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EPIDEMIOLOGY

The Prevalence and Risk Factors of Low Back Pain in Rural Community Residents of Korea

Nam H. Cho, MD, PhD,* Young Ok Jung, MD, PhD,† Seung Hun Lim, MS,* Chun-Kee Chung, MD, PhD,‡ and Hyun Ah Kim, MD, PhD†§

Study Design. A community-based, cross-sectional study that is part of the prospective Korean Health and Genome Study.

Objective. To determine the prevalence of low back pain (LBP) among middle-aged and elderly rural community residents in Korea and to examine the relevant risk factors, including activities reflecting the Asian lifestyle, and the relationship between radiographical features of degenerative changes in the lumbar spine and LBP.

Summary of Background Data. The prevalence and implication of LBP among the elderly, particularly Asians, are under-represented in previous reports.

Methods. Data for LBP were collected for 4181 subjects from a rural farming community. The point and cumulative lifetime prevalences of LBP were obtained in addition to measurement of the severity of LBP. Lateral lumbar spine radiographs were obtained according to a standard protocol.

Results. The mean age of the study subjects was 56 years and 55% were women. The lifetime prevalence of LBP was 61.3%, with women having a higher prevalence. The point and 6-month prevalences were also higher among women. The lifetime, point, and 6-month prevalences increased with age in both sexes, except for lifetime prevalence in men. The prevalence of LBP of grade 3 or more was significantly higher in women and increased significantly with age, particularly in women. Both lifetime and point of prevalence of LBP were significantly associated with age, female sex, and time spent squatting. After adjusting for age and sex, the presence of disc space narrowing, osteophytes, and advanced Kellgren-Lawrence grade in lumbar radiograph was associated with LBP.

Conclusion. The prevalence of LBP is comparable between these Korean community residents and other population groups. Risk factors associated with LBP included advanced age, female sex, squatting, the presence of osteophytes, joint space narrowing, and advanced Kellgren-Lawrence grading on lumbar radiograph.

Key words: back pain, lumbar spine, prevalence, quality of life, risk factors. **Spine 2012;37:2001–2010**

Low back pain (LBP) is an important public health problem in industrialized societies because of its high prevalence and associated disability. It is a leading cause of work absenteeism and is associated with substantial health care and societal costs.[1] The reported lifetime prevalence ranges from 54% to more than 80%, and the point prevalence rate is around 20% in the general population, making it the most common musculoskeletal symptom.[2,3]

Because both population aging and economic growth have occurred at a much faster pace in Asian countries, such as South Korea, LBP is expected to become a major public health problem in this area. Some prevalence data have recently been reported for rural Asian communities, such as those in Bangladesh, China, India, The Philippines, Indonesia, and Pakistan, with reported prevalence ranging from 4% to 35%.[4–9] The variation in the reported prevalence of LBP stems from its definition (*i.e.*, lifetime prevalence *vs.* 1-year prevalence) and the presence of various risk factors for LBP, such as psychosocial factors and work compensation. In a large community-based, cross-sectional study in Anhui Province, a rural community in China, the 1-year prevalence of LBP was reported to be 64%, with a higher risk among women across all age groups.[2] Being a farmer, reporting moderate or heavy physical stress, and having had former or current exposure to vibration were positively associated with LBP. The results showed that the prevalence of LBP was comparable between rural Asian populations and Western populations with a similar risk factor profile. However, most of these reports focused on younger populations. The prevalence and implication of LBP among the elderly, particularly Asians, are under-represented in previous reports, although population aging will be an important factor influencing health care in the 21st century. In addition, a paucity of data exists on risk factors involving

From the *Department of Preventive Medicine, Ajou University School of Medicine, Suwon, Korea; †Department of Internal Medicine, Hallym University College of Medicine, Chunchun, Korea; ‡Department of Neurosurgery, Seoul National University Hospital, Seoul, Korea; and §Institute of Musculoskeletal Aging, Hallym University, Chuncun Korea.

