This study aimed to identify the prevalence of pain and medical utilization in Korea using the Korea Health Panel data which is representative of Korea, and to find trends in the numbers of chronic disease and personal out-of-pocket medical expenditures over 5 years.

MATERIALS AND METHODS

1. Design

This study was a retrospective longitudinal one, using Korea Health Panel data to identify the prevalence of pain and personal out-of-pocket medical expenditure over the period from 2009 to 2013 using Korea Health Panel data.

2. Data and subjects

The Korea Health Panel survey was a government approved statistical survey based on the Statistics Law. Its purpose was to provide basic information on policy performance for the national health service, medical utilization, and expenditure. This Korea Health Panel survey received IRB to consider the ethics for study (KIHASA 2016-01). In addition, this study did not include identifiable individual variables, and analyzed and interpreted by group unit to protect individual information. Subjects of this study were a total of 58,151 members of the adult populations over 18 years old who responded to an added survey on the status of today’s pain and medical expenditure from 2009 to 2013.

3. Methods of data collection and variables

The Korea Health Panel data was collected by face-to-face interview. A survey interviewer from the Korea Health Panel visited the household and documented the responses. To decrease the responder’s recall bias about medical utilization and medical expenditures, subjects recorded the reasons for their visits and receipts for their expenditures in a health household account book, whenever they visited the hospital/clinic or pharmacy. Thus, data was collected by the interviewer including the diagnosis of chronic disease and the personal out-of-pocket medical expenditures.

The variables used in this study were today’s pain status and gender, age, marital status, education, job status, and 16 items of city/province information to identify the pain related factors. The pain questionnaire asked ‘How was your pain or unpleasant sensation today?’ and possible answers included ① ‘I do not have any pain or unpleasant sensation’, ② ‘I have mild pain or unpleasant sensation’, and ③ ‘I have very severe pain or unpleasant sensation’.

In this study, we defined these as ‘Absence of pain’, ‘Presence of mild pain’, and ‘Presence of severe pain’. In

addition, to identify the characteristics of the pain and the subjects' medical utilization, variables used were presence of chronic disease, taking medication for over 3 months, emergency-room visits, history of admission experience this year, current admission, and out-patient department (OPD) visits.

The numbers of chronic diseases and annual personal out-of-pocket medical expenditure by type of pain in 2013 were identified. The latter includes emergency-room visits, admissions, OPD visits, and prescribed drugs. Chronic diseases are condition lasting more than 3 months which included hypertension, diabetes, hyperlipidemia, arthritis, tuberculosis, ischemic heart disease, cerebrovascular disease, and other diseases.

4. Data analysis methods and control of bias in the study.

Descriptive statistics, Chi-square, and t-tests were conducted to identify the demographic characteristics and pain prevalence. A multinomial multiple regression model on pain was conducted to identify the odds ratios of demo-social factors, chronic disease, and medical utilization.

To avoid exaggeration of the mean, extreme outliers, points beyond the outer fence (Quartile3 + 3 × Inter Quartile Range) were excluded. Analysis of covariance (ANCOVA) adjusting for gender and age was conducted to identify mean differences in the numbers of the chronic diseases and personal out-of-pocket medical expenditures. Then, repeated measures analysis of variance (ANOVA)

was conducted by the status of pain in 2013 to find 5 years' trends from 2009 to 2013 retrospectively. In addition, average inflation by year for South Korea was applied.

All data was analyzed after excluding missing data and interpreted as significant at a *P* value of less than 0.05 using SAS 9.4 (SAS Institute Inc., Cary, NC).

RESULTS

1. Demographic characteristics and pain prevalence

Subjects included a total of 58,151, of which 44.8% (26,068) were male and 55.2% (32,083) were female. Their mean age at the start of the panel survey was 50 years old. The prevalence of mild pain was 28.1% and severe pain was 1.7%. According to gender, mild pain and severe pain were 22.0% and 1.3% in the males, and 33.0% and 2.1% in the females (*P* < 0.0001). Thus, the females had a greater prevalence of pain (Table 1).

