

Prevalence of Widespread Pain and Its Influence on Quality of Life: Population Study in Korea

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The objective of this study was to examine the prevalence and risk factors for widespread pain and its influence on quality of life in residents of Korean communities. A rural and an urban community were selected, and 5,037 subjects were surveyed. Participants were asked if they had pain, aching, or stiffness in any of their joints on most days. Widespread pain was defined as pain above the waist, below the waist, on both sides of the body and in the axial region. The prevalence of widespread pain was 12% (16.2% and 5.5% in females and males, respectively). It was more frequent among females and increased with age in both genders. Age, female gender, and the presence of hand or knee arthritis were significantly associated with widespread pain after multivariate analysis. Except for mental health, all the items in the SF-12 were adversely affected in the widespread pain group after adjustment for confounding factors. Our findings show that the prevalence of widespread pain among residents of Korean communities is comparable to that reported among Caucasians. The significantly worse quality of life among subjects with widespread pain suggests that it may cause major health issues in the aging population.

Key Words: Widespread Pain; Risk Factors; Arthritis; Quality of Life

INTRODUCTION

Musculoskeletal pain is among the most common chronic conditions in older adults (1). Musculoskeletal pain is caused by multiple, heterogeneous pathologies including arthritis, soft tissue rheumatism, degenerative spinal disease and fibromyalgia (FM). Although musculoskeletal pain is often attributed to arthritis, pain is associated with functional disabilities even in the absence of radiographic evidence of arthritis (2). Furthermore, self-reported pain was found to be a stronger determinant of locomotor disability than radiographic osteoarthritis (3). In particular, widespread pain, defined as pain in the upper and lower extremities, pain on the right and left sides of the body, or axial skeletal pain, has been reported as the most disabling type of pain (4). Studies of Western populations have shown that the prevalence of widespread pain increases with age, implying that widespread pain will become a significant health issue in the future (5, 6). In addition, widespread pain in Western populations is associated with subsequent death from cancer in the medium and long term, indicating that widespread pain may be associated with the presence of an underlying organic disease and that it has a significant impact on health status (7). Such epidemiologic data on musculoskeletal pain or widespread pain have been scarcely published in Asia, where over 60% of the world's popu-

lation lives. In a recent study using questionnaire among 11,507 Japanese subjects, chronic musculoskeletal pain defined as pain persisting for at least 6 months, was present in 15.4% of respondents and it adversely affected quality of life, drawing attention to chronic pain as a medical and public health issue (8). In this study, we examined the prevalence of musculoskeletal pain and focused on the risk factors for widespread pain in Korean communities in subjects aged 40-79 yr. We also examined the influence of widespread pain on quality of life (QOL) as measured by the 12-item Short Form (SF-12) questionnaire.

MATERIALS AND METHODS

Study population

In the ongoing prospective Korean Health and Genome Study, a rural farming community (Anseong) and an urban community (Ansan) in Korea were selected. The methods of this study have been previously described elsewhere (9). Briefly, the eligibility criteria included an age of 40 to 79 yr, residence within the borders of the survey area for at least 6 months before testing, and the mental and physical ability to participate. Anseong and Ansan had a population of 554,998 and 132,906, respectively in 2000 (10).

Data collection

Demographic information was collected at baseline that included educational attainment, occupation, exercise, and co-morbidities using a standard questionnaire during a face-to-face interview. Educational attainment was dichotomized into ≥ 12 yr (finished high school, finished vocational school, some college, finished college, some graduate school and higher) or < 12 yr for the analysis. Occupation including factory workers, laborers, and farmers were defined as a manual work. The exercise category was self-reported and classified as none vs at least once per week (once/week, 2-3 times/week, and daily) for the analysis. The presence of arthritis is an important factor influencing the presence of bodily pain, however, physical examination for formal evaluation of arthritis could not be performed due to the limitation in budget and logistics. Thus, data on self-reported hand or knee arthritis were collected by the responses to the following question, "Have you ever been diagnosed as hand (or knee) arthritis by a physician?"