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Address correspondence and reprint requests to Hyun Ah Kim, MD, PhD, Division of Rheumatology, Department of Internal Medicine, Hallym University Sacred Heart Hospital, 896, Pyongchondong, Dongan-gu, Anyang, Kyunggi-do, 431-070, Korea; E-mail: kimha@hallym.ac.kr

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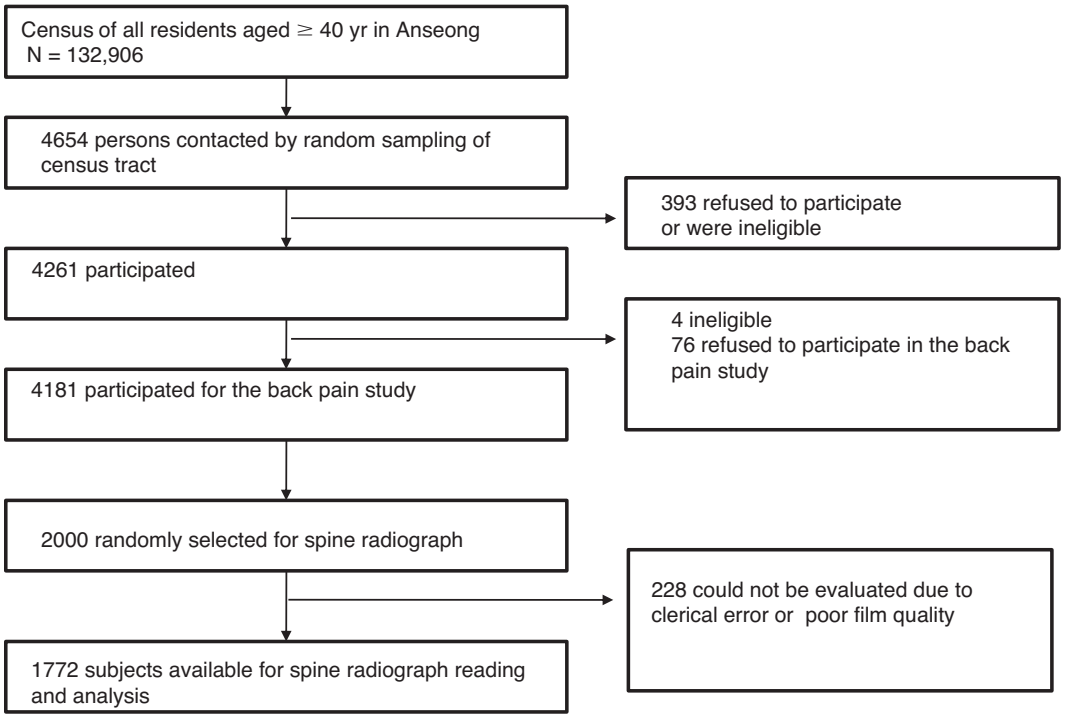

Figure 1. Recruitment and follow-up of study participants and enrollment into the back pain study.

activities inherent in Asian lifestyle or radiographical features in this population.

In this study, we sought to determine the prevalence of LBP among middle-aged and elderly rural community residents in Korea. We also examined the relevant lifestyle risk factors and the relationship between radiographical features of the lumbar spine and LBP.

MATERIALS AND METHODS

Study Population

In the ongoing prospective Korean Health and Genome Study, a rural farming community (Anseong) in South Korea was selected. The methods of this study have been described previously.[10] Briefly, the eligibility criteria included age of 40 to 79 years, residence within the borders of the survey area for at least 6 months before testing, and mental and physical ability to participate. Cluster sampling using a bracket survey method was conducted, and 4261 subjects were surveyed among residents using a random sampling method and the local telephone directory. After excluding 80 subjects who were ineligible or who refused to participate in the LBP study, data for LBP were available for 4181 subjects. Among these, 2000 subjects were randomly selected for spine radiography. No difference was found in the prevalence of LBP among those who obtained radiographs and those who did not. After excluding 228 subjects who could not be evaluated because of clerical error or poor film quality, data for 1772 subjects were available for grading of the radiographs (Figure 1).

The ethics committees of the Korean Health and Genome Study and Ajou University School of Medicine approved the study protocol. Written informed consent was obtained from each participant.

Data Collection

Demographic information was collected at baseline and included educational attainment, occupation, exercise, and comorbidities using a standard questionnaire during a face-to-face interview. Educational attainment was dichotomized into 12 years or more (finished high school, finished vocational school, some college, finished college, some graduate school, and higher) or less than 12 years for the analysis. Occupation was classified into 14 standard categories according to the Korean National Statistical Office. Occupations including factory worker, laborer, and farmer were defined as manual work. The exercise category was self-reported and classified as none, once per week, 2 to 3 times per week, and daily. The data on self-reported hand or knee arthritis were collected from the responses to the following question: Have you ever been diagnosed with hand (or knee) arthritis by a physician? To analyze the association between activities reflecting the Asian lifestyle and LBP, the time spent daily at present and at 25 years of age for the following activities was inquired about: sitting in a chair, sitting on the floor without back support, squatting, and lying down (including sleep).