2. Odds ratios of pain by demographic factors

Using a multinomial multiple logistic regression model, the odds ratios mild pain and severe pain were identified by demo-social factors. Independent variables with higher odds ratios of mild of pain were being female (*P* < 0.0001), being in an older age group (*P* < 0.0001), being separated/divorced (*P* < 0.0001), having a low education level (*P* < 0.0001), being an unpaid worker (*P* < 0.005), having a death in the family within the last year (*P* < 0.01), and low household income (*P* < 0.0001). In cities,

Table 1. Demographic Characteristics and Prevalence of Pain

Classification		Total n = 58,151	M n = 26,068	F n = 32,083	P value
		Mean ± SD or n (%)	Mean ± SD or n (%)	Mean ± SD or n (%)	
Age (yr)		50.0 ± 16.5	49.9 ± 16.2	50.1 ± 16.8	0.129
Group of age	Less than 30	5,392 (9.3)	2,382 (9.1)	3,010 (9.4)	< 0.0001
	30s	8,751 (15.0)	3,778 (14.1)	5,073 (15.8)	
	40s	13,060 (22.5)	6,139 (23.5)	6,921 (21.6)	
	50s	10,739 (18.5)	5,007 (19.2)	5,732 (17.9)	
	60s	9,335 (16.1)	4,225 (16.2)	5,110 (15.9)	
	70s	8,412 (14.5)	3,536 (14.0)	4,756 (14.8)	
	≥ 80	2,462 (4.2)	981 (3.8)	1,481 (4.6)	
Pain	Absence	40,820 (70.2)	20,006 (76.8)	20,814 (64.9)	< 0.0001
	Mild	16,321 (28.1)	5,730 (22.0)	10,591 (33.0)	
	Severe	1,010 (1.7)	332 (1.3)	678 (2.1)	

Table 2. Odds Ratios of Pain by Demographic Factors using Multinomial Multiple Logistic Regression