Other health factors, such as body mass index (BMI), blood glucose and blood pressure were measured to observe the association between these factors and widespread pain. Height (cm) and body weight (kg) were measured to the nearest 0.1 cm and 0.1 kg, respectively, with the subject wearing light clothing and barefooted for calculation of the BMI. BMI ≥ 27 kg/m² was defined as obese. The presence of diabetes mellitus (DM) was defined as either a fasting glucose level ≥ 126 mg/dL or a 2-hr glucose level of ≥ 200 mg/dL after 75 g oral glucose loading. The presence of hypertension was defined as either a systolic pressure ≥ 160 mmHg or a diastolic pressure ≥ 100 mmHg after measuring the blood pressure with a sphygmomanometer, with the second and third of three measurements averaged to estimate systolic and diastolic pressure.

The measure of pain used in this study was based on a previ-

ous report by Leveille et al. (11). Briefly, participants were asked if they had pain, aching, or stiffness in any of their joints for more than 1 week on most days. Persons who responded 'yes' were asked to mark painful joints with circles on a homunculus showing upper and lower extremity joints and four areas of the back and neck (12). Widespread pain was defined according to the American College of Rheumatology criteria as pain above the waist, below the waist, on both sides of the body and in the axial region (11). Tender point was not examined. Three other categories of pain in these analyses were pain in two or more regions that did not meet the criteria for widespread pain, pain in one region, and no pain. Subjects also filled out the validated Korean version of SF-12 questionnaire, which measures self-reported health status and QOL (13).

Statistical analysis

For a comparison between the normal subjects and those with widespread pain, continuous variables were tested using Student's t-test, and categorical variables were tested using Pearson's chi-square test. Tests for a linear trend across categories of pain constellations were performed using Mantel-Haenszel chi-square tests for categorical variables and the F-statistics from linear regression models for continuous variables. Odds ratios (OR) and 95% confidence intervals (CI) for widespread pain were calculated using multivariate logistic regression analysis with adjustments made for the factors significantly associated with widespread pain in univariate analysis. For the comparison of QOL measures assessed by SF-12, adjustments for confounding factors were made using ANOVA with multiple classification analysis. Statistical analysis was performed with SPSS 12.0 (SPSS Inc., Chicago, IL, USA). *P* value < 0.05 (2-tailed) was considered statistically significant.

Table 1. Demographic characteristics and the prevalence of selected comorbidities of the study subjects

Parameters	Men (n = 2,110)	Women (n = 2,820)	Total (N = 4,930)	<i>P</i> value*
Age (yr) mean (SD)	59.2 \pm 8.7	59.1 \pm 8.9	59.1 \pm 8.8	0.814
BMI (kg/m ²) mean (SD)	24.0 \pm 3.0	24.8 \pm 3.2	24.5 \pm 3.1	< 0.001
Obesity	316 (15.0)	614 (21.8)	930 (18.9)	< 0.001
Married	2,020 (95.7)	2,263 (80.2)	4,282 (86.9)	< 0.001
Education ≥ 12 yr	996 (47.2)	735 (26.1)	1,731 (35.1)	< 0.001
Alcohol	1,431 (67.8)	668 (23.7)	2,099 (42.6)	< 0.001
Smoking	756 (35.9)	53 (1.9)	809 (16.4)	< 0.001
Exercise	982 (46.6)	1,254 (44.6)	2,236 (45.4)	0.162
Diabetes mellitus	497 (23.7)	594 (21.3)	1,091 (22.3)	0.045
Hypertension	303 (14.4)	512 (18.2)	815 (17)	< 0.001
Self-reported hand or knee arthritis	76 (3.6)	333 (11.8)	409 (8.3)	< 0.001
Manual work	1,427 (67.7)	1,245 (44.2)	2,672 (54.2)	< 0.001

Values are number of individuals (%) unless stated otherwise. *Variables were compared between men and women using Student's t-test for continuous variables and Pearson's chi-square test for categorical variables. Obesity was defined as body mass index of ≥ 27 kg/m². Alcohol drinking was defined as drinking of any alcoholic beverages more than once per month. Smoking was defined as more than 20 packs of cigarettes ever smoked during lifetime. The exercise category was self-reported and classified as none vs at least once per week (once/week, 2-3 times/week, and daily). The presence of diabetes mellitus (DM) was defined as either a fasting glucose level ≥ 126 mg/dL or a 2-hr glucose level of ≥ 200 mg/dL after 75 gram oral glucose loading. Self-reported hand or knee arthritis was defined as those responded positively to the following question: Have you ever been diagnosed as hand (or knee) arthritis by a physician? BMI, body mass index; SD, standard deviation.