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 body mass index. A body mass index of 30 kg/m^2 or more was defined as obese. The presence of diabetes mellitus was defined as either a fasting glucose level of 126 mg/dL or more or a 2-hour glucose value of 200 mg/dL or more after 75 mg of oral glucose loading. The presence of hypertension was defined as either a systolic pressure of 140 mm Hg or more or a diastolic pressure of 90 mg/dL or more after measuring the blood pressure with a sphygomomanometer, with the second

and third of 3 measurements averaged to estimate the systolic and diastolic pressures.

The point, 6 months, and cumulative lifetime prevalences of LBP were obtained using a direct questionnaire, and a mannequin diagram was used to define the anatomical location of LBP. For the point prevalence, the question read, "Do you have LBP at the present time, that is, right now?" The 6-month and lifetime prevalence questions read, "During the last 6 months, have you had LBP lasting more than a day?" and "In your lifetime, have you ever had LBP lasting more than a day?" LBP on the mannequin diagram was verified as that in the area below the 12th rib and above the gluteal fold. In addition, the Chronic Pain Questionnaire, a measure of graded severity of LBP, was used.[11] The questionnaire is a 7-item Guttman scale that was developed to classify pain in population-based and primary health care surveys, with 3 items assessing pain intensity and 4 items assessing disability over the previous 6 months. Pain intensity is rated from 0 to 10, according to the following variables: (1) today's pain, (2) the worst pain in the last 6 months, and (3) the average pain experienced in the last 6 months. Three disability questions measure the interference during the past 6 months caused by LBP and are rated from 0 to 10 with respect to the following: work; recreational, social, and family activities; and daily activities. One disability question measures the number of days in the past 6 months that the respondent had been kept from usual activities due to LBP (work, school, or housework). Five grades of pain severity are derived from the aggregate score of pain intensity (ranging from 0 to 100) and the number of disability points (ranging from 0 to 6), which are derived from the 3 disability scores and the number of disability days (Supplemental Table 1, Supplemental Digital Content 1, available at http://links.lww.com/BRS/A669).[12–14] Subjects also filled out the Short Form-12 (SF-12) questionnaire, which measures self-reported health status and quality of life.

Radiographical Evaluation of the Lumbar Spine

Lateral lumbar spine radiographs were obtained according to a standard protocol, with the film centered on the second lumbar vertebra. In total, 1772 lumbar radiographs were available for review and were evaluated by a single observer, blinded to the subjects' reporting of LBP. Each vertebral level from L1–L2 to L4–L5 was reviewed for the presence of radiographical features of degenerative change. Semiquantitative scores for the following features were given using a reference atlas[15]: presence and severity of anterior osteophytes (grade 0 = none; grade 1 = barely visible; grade 2 = definite; grade 3 = large), endplate sclerosis (grade 0 = none; grade 1 = present), and joint space narrowing (grade 0 = none; grade 1 = probable; grade 2 = definite; grade 3 = severe, bone to bone). In addition, Kellgren-Lawrence (K-L) grading was used for each vertebral level (grade 0 = normal disc with no osteophytes; grade 1 = slight anterior wear and osteophyte formation; grade 2 = definite anterior wear and mild disc space narrowing with osteophyte formation; grade 3 = moderate disc space narrowing with osteophytes and sclerosis; and grade 4 = large osteophytes, marked disc space narrowing, and sclerosis of vertebral endplates). Radiographs were read twice by 1 reader, an academically based rheumatologist (Y.O.J.). Intraobserver reproducibility was assessed by re-evaluating 50 films within 1 week of the first reading. The reproducibility of intrareader assessments was high (for osteophyte grading, $\kappa = 0.89–0.93$; for endplate sclerosis, $\kappa = 0.71–84$; for joint space narrowing, $\kappa = 0.81–0.89$; and for K-L grading, $\kappa = 0.69–0.80$, for various vertebral levels). Films allocated different grades at the 2 readings were adjudicated by consensus between the original reader and a second reader.

Statistical Analyses

For a comparison between the normal subjects and those with LBP, continuous variables were tested using Student *t* test, and categorical variables were tested using Pearson's χ^2 test. Odds ratios (ORs) and 95% confidence intervals (CIs) for LBP risk factors were calculated using multivariate logistic regression analysis, with adjustments made for the factors significantly associated with LBP in the univariate analysis. Logistic regression analysis was used because it is suited for identifying the risk factors that best predict a given condition among multiple variables by exclusion of nonrelevant variables by adjustment.