Classification		Pain			
		Mild n = 16,279		Severe n = 1,006	
		OR (95% CI)	P value	OR (95% CI)	P value
Gender	Male	1.0			
	Female	1.6 (1.5–1.6)	< 0.0001	1.4 (1.2–1.7)	< 0.0001
Age group	Less than 30				
	30s	1.6 (1.4–1.8)	< 0.0001	1.7 (0.8–3.5)	0.178
	40s	2.0 (1.8–2.3)	< 0.0001	2.9 (1.4–6.1)	0.0045
	50s	2.9 (2.5–3.4)	< 0.0001	4.7 (2.2–10.0)	< 0.0001
	60s	3.9 (3.4–4.5)	< 0.0001	5.9 (2.8–12.5)	< 0.0001
	70s	5.3 (4.6–6.2)	< 0.0001	10.2 (4.8–21.9)	< 0.0001
	≥ 80	7.4 (6.2–8.8)	< 0.0001	13.6 (6.2–29.5)	< 0.0001
Marriage	Married	1.0			
	Separated, divorced	1.2 (1.1–1.3)	< 0.0001	1.5 (1.2–1.7)	< 0.0001
	Unmarried	1.0 (0.9–1.1)	0.5225	1.2 (0.8–1.9)	0.4343
Education	College enrolled or graduated	1.0			
	Uneducated	2.5 (2.2–2.9)	< 0.0001	5.2 (3.6–7.4)	< 0.0001
	Elementary school enrolled or graduated	2.0 (1.9–2.2)	< 0.0001	3.7 (2.7–5.1)	< 0.0001
	Middle school enrolled or graduated	1.6 (1.5–1.7)	< 0.0001	2.2 (1.6–3.1)	< 0.0001
	High school enrolled or graduated	1.2 (1.1–1.3)	< 0.0001	1.7 (1.3–2.3)	0.0004
Job status	Regular worker	1.0			
	Full time	0.9 (0.8–1.1)	0.2995	0.9 (0.4–1.7)	0.6431
	Temporary	1.0 (0.9–1.1)	0.7402	0.9 (0.5–1.7)	0.6878
	Day	1.1 (1.0–1.3)	0.055	0.9 (0.5–1.8)	0.8192
	Self-support, public, elderly job	1.1 (0.8–1.5)	0.5897	0.7 (0.2–2.4)	0.6089
	Unpaid	1.2 (1.0–1.3)	0.0054	1.5 (0.8–2.8)	0.1698
Death among family for last 1 year	Absence	1.0			
Death household	Presence	1.9 (1.2–3.1)	0.0104	2.3 (0.9–6.2)	0.0876
Bracket of household income	1st (the poor group)	1.5 (1.4–1.6)	< 0.0001	3.3 (2.4–4.4)	< 0.0001
	2nd	1.3 (1.2–1.4)	< 0.0001	2.3 (1.7–3.0)	< 0.0001
	3rd	1.1 (1.0–1.2)	0.0038	1.9 (1.4–2.6)	< 0.0001
	4th	1.1 (1.0–1.1)	0.1443	1.3 (1.0–1.8)	0.093
	5th (the rich group)	1.0			
Present address	Seoul City	1.0			
	Busan City	1.2 (1.1–1.4)	< 0.0001	1.2 (0.9–1.7)	0.1686
	Daegu City	1.2 (1.1–1.3)	0.0011	0.7 (0.5–1.0)	0.0616
	Incheon City	1.1 (1.0–1.2)	0.2611	0.7 (0.4–1.0)	0.06
	Gwangju City	0.8 (0.7–0.9)	< 0.0001	0.8 (0.5–1.3)	0.3667
	Daejeon City	1.2 (1.1–1.4)	0.0011	1.0 (0.6–1.5)	0.975
	Ulsan City	0.7 (0.6–0.8)	< 0.0001	0.8 (0.5–1.4)	0.4767
	Gyeonggi-do	1.0 (0.9–1.1)	0.5535	1.0 (0.8–1.3)	0.8255
	Gangwon-do	1.6 (1.4–1.8)	< 0.0001	0.9 (0.6–1.4)	0.6262
	Chungcheongbuk-do	0.8 (0.7–0.9)	< 0.0001	1.9 (1.4–2.6)	0.0001
	Chungcheongnam-do	1.0 (0.9–1.1)	0.5424	1.2 (0.8–1.6)	0.3654
	Jeollabuk-do	1.1 (1.0–1.2)	0.0482	1.2 (0.9–1.7)	0.253
	Jeollanam-do	1.3 (1.2–1.5)	< 0.0001	1.0 (0.7–1.4)	0.999
	Gyeongsangbuk-do	0.9 (0.8–1.0)	0.0205	1.4 (1.1–1.9)	0.0157
	Gyeongsangnam-do	1.1 (1.0–1.2)	0.0372	1.1 (0.8–1.5)	0.6336
Jeju-do	1.1 (1.0–1.3)	0.0538	1.1 (0.7–1.8)	0.5964	

Gwangju and Ulsan had lower odds ratios of mild pain than Seoul.

Independent variables with higher odds ratios for severe pain were being female ($P < 0.0001$), being in an older age group ($P < 0.0001$), being separated/divorced ($P < 0.0001$), having a low level of education ($P < 0.0001$), and low household income ($P < 0.0001$). In cities, The Chungcheongbuk-do and Gyeongsanbuk-do provinces had higher odds ratios for severe pain than Seoul (Table 2).

3. Odds ratios of pain with chronic disease and medical utilization

Using a multinomial multiple logistic regression model, the odds ratios for mild and severe pain according to chronic disease and medical utilization were identified. The results were as follows: 3.4 (95% CI, 3.2–3.5) and 9.1 (95% CI, 7.0–11.7) in chronic disease, 1.1 (95% CI, 1.0–1.2) and 1.5 (95% CI, 1.2–1.7) in those taking medication over 3

months, 1.2 (95% CI, 1.1–1.3) and 1.6 (95% CI, 1.3–1.9) in those making emergency-room visits, 1.8 (95% CI, 1.7–1.9) and 3.5 (95% CI, 3.0–4.1) in those experiencing hospital admission, 5.4 (95% CI, 3.3–8.9) and 44.4 (95% CI, 24.7–79.8) in those in current admission, and 1.9 (95% CI, 1.8–2.1) and 2.8 (1.8–4.4) in those who made an OPD visit, respectively (Table 3).