Ethics statement

The institutional review board of Ajou University School of Medicine approved the study protocol (approval number AJIRB-CRO-07-012). Written informed consent was obtained from each participant.

RESULTS

Of the 5,037 subjects surveyed, 107 subjects were excluded; of these, 100 had missing questionnaire data due to clerical error, and seven failed to participate due to impaired cognition. The mean age and the percentage of women were similar between the subjects included and those excluded (mean age, 59.1 vs 59.7 yr; percentage of women, 57.3% vs 54.7%, for those included

and excluded, respectively). Table 1 shows the baseline characteristics of the study participants. Women were significantly less educated and had a higher BMI compared to men. Women had a lower rate of diabetes mellitus (DM) and a higher rate of hypertension and self-reported arthritis.

The prevalence of any pain was 51% (42.5% and 58.9% in men and women, respectively; Fig. 1). Whereas pain at one site was more frequent in men, pain at two or more sites was more frequent in women (Fig. 1). The prevalence of widespread pain was 12% (5.5% and 16.2% in men and women, respectively). It was more frequent among women in all age ranges and increased with age in both genders (Fig. 2). The prevalence of widespread pain was significantly higher among rural residents compared to urban residents (13.0% vs 8.9% in Anseong and Ansan, respec-

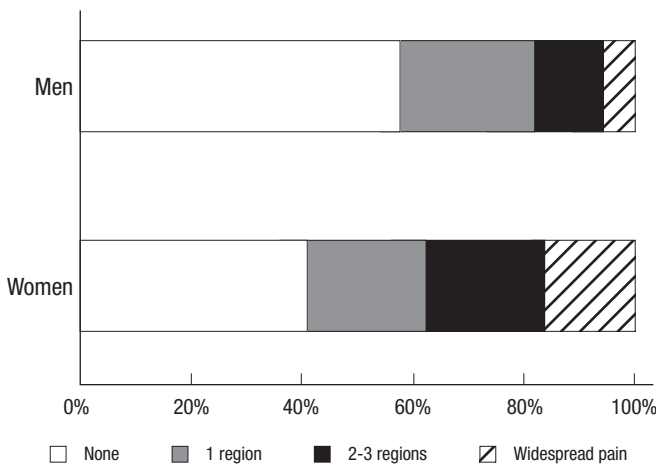


Fig. 1. Prevalence of musculoskeletal pain according to the number of painful regions in women and men.

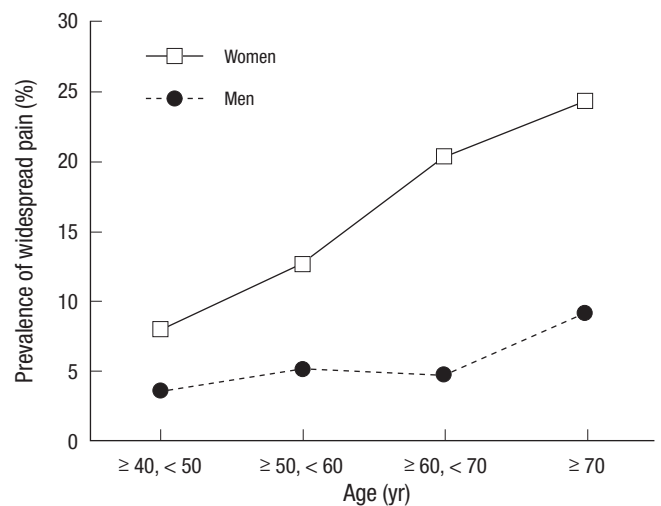


Fig. 2. Prevalence of widespread pain in women and men according to age.