The ORs describe the strength of association between 2 data categories. For example, an OR of 1.53 comparing a group in "01" and another group in "23" means that the "23" group will have a probability of LBP that is 1.53 times greater than the probability for the "01" group. For analysis of the associations of daily activities with LBP, time spent per day on each activity at present and at 25 years of age was divided into less than 1 hour, 1 to 3 hours, and 3 hours or more, and ORs for the risk of LBP were calculated after adjustment of age and sex, using time spent for less than 1 hour as the reference. For comparison of quality of life measures assessed by SF-12, adjustments for confounding factors were made using analysis of variance with multiple classification analysis. Logistic regression was used to determine the association between each of the 4 radiographical features (osteophytes, joint space narrowing, endplate sclerosis, and K-L grade) and LBP (both lifetime and point). The grade of the most severely affected vertebral level within an individual was used for the analysis. LBP was used as the dependent variable with adjustments made for age and sex. The results of these analyses are expressed as ORs and 95% CIs. Statistical analyses were performed using the SPSS software (ver. 12.0; SPSS Inc., Chicago, IL). A *P* value of less than 0.05 (2-tailed) was considered to indicate statistical significance.

RESULTS

Table 1 shows the baseline characteristics of the study participants. The mean age of the study subjects was 56.6 years and 55.5% were women. Table 2 shows the lifetime, point, and 6-month prevalences of LBP. The lifetime prevalence of LBP was 61.3% in this cohort, with women having a higher prevalence than men. The point and 6-month prevalences were also higher among women. In addition, the lifetime and point prevalences increased with age in both sexes, except for lifetime prevalence in men, which remained stable with increasing age

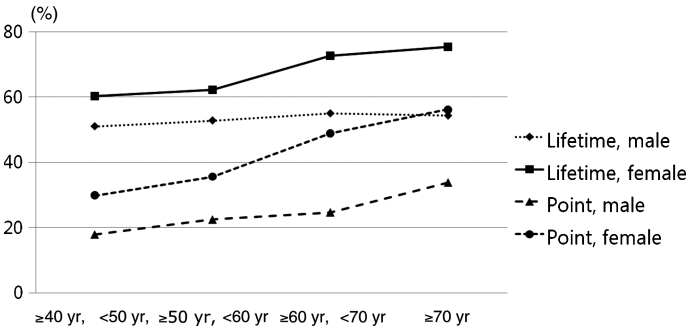

Figure 2. Lifetime and point prevalence of low back pain according to age and sex.

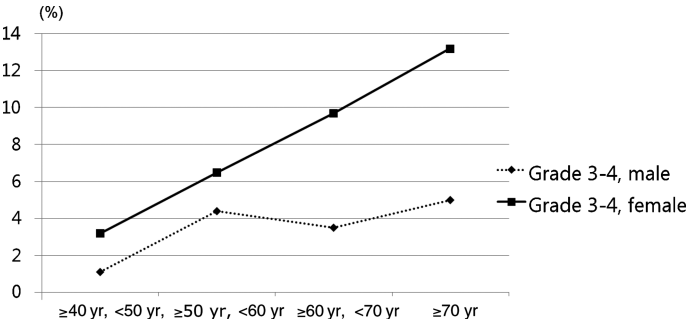

Figure 3. Prevalence of grade 3–4 low back pain according to age and sex.

(Figure 2). The distribution of LBP severity grade, measured using the Chronic Pain Questionnaire, was 37.4%, 13.8%, and 5.8% for grade 1, grade 2, and grade 3–4, respectively, showing that the majority of individuals had low-intensity/low-disability pain. However, the prevalence of LBP of grade 3 or more was significantly higher in women than in men and increased significantly with age, particularly in women (Figure 3). Subjects with LBP had a significantly worse SF-12 score in all domains except for mental health, reflecting the influence of LBP on the deterioration in quality of life (Supplemental Table 2, Supplemental Digital Content 2, available at http://links.lww.com/BRS/A670). Next, we evaluated risk factors associated with the presence of LBP. As shown in Table 3, after adjustment of multiple confounders, LBP was significantly associated with age, female sex, the presence of obesity (point only), and osteoporosis (lifetime only). Exercise (both lifetime and point) and manual work (point only) were negatively associated with LBP. Among daily activities, time spent squatting at 25 years of age was significantly associated with lifetime and present LBP after adjusting for age and sex (Table 4). In addition, time spent sitting on the floor without back support at 25 years of age was significantly associated with lifetime LBP. Furthermore, both of these activities were significantly associated with the presence of degenerative change in the lumbar spine defined as more than K-L grade 2 after adjusting for confounders (OR for sitting on the floor = 2.22 and 95% CI = 1.59–3.08; OR for squatting = 1.92 and 95% CI = 1.48–2.50, respectively). Finally, we evaluated the relationship between degenerative change on lumbar spine radiographs and the presence of LBP. After adjusting for age and sex, the presence of disc space narrowing (≥ grade 2) and osteophytes (≥ grade 2) was associated with both lifetime and present LBP, and the strength of the association increased with increasing severity of disc space narrowing (Table 5). In contrast, the presence of endplate sclerosis was not associated with LBP. Advanced K-L grade (3–4) was significantly associated with LBP at present.