4. Means of numbers of chronic diseases and personal out-of-pocket medical expenditure by pain status

Subjects without pain had 1.5 chronic diseases, those with mild pain had 2.2, those with severe pain had 2.9 increasingly ($P < 0.0001$). In regards to personal out-of-pocket medical expenditures, subjects without pain spent ₩300,400, those with mild pain spent ₩413,000, and those with severe pain spent ₩503,500 ($P < 0.0001$).

In addition, females without pain spent ₩339,000 which was higher than the ₩250,700 spent by males.

Table 3. Odds Ratios of Pain by Presence of Chronic Disease and Factors of Medical Utilization in Multinomial Logistic Regression

Classification	Pain			
	Mild n = 16,279		Severe n = 1,006	
	OR (95% CI)	P value	OR (95% CI)	P value
Absence	1.0		1.0	
Chronic disease	3.4 (3.2–3.5)	< 0.0001	9.1 (7.0–11.7)	< 0.0001
Taking medication for over 3 months	1.1 (1.0–1.2)	0.0008	1.5 (1.2–1.7)	< 0.0001
Emergency-room visit	1.2 (1.1–1.3)	< 0.0001	1.6 (1.3–1.9)	< 0.0001
Admission history	1.8 (1.7–1.9)	< 0.0001	3.5 (3.0–4.1)	< 0.0001
Admission current	5.4 (3.3–8.9)	< 0.0001	44.4 (24.7–79.8)	< 0.0001
Out-patient department visit	1.9 (1.8–2.1)	< 0.0001	2.8 (1.8–4.4)	< 0.0001

Table 4. Pain and Numbers of Chronic Disease and Personal Out-of-Pocket Medical Expenditure by ANCOVA

Classification	Subjects	Pain			P value	
		Absence	Mild	Severe		
		Mean ± SE	Mean ± SE	Mean ± SE		
Numbers of chronic disease	Total ^{a)}	57,602	1.5 ± 0.0	2.2 ± 0.0	2.9 ± 0.1	< 0.0001
	Male ^{b)}	25,917	1.2 ± 0.1	1.9 ± 0.0	2.4 ± 0.1	< 0.0001
	Female ^{b)}	31,685	1.7 ± 0.0	2.4 ± 0.0	3.1 ± 0.1	< 0.0001
Personal out-of-pocket medical expenditure (₩1,000) ^{c)}	Total ^{a)}	54,933	300.4 ± 2.3	413.0 ± 3.8	503.5 ± 15.6	< 0.0001
	Male ^{b)}	24,801	250.7 ± 2.9	365.2 ± 5.8	472.6 ± 25.2	< 0.0001
	Female ^{b)}	30,132	339.0 ± 3.4	457.0 ± 4.9	545.7 ± 20.0	< 0.0001

^{a)}Covariate: gender, age. ^{b)}Covariate: age. ^{c)}For last 1 year including emergency-room visit, admission and out-patient department visit and prescribed drug.

Females with mild pain spent ₩457,000 which was higher than the ₩365,200 spent by males. The amount spent by those with severe pain was also higher in females, at ₩545,700 than the ₩472,600 spent by males (Table 4).

5. Trend in the number of chronic diseases and personal out-of-pocket medical expenditures by pain status over 5 years

The trend of the repeatedly measured number of chronic diseases and personal out-of-pocket medical expenditures according to pain status over 5 years were as follows: from 2009 to 2013, those without pain had 1.1, 1.3, 1.4, 1.5, and 1.7 chronic diseases. Those with mild pain had an increasing trend of 2.1, 2.4, 2.8, 2.9, and 3.1 chronic diseases, and those with severe pain also had an increasing trend of 3.0, 3.4, 3.9, 4.2, and 4.4 chronic diseases ($P < 0.0001$).

Also, numbers of chronic diseases in those without pain, the presence of mild and severe pain were 1.1, 2.1, and 3.0, respectively in 2009. In 2013, those had increased to 1.7, 3.1, and 4.4. There were differences in chronic diseases by pain status per year ($P < 0.0001$).