Table 2. Characteristics of subjects according to pain category

Characteristics	Women				Men			
	No pain, N = 1,160	Pain 1 region, N = 597	Pain in 2-3 regions, N = 605	Wide-spread pain, N = 458	No pain, N = 1,213	Pain 1 region, N = 517	Pain in 2-3 regions, N = 263	Wide-spread pain, N = 117
Mean (SD)								
Age (yr)	57.3 (8.6)	59.3 (8.9)	59.9 (8.9)	62.5 [†] (8.7)	58.6 (8.5)	59.4 (8.7)	60.5 (9.0)	61.3 [†] (8.8)
Body mass index	24.5 (3.2)	24.6 (3.3)	25.2 (3.1)	25.2 [†] (3.2)	24.1 (3.0)	23.9 (3.1)	24.2 (2.9)	23.9 (2.9)
Body fat mass	18.0 (5.2)	18.0 (5.5)	19.0 (5.1)	18.8 [†] (5.4)	14.2 (4.8)	14.0 (4.9)	14.3 (4.9)	14.1 (4.8)
Percent								
Married	83.5	79.0	80.7	72.9 [†]	95.6	96.1	95.8	94.0
Education ≥ 12 yr	33.7	24.9	22.7	17.8 [†]	52.5	47.0	41.5	46.6 [†]
Obesity	18.5	20.4	26.4	25.5 [†]	15.8	13.5	15.6	11.1
Alcohol use	25.4	19.8	26.0	21.6 [*]	70.3	66.9	63.9	54.7 [†]
Smoking	1.6	1.2	2.6	2.6	36.6	35.2	34.0	35.9
Exercise	49.6	42.7	41.8	38.0 [†]	48.9	43.7	43.5	41.9
Diabetes mellitus	19.4	20.4	21.6	26.8 [*]	23.2	24.3	23.6	27.0
Hypertension	15.3	18.3	20.2	22.5 [†]	13.5	15.1	14.4	19.7
Manual work	39.2	48.7	45.1	49.6 [†]	67.7	67.1	70.7	63.2
Hand or knee arthritis	50.6	54.4	62.2	70.5 [†]	35.0	38.6	50.2	54.5 [†]
Poor self-reported health	5	8.2	12.3	22.9 [†]	3.1	3.9	9.9	14.8 [†]

Tests for a linear trend across categories of pain constellations were performed using Mantel-Haenszel chi-square tests for categorical variables and the F-statistics from linear regression models for continuous variables. * and [†] denote $P < 0.05$ and $P < 0.01$, respectively. Poor self-reported health was defined as respondents who rated poor to the 5-level rating assessing self-rated health in SF-12. * $P < 0.05$, ** $P < 0.01$.

tively).

Characteristics associated with musculoskeletal pain included age, lower educational status, lack of alcohol intake, the presence of self-reported arthritis, and poor self-reported health. In women, additional associations included higher BMI, higher body fat mass, unmarried status, lack of exercise, the presence of DM and hypertension, and manual work (Table 2).

We analyzed the odds ratio and 95% confidence intervals for each risk factor predicting the likelihood for widespread pain compared to no pain using multivariate logistic regression analysis (Table 3). A test of interaction between gender and other risk factors showed that gender was not a significant effect modifier of the relationship between other risk factors and widespread pain, thus, the analysis was performed without stratifying by sex (data not shown). Age ≥ 50 yr, female sex, unmarried status, obesity, the presence of DM and hypertension, and self-reported hand and knee arthritis were significant risk factors,

while higher level of education, alcohol uptake, smoking, and exercise were negatively associated in univariate analysis. None of these variables had significant correlations with each other (Pearson correlation < 0.5 , data not shown), thus, multivariate analysis was performed after adjusting for all those significant factors. Age ≥ 60 yr, female sex, and the presence of self-reported hand or knee arthritis was significantly associated after multivariate analysis. Finally, we examined QOL as measured with the SF-12 and compared the group with no pain to the widespread pain group (Table 4). Except for mental health, all items in the SF-12 were adversely affected in the widespread pain group in both genders after adjustment for confounding factors. In general, women had lower QOL scores compared to men regardless of the presence of widespread pain. After adjustment for confounding factors, women with widespread pain had worse SF-12 scores than men, but the difference reached significance for physical functioning and physical component summary scores only.