DISCUSSION

In this study of middle-to-old age rural community residents in Korea, the lifetime prevalence of LBP was 61.3%, with women having a higher prevalence than men. In addition, high-grade LBP was significantly more common in women and increased significantly with age. Risk factors associated with LBP included advanced age, female sex, and activities related to the Asian lifestyle, such as sitting on the floor without back support and squatting.

Comparing the prevalence of LBP among epidemiological studies is challenging because of differences in demographic profiles of study populations, lack of a uniform case definition, and methodological heterogeneity. Although relatively few studies have investigated the epidemiology of LBP in developing countries, an increasing body of high-quality evidence accumulated recently suggests that the prevalence of LBP is also high in these countries.[16,17] Our prevalence data are consistent with previous reports showing a point prevalence of 34.1% among rural Tibetan residents and a lifetime prevalence of 61% among Chinese workers in Shanghai, although our population included more advanced-aged subjects than these reports.[18,19] A higher prevalence of LBP and more disability from it in women despite a lower likelihood of performing heavy manual labor have been widely reported, and we also saw this in our results.[20] More interesting was that the sex difference in prevalence and severity of LBP was accentuated according to age in our subjects. Many debates exist regarding whether the prevalence of LBP decreases in the elderly; adults of working age have been reported to be the most vulnerable, and the prevalence of LBP decreases from the sixth decade.[21–23] Notably, studies conducted in working populations are susceptible to a "healthy worker effect," such that a bias is introduced by the exclusion of subjects with LBP from the workforce.[24] A previous systematic review showed that the prevalence of benign LBP decreased with increasing age, after a peak in the sixth decade, whereas that of severe LBP continued to increase with increasing age.[24] In our study, we studied only subjects aged 40 years or older, and lifetime and point prevalences did not show peaking at any younger age range in either sex. The reason for the discrepancy in such a continued increase in LBP according to age among our population is probably related to the exclusion of subjects aged younger than 40 years, with the additional possibility of differences in genetic factors, lifestyle, or cultural backgrounds. Among women, the prevalence of severe LBP increased sharply according to age, suggesting that it may become another major health consequence of aging in this population.

TABLE 1. Baseline Characteristics of the Subjects

Variables	Subjects (N = 4181)	Men (N = 1861)	Women (N = 2320)
Age (yr, mean ± SD)	56.6 ± 13.4	55.7 ± 13.8	57.2 ± 13.0
Body mass index (kg/m^2, mean ± SD)	24.3 ± 3.3	23.9 ± 3.1	24.6 ± 3.4
Education ≥12 yr	1451 (34.7)	893 (48.0)	558 (24.1)
Manual occupation	1618/4178 (38.7)	525/1860 (28.2)	1093/2318 (47.1)
Regular exercise	1581 (37.8)	747 (40.1)	834 (35.9)
Previous or current smoker	828 (19.8)	779 (41.9)	49 (2.1)
Alcohol	1947(46.6)	1298 (69.7)	649 (28.0)
Married	3383 (80.9)	1628 (87.5)	1755 (75.6)
Diabetes mellitus	448 (17.9)	186 (10.0)	262 (11.3)
Hypertension	726 (17.4)	268 (14.4)	458 (19.7)
Self-reported hand or knee arthritis	1466 (46.2)	485 (26.1)	981 (42.3)

Except where indicated otherwise, values are n (%). The body mass index is the weight in kilograms divided by the square of the height in meters. Manual occupation was defined as work demanding physical exertion (factory worker, laborer, and farmer). Regular exercise was defined as self-reported exercise more than 3 times per week.