The trend of personal out-of-pocket medical expenditure per year over the 5 years were as follows: Those without pain from 2009 to 2013 spent ₩231,400, ₩249,100, ₩280,400, ₩317,800, and ₩322,600; those with mild pain spent ₩322,200, ₩359,600, ₩405,200, ₩459,000 and ₩510,200; those with severe pain spent

₩331,600, ₩410,700, ₩539,000 ₩596,700, and ₩630,300. Thus, there was an increasing trend over time in personal out-of-pocket medical expenditures ($P < 0.0001$).

In addition, there was also an increasing trend by pain status ($P < 0.0001$). In 2009, those without pain, and with mild and severe pain had ₩231,400, ₩322,200 and ₩331,600 respectively. In 2013, those had increased to ₩322,600, ₩510,200, and ₩630,300, respectively. In addition, the applied inflation rates were 2.94%, 4.03%, 2.19%, and 1.30% according to average inflation in South Korea based upon the consumer price index from 2009 to 2013.

After applying the inflation rates, the annual, personal out-of-pocket medical expenditures for those with mild pain were ₩322,200, ₩349,900, ₩379,000 ₩420,200 and ₩461,000, and those of individuals with severe pain were ₩331,600, ₩399,600, ₩504,200, ₩546,200 and ₩569,500 respectively ($P < 0.0001$). Thus, personal out-of-pocket medical expenditures also revealed an increase over 5 years in those without pain, with mild pain, and with severe pain (Table 5).

DISCUSSION

The study of pain in the population is useful to know what essential medical policy should be. Pain is the main reason people seek medicine [5–7]. Eighty-seven percent

Table 5. Numbers of Chronic Disease and Personal Out-of-Pocket Medical Expenditure by Pain Type and over Year used Repeated ANOVA

Classification pain		Year					P value for between pain status
		2009	2010	2011	2012	2013	
Numbers of chronic disease	Absence (n = 5,178)	1.1	1.3	1.4	1.5	1.7	< 0.0001
	Mild (n = 2,446)	2.1	2.4	2.8	2.9	3.1	
	Severe (n = 114)	3.0	3.4	3.9	4.2	4.4	
	P value for MANOVA	< 0.0001					
Personal out-of-pocket medical expenditure (₩1,000) ^{a)}	Absence (n = 4,309)	231.4	249.1	280.4	317.8	322.6	< 0.0001
		Ref ^{b)}	242.3	262.3	290.9	291.5	
	Mild (n = 1,837)	322.2	359.6	405.2	459.0	510.2	
		Ref ^{b)}	349.9	379.0	420.2	461.0	
	Severe (n = 71)	331.6	410.7	539.0	596.7	630.3	
	Ref ^{b)}	399.6	504.2	546.2	569.5		
	P value for MANOVA	< 0.0001					

^{a)}For last 1 year, including emergency-room visit, admission and out-patient department visit and prescribed drug. ^{b)}Applied inflation rates were 2.94%, 4.03%, 2.19%, and 1.30% according to average inflation South Korea based upon the consumer price index from 2010 to 2013.

of Americans visited a doctor for medical advice when they felt pain [5]. In Korea, pain is the most common factor for medical consumer to choose medical treatment. However, pain studies using big data are rare [11]. The subject of this study was the adult population over 18 years old. The questionnaire was about today's pain, and it classified respondents as having an absence of pain, the presence of mild pain, and the presence of severe pain. So, in this study, pain includes acute and chronic pain.

In this study, the prevalence of mild and severe pain was 28.1% and 1.7%, respectively. Thus approximately 3 among 10 in the population suffered from pain. In the U.S., 30.7% of the population had long lasting pain for at least 6 months [12]. In Iran, the pain prevalence was 38.9% [13]. In Spain, yesterday's pain was 29.7%, and the pain prevalence of the previous week was 43.2% [14]. As in these cases, the pain prevalence was different because the definition and period of acute and chronic pain were different.