Table 3. Risk factors associated with widespread pain

Factors	Odds ratio (OR) (95% CI)	
	Unadjusted OR	Adjusted OR*
Age (yr) (vs ≥ 40 , < 50)		
≥ 50 , < 60	1.59 (1.15,2.20)	1.39 (0.86,2.25)
≥ 60 , < 70	2.81 (2.04,3.88)	1.91 (1.16,3.14)
≥ 70	4.22 (3.00,5.93)	2.24 (1.30,3.84)
Female	4.09 (3.29,5.09)	3.35 (2.34,4.78)
Married	2.57 (2.03,3.26)	1.08 (0.78,1.48)
Education ≥ 12 yr	0.39 (0.32,0.49)	1.04 (0.74,1.45)
Obesity	1.41 (1.13,1.76)	1.17 (0.87,1.58)
Alcohol	0.42 (0.35,0.52)	0.88 (0.66,1.17)
Smoking	0.43 (0.32,0.58)	0.89 (0.57,1.38)
Exercise	0.65 (0.54,0.79)	0.79 (0.61,1.02)
Diabetes mellitus	1.35 (1.09,1.66)	1.00 (0.75,1.33)
Hypertension	1.67 (1.33,2.09)	1.10 (0.82,1.49)
Manual work	0.95 (0.79,1.13)	0.87 (0.67,1.14)
Hand or knee arthritis	2.83 (2.27,3.52)	1.64 (1.24,2.16)

*Odds ratios and 95% confidence intervals for widespread pain were calculated using multivariate logistic regression analysis with adjustments made for the factors significantly associated with widespread pain in univariate analysis.

DISCUSSION

In this study of Korean community residents aged 40-79 yr, the prevalence of widespread pain was 5.5% and 16.2% among men and women, respectively. Age, female gender, and the presence of hand or knee arthritis were significantly associated with widespread pain. Subjects with widespread pain had significantly worse QOL after adjustment for confounding factors.

Recently, musculoskeletal pain has been recognized as a problem in its own right, independent of underlying pathology. Widespread pain, including FM syndrome, represents the most severe clinical manifestation and has a significant impact on QOL and physical function (14). Relatively large differences in the prevalence of widespread pain in the community have been reported, with figures of 4.7%-14.4% reported among Caucasian populations (5, 6, 15-17). The definition of widespread pain varies from studies to studies. Chronic widespread pain is defined as pain

Table 4. Health-related quality of life as measured with SF-12 among persons reporting widespread pain and persons not reporting any pain

Parameters	All		Women		Men	
	No pain	Pain	No pain	Pain	No pain	Pain
Physical functioning	77.4	55.1*	70.1	48.1* [†]	85.6	66.4*
Role physical	83.8	64.9*	79.3	61*	88.8	70.7*
Bodily pain	87.9	67.6*	83.9	64.1*	92.2	73*
General health	51.2	34*	48	32.1*	54.8	34.9*
Vitality	53.6	42.8*	48.7	38.2*	59.3	47.8*
Social functioning	90.8	76.5*	88.6	74.3*	93.4	79.8*
Role emotional	89.6	77.1*	87.4	75*	92.1	81*
Mental health	44.9	44.9	46.1	44.9	43.7	46.8
Mental component score	75.1	55.3*	70.3	51.1*	80.3	61.3*
Physical component score	69.8	60.3*	67.7	58.1* [†]	72.1	63.9*

Quality of life measures assessed by SF-12 were compared using ANOVA with multiple classification analysis after adjustments for age, sex (only in all subjects), and the presence of hand or knee arthritis. * and [†] denotes $P < 0.05$ and $P < 0.01$ compared to no pain group, respectively. [‡] $P < 0.05$ compared to men.

present in at least 2 contralateral body quadrants and the axial skeleton, which has persisted for at least 3 months (2). On the other hand, other investigators used the question, "any pain lasting at least 24 hr experienced during the previous month" (15, 18) to screen chronic widespread pain or widespread musculoskeletal pain. In this study, we used the definition "pain, aching, or stiffness in any of the joints for more than 1 week on most days."