Recent systematic reviews failed to establish causality between many occupational activities, such as standing, walking, lifting, pushing/pulling, and carrying, and LBP.[25–28] Among risk factors, we were particularly interested in those activities inherent in the Asian lifestyle, such as squatting and sitting on the floor without back support, which have not been previously examined. We noticed that the hours devoted to deep squatting and sitting on the floor without back support at a young age were significantly associated with LBP. Deep squatting has been reported to be associated with knee osteoarthritis in Asian populations, with an increase in the compressive and shear force on the knee joint.[29] Squatting was also reported to be associated with LBP in Chinese middle-aged women and in Australian younger age workers, and a study reported that intramuscular pressures of the erectors spinae were increased in the squatting postures compared with the pressure that occurred with upright standing, and this may lead to viscoelastic deformation of tissue structures and hence changes in tissue properties as well as muscle fatigue and sore.[30,31] Sitting on the floor without back support is a common posture adopted by Asians during work or recreational activities (Supplemental Figure, Supplemental Digital Content 3, available at http://links.lww.com/BRS/A671). No reported study has examined the relationship between this posture and LBP. Most studies regarding the relationship between sitting and LBP were performed in Western populations where sitting typically involves sitting on a chair. Although lumbar intradiscal pressure is often reported to be higher with upright sitting than with standing, a recent review reported otherwise, suggesting that if sitting is a greater threat for development of LBP than standing, the mechanism is unlikely to be increased intradiscal pressure.[32] A recent systematic review also reported that evidence showing the association between a sedentary lifestyle and LBP is limited.[33] Further research is warranted concerning how sitting on the floor without back support, typical of Asians, instead of sitting in a chair affects intradiscal pressure and other biomechanical properties of the lower back. Notably, squatting and sitting on the floor were associated not only with LBP but also with the presence of radiographical degenerative change in the

TABLE 2. Prevalence of Back Pain

	Lifetime Prevalence		Point Prevalence		6-m Prevalence	
	No.	% (95% CI)	No.	% (95% CI)	No.	% (95% CI)
Men (1861)	1001	53.8 (50.8–56.9)	443	23.8 (21.9–25.8)	717	38.5 (36.3–40.8)
Women (2320)	1561	67.3 (65.3–69.2)	955	41.2 (39.2–43.2)	1289	55.6 (53.3–57.6)
All (4181)	2562	61.3 (59.8–62.7)	1398	33.4 (32.0–34.9)	2006	48.0 (46.5–49.5)

95% CI was calculated with the use of the modified Wald method.

CI indicates confidence interval.

TABLE 3. Risk Factors of Low Back Pain

	Lifetime Odds Ratio (95% CI)				Point Odds Ratio (95% CI)			
	P	Unadjusted OR	*P*	Adjusted OR*	*P*	Unadjusted OR	*P*	Adjusted OR*
Age (yr)								
≥50,<60 (*vs.* ≥40, <50)	0.488	1.06 (0.90–1.26)	0.217	1.17 (0.91–1.51)	<0.001	**1.51** (1.24–1.83)	0.043	**1.35** (1.01–1.80)
≥60,<70 (*vs.* ≥40, <50)	<0.001	**1.48** (1.25–1.75)	0.022	**1.37** (1.05–1.80)	<0.001	**2.33** (1.94–2.80)	<0.001	**1.88** (1.39–2.54)
≥70 (*vs.* ≥40, <50)	<0.001	**1.52** (1.26–1.84)	0.064	1.33 (0.98,–1.80)	<0.001	**3.13** (2.56–3.83)	<0.001	**2.37** (1.70–3.29)
Female	<0.001	**1.77** (1.56–2.00)	<0.001	**1.69** (1.38–2.08)	<0.001	**2.24** (1.96–2.56)	<0.001	**2.11** (1.69–2.63)
Hypertension	<0.001	**1.32** (1.12–1.57)	0.160	1.15 (0.95–1.41)	<0.001	**1.50** (1.27–1.77)	0.454	1.08 (0.89–1.31)
Obesity	<0.001	**1.37** (1.02–1.84)	0.284	1.22 (0.85–1.76)	<0.001	**1.45** (1.24–1.70)	0.002	1.71 (1.21–2.41)
Alcohol	<0.001	**0.75** (0.66–0.85)	0.501	1.06 (0.89–1.26)	<0.001	**0.59** (0.52–0.67)	0.750	1.03 (0.86–1.23)
Smoking	<0.001	**0.73** (0.63–0.85)	0.847	1.02 (0.82–1.27)	<0.001	**0.65** (0.55–0.77)	0.611	1.07 (0.84–1.36)
Exercise	0.005	**0.83** (0.73–0.95)	0.007	**0.81** (0.69–0.94)	<0.001	**0.70** (0.61–0.80)	<0.001	**0.70** (0.59–0.83)
Diabetes mellitus	0.534	1.05 (0.90–1.23)	0.501	0.94 (0.78–1.13)	0.007	**1.25** (1.06–1.46)	0.817	0.98 (0.81–1.18)
Osteoporosis	<0.001	**1.84** (1.59–2.13)	0.029	**1.24** (1.02–1.50)	<0.001	**2.18** (1.89–2.51)	0.191	1.14 (0.94–1.38)
Manual work	0.658	1.03 (0.91–1.17)	0.882	1.01 (0.85–1.20)	0.767	1.02 (0.89–1.16)	0.047	**0.84** (0.70–0.99)
Self-reported hand and knee arthritis	<0.001	**1.47** (1.27–1.70)	0.136	1.14 (0.96–1.36)	<0.001	**1.70** (1.47–1.97)	0.376	1.08 (0.91–1.30)

Values in boldface indicates significant increase of odds ratio.