Prevalence of today's mild and severe pain was 22.0% and 1.3% in males, respectively, and 33.0% and 2.1% in females. Using multinomial multiple logistic regression after adjusting confounding variables in females, the odds ratios for mild and severe pain were 1.6 (95% CI, 1.5–1.6) and 1.4 (95% CI, 1.2–1.7) ($P < 0.0001$), respectively. Thus, females had more pain than males. In previous studies, females had more pain and perceived pain more sensitively, and for a longer duration [15,16]. In addition, social and cultural beliefs regarding gender characteristics were determinant factors in pain sensitivity [17,18]. This might also be socio-cultural in Korea, and thus males explained their pain less than females. In addition, using ANCOVA after adjusting for age, personal out-of-pocket medical expenditures of those with mild pain were ₩365,200 in males and ₩457,000 in females ($P < 0.0001$). Those of individuals with severe pain were ₩472,600 in males and ₩545,700 in females. This was somewhat different from a previous study, which found that males utilize medical institutions more than females [19].

In this study, the older, the higher prevalence of pain. When those in their 30s were the reference group, the odds ratios of mild and severe pain of those in their 60s were 3.9 (95% CI, 3.4–4.5) and 5.9 (95% CI, 2.8–12.5), those of individuals over 80 were 7.4 (95% CI, 6.2–8.8) and 13.6 (95% CI, 6.2–29.5), respectively. In some previous studies, the prevalence of pain was lower with increasing age [20], but mostly the older, the more pain was experi-

enced [21,22]. Currently, the population of the baby boomer generation who were born from 1955 to 1963 in Korea is approximately 8,160,000. They consist of 15.8% of the total population [23]. Therefore, we expect that as the aging of the baby boomer generation increases, the number of patients with pain will be also continue to increase.

In addition, there were higher odds ratios with pain among those with chronic disease, taking medication for over 3 months. In patients with chronic disease, the presences of mild and severe pain were 3.4 (95% CI, 3.2–3.5) and 9.1 (95% CI, 7.0–11.7), respectively. Those of individuals taking medication for over 3 months were 1.1 (95% CI, 1.0–1.2) and 1.5 (95% CI, 1.2–1.7). Those of individuals with an emergency-room visit were 1.2 (95% CI, 1.1–1.3) and 1.6 (95% CI, 1.3–1.9). Those of individuals who experienced admission were 1.8 (95% CI, 1.7–1.9) and 3.5 (95% CI, 3.0–4.1). Those of individuals with OPD visits were 1.9 (95% CI, 1.8–2.1) and 2.8 (1.8–4.4). In addition, those of individuals with current admission were 5.4 (95% CI, 3.3–8.9) and 44.4 (95% CI, 24.7–79.8) respectively. In a previous study, 70% of the subjects with chronic pain took analgesics, and 55% of those with pain did not live a normal life [10]. It is a similar result that 50% of admission patients in china had pain [24].

Pain becomes a socioeconomic burden [25,26]. Among all subjects in this panel study, the responder without pain had 1.5 chronic diseases, but those with mild pain had 2.2 and those with severe pain had 2.9, which was also an increase in the number of chronic diseases ($P < 0.0001$). Personal out-of-pocket medical expenditures were ₩300,400 in the absence of pain, ₩413,000 in mild pain, and ₩503,500 in the presence of severe pain ($P < 0.0001$). In 2008, according to the Medical Expenditure Panel Survey in the U.S., the costs attributable to pain ranged from 560 to 635 billion dollars [27].

According to the pain status of all analyzed subjects for 5 years from 2009 to 2013, trends of repeated measured numbers of chronic disease and personal out-of-pocket medical expenditure for 5 years were identified. The numbers of the chronic diseases were 1.1, 1.3, 1.4, 1.5, and 1.7 in the absence of pain. However, those with mild pain were 2.1, 2.4, 2.8, 2.9, and 3.1, and those with severe pain were 3.0, 3.4, 3.9, 4.2, and 4.4, respectively, which was more than those without pain ($P < 0.001$). It also revealed the predominant increase in trends over time ($P < 0.001$). In addition, personal out-of-pocket medical expenditures

were ₩231,400, ₩249,100, ₩280,400, ₩317,800, and ₩322,600 in absence of pain. Those with mild pain were ₩322,200, ₩359,600, ₩405,200, ₩459,000, and ₩510,200, and those with severe pain were ₩331,600, ₩410,700 ₩539,000, ₩596,700, and ₩630,300, respectively. According to pain status, the trend in personal out-of-pocket medical expenditures was an increase, ($P < 0.001$), and it was also increased over 5 years ($P < 0.001$). These results were same after applying the inflation rate.