A paucity of data is available on the prevalence of widespread pain among ethnic groups other than Caucasians. In previous reports from Korea, chronic widespread pain was reported in 14% among rural residents with mean age of 67.7 yr (19) and in 2.6% among livestock raisers (20). The former report is in line with our prevalence of 12%, while the low prevalence of the latter report possibly reflects selection bias from healthy worker effects. Absence of chronic widespread pain was found in Pima Indians in Arizona, USA (21). Other prevalence data for Asians are from the UK and have consistently revealed that widespread pain occurs in excess among South Asian immigrants compared to white Europeans. The increased ORs for widespread pain among South Asians compared with Europeans ranged from 2.7 to 5.8 in one report (18). Because widespread pain is considered a somatization disorder, this ethnic difference in the prevalence of widespread pain was considered to result from psychosocial or cultural differences. Diverse mechanisms including a pain threshold disparity, communication barriers, and subclinical osteomalacia with vitamin D deficiency have been postulated as well (22). The prevalence of 12% observed in our cohort is closer to the prevalence among Europeans than that of South Asians in the UK (23). However, as was noted, we used different definition for widespread pain, so direct comparison between our study and other studies would be difficult. Comparison between Framingham cohort and ours using the same definition shows that the prevalence of widespread pain among the elderly (> 72 yr old in Framingham and > 70 yr old in ours) are 15% and 5.2%, and 24% and 9.3%, for women and men, respectively, showing higher prevalence among our cohort. On the other hand, the proportion of subjects with no pain in our subjects was considerably higher than that among South Asians of similar age in the UK (57.5% vs 21%-37% in men, 41.1% vs 18%-36% in women) (23). This result, in line with previous Korean report, suggests that in Korean community residents, the prevalence of widespread pain may be lower than that among South Asian immigrants in the UK. Studies from other regions would be warranted to determine whether the prevalence of widespread pain in our cohort is representative of other Asian populations residing in Asia.

In the present study, the prevalence of widespread pain was three times higher in women compared to men, and the stronger age effect among women is consistent with previous reports (5, 14, 24, 25). Whether the prevalence of chronic pain increases with age is debated with one report showing its increase by age up to 50-59 yr and then decrease after the age of 60 yr, while an-

other report showing its increase with age, with highest values attained between 60 and 79 yr (6, 26). Our result shows increase in prevalence of widespread pain with age without any leveling off at older age, and this is consistent with the previous Korean report. This discrepancy may stem from the differences in definition of chronic widespread pain.

It is plausible that high workload caused by farming activity leads to physical hazard, and thus, results in higher prevalence of musculoskeletal pain. While our study also showed that the prevalence of widespread pain is higher in rural area compared to urban area, some reports are contradictory (8). Other reported factors associated with higher prevalence include being an immigrant, living in collective housing, having a lower educational level, being a lower level non-manual employee or a manual worker, lower consumption of vegetables and diabetes mellitus (19, 24). In a study of 1,062 subjects from the Framingham cohort aged 72 yr and older, factors associated with widespread pain were analyzed separately according to gender. In women, body mass index, systolic blood pressure, and depressive symptoms were associated with widespread pain; however, in men the only association was polyarticular radiographic osteoarthritis, suggesting that the factors associated with musculoskeletal pain at older ages differ in women and men (11). We also performed logistic regression analysis according to gender, and found out that the presence of hand or knee arthritis was significantly associated with widespread pain in both genders: adjusted OR (95% CI), 1.48 (1.08-2.02) and 1.83 (1.13-2.98) for women and men, respectively. This implies that arthritis accounted for widespread pain in our female subjects more than in Caucasians.

Widespread pain is associated with persistent symptoms and high levels of disability as well as the progression of disability (4, 27). Although relatively few studies used the SF questionnaire to evaluate the health status of subjects with widespread pain, the SF questionnaire was found in one report to represent health dimensions relevant to subjects with widespread pain (28). In our study, subjects with widespread pain had worse health status compared to subjects with no pain after adjustment for confounders in both genders. Overall, women with widespread pain had worse SF-12 scores compared to men, but the difference was only significant for physical functioning and physical component summary scores, implying that widespread pain may have a comparable adverse influence on QOL in both genders.

Our study has strengths and limitations. First, this is the first large-scale population-based study on the prevalence of and associated risk factors for widespread pain among non-immigrant Asian subjects. Second, health status and QOL were evaluated with a tool previously validated in Korean populations. The study area included both rural and urban communities, enhancing the representativeness of the study sample. On the other hand, the cross-sectional design of the study prohibited elucidation of the causative role of some risk factors. The presence of arthritis,

which was a significant risk factor for widespread pain, was self-reported; thus, diagnostic inaccuracy and bias inflating the risk might have been introduced. Psychological factors, such as depression, or anxiety, which plays an important role in the development of widespread pain was not assessed.

In conclusion, our findings show that the prevalence of widespread pain among residents of Korean communities is 12%. It was higher among women and rural residents. The significantly worse quality of life among subjects with widespread pain suggests that it may cause a major health issue in aged population.

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