OR indicates odds ratio; CI, confidence interval.

**Adjustments made for the factors significantly associated with low back pain in the univariate analysis.*

TABLE 4. The Association Between Time Spent in Daily Activities and Low Back Pain

	Lifetime OR (95% CI)				Point OR (95% CI)			
	P	Unadjusted OR	*P*	Adjusted OR	*P*	Unadjusted OR	*P*	Adjusted OR
Sitting on chair—present								
1–2 hr (*vs.* <1 hr)	0.036	1.18 (0.91–1.38)	0.003	1.31 (0.97–1.59)	0.469	1.06 (0.91–1.24)	0.018	1.22 (0.98–1.49)
>3 hr (vs. <1 hr)	0.158	0.89 (0.75–1.05)	0.261	1.11 (0.93–1.32)	0.000	0.68 (0.57–0.81)	0.738	1.03 (0.86–1.25)
Sitting on chair—at 25 years of age								
1–2 hr (*vs.* <1 hr)	0.106	0.88 (0.76–1.03)	0.682	1.03 (0.88–1.21)	0.002	**0.78** (0.67–0.91)	0.487	1.06 (0.90–1.26)
>3 hr (*vs.* <1 hr)	0.006	**0.80** (0.68–0.94)	0.825	1.02 (0.85–1.22)	0.000	**0.61** (0.51–0.72)	0.728	1.04 (0.86–1.25)
Sitting on the floor without back support—present								
1–2 hr (*vs.* <1 hr)	0.096	1.16 (0.97–1.38)	0.125	1.15 (0.96–1.37)	0.185	1.14 (0.94–1.37)	0.196	1.14 (0.94–1.38)
>3 hr (*vs.* <1 hr)	0.005	**1.31** (1.08–1.58)	0.219	1.13 (0.93–1.37)	0.026	**1.25** (1.03–1.53)	0.850	0.98 (0.80–1.21)
Sitting on the floor without back support—at 25 years of age								
1–2 hr (*vs.* <1 hr)	0.004	**1.29** (1.08–1.55)	0.003	**1.31** (1.10–1.57)	0.382	1.09 (0.90–1.32)	0.201	1.14 (0.93–1.38)
>3 hr (*vs.* <1 hr)	0.000	**1.61** (1.33–1.93)	0.000	**1.41** (1.17–1.71)	0.007	**1.31** (1.07–1.59)	0.681	1.04 (0.85–1.28)
Squatting—present								
1–2 hr (*vs.* <1 hr)	0.698	1.03 (0.89–1.18)	0.614	1.04 (0.90–1.20)	0.059	0.87 (0.75–1.01)	0.409	0.94 (0.80–1.09)
>3 hr (*vs.* <1 hr)	0.000	**1.55** (1.28–1.88)	0.001	**1.38** (1.13–1.68)	0.001	**1.38** (1.15–1.67)	0.129	1.16 (0.96–1.41)
Squatting—at 25 years of age								
1–2 hr (*vs.* <1 hr)	0.052	**1.16** (1.00–1.35)	0.239	1.10 (0.94–1.28)	0.464	1.06 (0.90–1.25)	0.965	0.99 (0.84–1.18)
>3 hr (*vs.* <1 hr)	0.000	**2.23** (1.88–2.63)	0.000	**1.87** (1.57–2.23)	0.000	**2.11** (1.80–2.48)	0.000	**1.45** (1.22–1.72)

Data are adjusted for age and sex.

OR indicates odds ratio; CI, confidence interval.