Added to this, pain related variables included family history such as separation/divorce, low education, unpaid work, being in a low-income household, and having a death in the family. In previous studies, socioeconomic factors such as low income, unemployment, and low education were related with pain [8,10,13,24,28]. In addition, Gwangju and Ulsan had the lowest prevalence of pain and Chungcheongbuk-do and Gyeongsangbuk-do had the highest, in Korea. Therefore, there needs to be a substantial exploration of what factors relate to the regional differences in pain prevalence.

The limitations of this study are as follows: First, the panel's questionnaire only considered pain presence, but did not consider pain duration. In addition, mild and severe pain were classified by subjective perception. So the pain information might be limited and falsely labeled. Second, use of alternative medicine is an increasing trend around the world [8]. But this study did not include both general medication and alternative medicine available without prescription. So, there is a possibility that the measured expenditure was less than the real amount spent for pain. Third, this study could not identify the accessibility of medical services and the performance of treatment to explore the difference between the cities and provinces among the pain-related variables.

However, this study had a strong point: First, this study repeatedly measured the same subjects for 5 years. In addition, the prevalences and trends were identified over time. Subjects also represented the general Korean population, not just those who visited a clinic. Second, this study identified personal out-of-pocket medical expenditures for pain. In particular, studies using panel data are few. So, this study can be used as a basic reference for further study. Third, using representative data in Korea, this study identified the pain prevalence related demographic and social characteristics and economic vari-

ables, and found some evidence of the necessity of pain management.

In conclusion, the prevalence of mild pain was 28.1% and severe pain was 1.7%. The pain prevalence were higher in females, those who are older, those with chronic disease, those experiencing hospital admission, emergency-room visits, and OPD visits. In numbers of chronic diseases and personal out-of-pocket medical expenditure for 5 years, there were differences according to pain status and also an increasing trend over time. In particular, in Korea, the pain prevalence and medical expenditures will increase because of the aging of the baby boomer generation. Pain will be a hot issue, one of interest for medical policy makers trying to improve health in Korea. Therefore, to achieve reasonable medical management, medical consumer education is needed to produce smart patients.

ACKNOWLEDGEMENTS

This paper was supported by Joongbu University Research & Development Fund, in 2016.

REFERENCES

1. Merskey H, Bogduk N; International Association for the Study of Pain. Task Force on Taxonomy. Classification of chronic pain: descriptions of chronic pain syndromes and definitions of pain terms. 2nd ed. Seattle (WA), IASP Press. 1994, pp 1–150.
2. Breivik H, Collett B, Ventafridda V, Cohen R, Gallacher D. Survey of chronic pain in Europe: prevalence, impact on daily life, and treatment. *Eur J Pain* 2006; 10: 287–333.
3. Breivik H, Eisenberg E, O'Brien T; OPENMinds. The individual and societal burden of chronic pain in Europe: the case for strategic prioritisation and action to improve knowledge and availability of appropriate care. *BMC Public Health* 2013; 13: 1229.
4. International Association for the Study of Pain (US). Global year against pain [Internet]. Washington, D.C.: IASP; 2017 [cited 2017 Jan 26]. Available at: <http://www.iasp-pain.org/Education/Content.aspx?ItemNumber=1698&navItemNumber=576#Pain>.
5. Bostrom M. Summary of the Mayday Fund Survey: public attitudes about pain and analgesics. *J Pain Symptom Manage* 1997; 13: 166–8.
6. Portenoy RK, Ugarte C, Fuller I, Haas G. Population-based survey of pain in the United States: differences among white, African American, and Hispanic subjects. *J Pain* 2004; 5:

- 317–28.
7. Castro-Lopes J. Impact of chronic pain on primary care across Europe. *J Pain Palliat Care Pharmacother* 2014; 28: 158–9.
 8. Gardiner P, Wornham W. Recent review of complementary and alternative medicine used by adolescents. *Curr Opin Pediatr* 2000; 12: 298–302.
 9. Organisation for Economic Co-operation and Development. OECD health statistics 2014: how does Korea compare? [Internet]. Paris: OECD; 2017 [cited 2017 Jan 26]. Available at: <http://www.oecd.org/els/health-systems/Briefing-Note-KOREA-2014.pdf>.
 10. Chung JW, Yang JC, Wong TK. The significance of pain among Chinese patients with cancer in Hong Kong. *Acta Anaesthesiol Sin* 1999; 37: 9–14.
 11. Leem JG. Big data and pain. *Korean J Pain* 2016; 29: 215–6.
 12. Johannes CB, Le TK, Zhou X, Johnston JA, Dworkin RH. The prevalence of chronic pain in United States adults: results of an Internet-based survey. *J Pain* 2010; 11: 1230–9.
 13. Zarei S, Bigzadeh S, Pourahmadi M, Ghobadifar MA. Chronic pain and its determinants: a population-based study in Southern Iran. *Korean J Pain* 2012; 25: 245–53.
 14. Català E, Reig E, Artés M, Aliaga L, López JS, Segú JL. Prevalence of pain in the Spanish population: telephone survey in 5000 homes. *Eur J Pain* 2002; 6: 133–40.
 15. Caumo W, Schmidt AP, Schneider CN, Bergmann J, Iwamoto CW, Adamatti LC, et al. Preoperative predictors of moderate to intense acute postoperative pain in patients undergoing abdominal surgery. *Acta Anaesthesiol Scand* 2002; 46: 1265–71.
 16. Katz J, Poleshuck EL, Andrus CH, Hogan LA, Jung BF, Kulick DI, et al. Risk factors for acute pain and its persistence following breast cancer surgery. *Pain* 2005; 119: 16–25.
 17. Wise EA, Price DD, Myers CD, Heft MW, Robinson ME. Gender role expectations of pain: relationship to experimental pain perception. *Pain* 2002; 96: 335–42.
 18. Robinson ME, Riley JL 3rd, Myers CD, Papas RK, Wise EA, Waxenberg LB, et al. Gender role expectations of pain: relationship to sex differences in pain. *J Pain* 2001; 2: 251–7.
 19. Ng KF, Tsui SL, Chan WS. Prevalence of common chronic pain in Hong Kong adults. *Clin J Pain* 2002; 18: 275–81.
 20. Dunn KS. Testing a middle-range theoretical model of adaptation to chronic pain. *Nurs Sci Q* 2005; 18: 146–56.
 21. James FR, Large RG, Bushnell JA, Wells JE. Epidemiology of pain in New Zealand. *Pain* 1991; 44: 279–83.
 22. Jung BF, Johnson RW, Griffin DR, Dworkin RH. Risk factors for postherpetic neuralgia in patients with herpes zoster. *Neurology* 2004; 62: 1545–51.
 23. Kahng SK. An exploratory study on generation differences in life satisfaction and related factors: generational comparisons using the Korean welfare panel study. *Korean J Soc Welf Stud* 2012; 43: 91–119.
 24. Peng LH, Jing JY, Qin PP, Su M. A multi-centered cross-sectional study of disease burden of pain of inpatients in Southwest China. *Chin Med J (Engl)* 2016; 129: 936–41.
 25. Kehlet H, Jensen TS, Woolf CJ. Persistent postsurgical pain: risk factors and prevention. *Lancet* 2006; 367: 1618–25.
 26. Fecho K, Miller NR, Merritt SA, Klauber-Demore N, Hultman CS, Blau WS. Acute and persistent postoperative pain after breast surgery. *Pain Med* 2009; 10: 708–15.
 27. Gaskin DJ, Richard P. The economic costs of pain in the United States. *J Pain* 2012; 13: 715–24.
 28. French P, Flora LF, Ping LS, Bo LK, Rita WH. The prevalence and cause of occupational back pain in Hong Kong registered nurses. *J Adv Nurs* 1997; 26: 380–8.