TABLE 5. The Association Between Low Back Pain and Features of Degenerative Change of Lumbar Spine

Grades	Back Pain			
	P/Point OR (95% CI)		*P*/Lifetime OR (95% CI)	
Osteophyte				
0 *vs*. 123	0.779	1.06 (0.72–1.55)	0.891	0.98 (0.68–1.39)
01 *vs*. 23	**0.000**	**1.53** (1.22–1.92)	**0.005**	**1.38** (1.10–1.73)
0		Referent		Referent
1	0.772	0.94 (0.64–1.40)	0.605	0.91 (0.64–1.30)
2	0.100	1.43 (0.93–2.20)	0.252	1.27 (0.84–1.90)
3	0.097	1.49 (0.93–2.39)	0.320	1.26 (0.80–1.98)
Endplate sclerosis				
0		Referent		Referent
1	0.825	1.03 (0.81–1.31)	0.890	1.02 (0.80–1.29)
Joint space narrowing				
0 *vs*. 123	0.084	1.20 (0.98–1.49)	0.004	1.35 (1.10–1.66)
01 *vs*. 23	**0.000**	**1.71** (1.28–2.28)	**0.000**	**2.03** (1.47–2.81)
0		Referent		Referent
1	0.637	1.06 (0.84–1.33)	0.144	1.18 (0.95–1.46)
2	**0.002**	**1.68** (1.21–2.33)	**0.000**	**2.21** (1.54–3.17)
3	**0.018**	**2.32** (1.16–4.65)	0.053	2.17 (0.99–4.74)
KLGr				
0 *vs*. 1234	0.649	1.09 (0.74–1.61)	0.780	0.95 (0.67–1.36)
0		Referent		Referent
1	0.908	1.02 (0.68–1.54)	0.842	0.96 (0.66–1.40)
2	0.599	1.12 (0.74–1.68)	0.667	0.92 (0.63–1.35)
3	**0.043**	**1.61** (1.02–2.55)	0.223	1.32 (0.85–2.05)
4	**0.005**	**2.41** (1.30–4.45)	0.251	1.44 (0.77–2.68)

Data are adjusted for age and sex. Referent means the category with which other categories are compared and is given a value of 1.

OR indicates odds ratio; CI, confidence interval; KLGr, Kellgren-Lawrence grade.

lumbar spine. A previous small study from Japan reported that severe lumbar degenerative disease was more common among British subjects than Japanese,[34] and comparison of the prevalence of radiographical spinal osteoarthritis in our population with that in Western populations is a subject of future research.

Among radiographical features analyzed, joint space narrowing and osteophytes were significantly associated with LBP and the strength of the association increased with increasing severity of disc space narrowing. Many previous studies suggested an association between disc space narrowing and LBP.[35,36] The mechanism linking disc space narrowing with LBP may be related to the extrusion of disc material, resulting in increased pressure on spinal nerve roots, reduction in physical space between the vertebra, alteration in spine biomechanics, and increasing pressure on the affected nociceptor.[35]

Our study has strengths and limitations. We used a standardized approach to define the prevalence of LBP in a large population of Korean community residents. We included elderly subjects, an under-represented population in back pain research. We defined culture-specific lifestyle factors related to LBP. Limitations include the lack of evaluation of psychological factors related to LBP, inclusion of only a rural population, and use of a questionnaire not validated in Korean to evaluate the severity of LBP. Recall bias for the time spent in various activities may have affected the study results such that subjects with LBP may be more likely to

report their history of specific activities than those without LBP. Because of restraint in the budget, we could not obtain lumbar radiographs of all of our study subjects, and this would have led to a selection bias, although we randomly selected subjects for radiograph, and the LBP rate was not different between those who obtained radiographs and those who did not. We could not evaluate facet joints in the lumbar spine radiographs because of technological limitations, thus missing the chance to evaluate the full range of degenerative changes in the lumbar spine. We did not collect any information regarding symptoms related to sciatica or leg pain, which may be relevant in explaining the association of LBP with disc space narrowing. Finally, because of the cross-sectional design, the risk factors verified in our study should be further confirmed in a prospective longitudinal study to establish the cause and effect relationship.

In conclusion, our study shows that the prevalence of LBP is comparable among these Korean rural community residents with that among other population groups. Risk factors associated with LBP included advanced age, female sex, squatting, sitting without back support, and the presence of osteophytes, joins space narrowing, and advanced K-L grading on lumbar radiograph.

➢ Key Points

- ❑ The lifetime prevalence of LBP was 61.3%, which is comparable with that reported in other populations.
- ❑ Lifetime, point, and 6-month prevalences were higher in women.
- ❑ Lifetime, point, and 6-month prevalences increased with age in both sexes, except for lifetime prevalence in men.
- ❑ The prevalence of LBP of grade 3 or more was significantly higher in women and increased significantly with age, particularly in women.
- ❑ LBP was significantly associated with age, female sex, the presence of osteoporosis, time spent squatting and sitting without back support, and the presence of disc space narrowing, osteophytes, and advanced K-L grade in lumbar radiograph.

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