

# Factors Associated with Depressive Symptoms in Patients with Chronic Low Back Pain

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**Objective** To investigate depressive symptoms and their related factors in patients with chronic low back pain in Korea.

**Method** A cross-sectional study using data from the fourth Korea National Health and Nutrition Examination Survey (KNHANES IV) 2009 was undertaken. The sample consisted of 1,426 participants with chronic low back pain. Multifactorial regression analysis was used to identify the association between depressive symptoms and socioeconomic demographics and other chronic diseases.

**Results** Among the 371 (26.0%) patients with depression, significant factors associated with depressive symptoms were female gender (odds ratio [OR], 2.691; 95% confidence interval [CI], 1.724–4.199), medical aid beneficiary (OR, 1.371; 95% CI, 1.039–1.810), a dependent group for activities of daily living (OR, 1.570; 95% CI, 1.180–2.087), 'not good' in the perceived health category (OR, 2.309; 95% CI, 1.730–3.081) and in a cancer group (OR, 1.803; 95% CI, 1.051–3.093).

**Conclusion** This study provides the foundation for managing patients with chronic low back pain and depressive symptoms. Clinicians managing chronic low back pain should consider risk factors for depressive symptoms.

**Key Words** Chronic low back pain, Depression, NHANES

## INTRODUCTION

Low back pain is a common disease, and it is observed at least once in 70-85% of the population during their lifetime. Low back pain is important due to progress in treating chronic pain, which decreases productivity and

the financial burden globally.<sup>1-5</sup>

Several psychiatric disorders commonly accompany chronic low back pain, and the rate of depressive symptoms is 30-60% among patients.<sup>6-8</sup> According to previous studies, a group of patients with chronic low back pain accompanied by depressive symptoms show significantly higher subjective pain, but no difference was found in the functional states or organic lesions when organic lesions, a subjective pain measure, and functioning and treatment progression were compared with a group of patients with general chronic low back pain. Improvements are minimal after rehabilitation.<sup>9</sup> The degree of depressive symptoms at the initiation of treatment and during the treatment period are the biggest independent factor for pain intensity in

Received July 13, 2011; Accepted August 23, 2011

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patients.<sup>10</sup> Accordingly, depressive symptoms as well as organic lesions in patients with chronic low back pain are very important for patient management. Therefore, factors associated with depressive symptoms need to be understood to consider treatment for chronic low back pain. However, socioeconomic and demographic approaches are rare in studies about depressive symptoms accompanying patients with chronic low back pain in Korea. Additionally, the subjects were limited in previous studies, so the results may have been biased in specific areas. Therefore, it is difficult to represent the general population in Korea.<sup>9,11,12</sup>

The aim of this study was to investigate depressive symptoms accompanied by chronic low back pain and their related factors using data from questions of the fourth Korea National Health and Nutrition Examination Survey (KNHANES IV) 2009, performed to sample households selected to represent the entire nation of Korea in 2009.

## MATERIALS AND METHODS

### Subjects

In the health survey of the third year (2009) of KNHANES IV, a patient with chronic low back pain was defined as “ill more than 3 months during the past year” for the items about low back pain among the 7,893 in the sample population over 19 years old. In total, 1,426 (18.1%) subjects were finally selected.

### Methods

The depressive symptom group was defined as those who answered “yes” to: “Have you felt sorrow or despair that has affected your daily life more than 2 weeks continuously during the past year?” Age was limited to those over 20 years old. Four groups were investigated, and their marital status was confirmed. Education level was divided into “less than elementary school”, “less than middle school”, “less than high school”, and “more than university”. Family income was classified into quartiles. Medical security was divided into “employee health insurance subscribers”, “local health insurance subscribers”, and “medical-aid beneficiaries”. Smoking status was classified into “smoking”, “not-smoking currently”, and “not applicable”. Drinking frequency was classified into “less than once per month”, “1-4 times per

month”, and “more than twice per week”. Perceived health was divided into “very good, good, average, bad, very bad” and, one group included “very good, good, average” and the other included “bad, very bad”. For items about activities of daily living (ADL), only “I am not disrupted from daily activity.” was defined as independent. Chronic diseases included stroke, hypertension, diabetes, ischemic heart disease, liver cirrhosis, arthritis, asthma, and chronic renal failure. The cancer group included patients who had at least one cancer among stomach, liver, lung, cervical, breast, colon, and other cancers. Each disease was defined as “yes” for “Did a doctor diagnose the disease?” so errors decreased due to the subjective judgment. Body mass index (BMI) was classified into underweight (<18.5), normal weight (18.5-24.9), and obese (>25).

### Data analysis

SPSS 15.0 version was used for the statistical analysis (SPSS Inc., Chicago, USA). A p-value less than 0.05 was considered significant. A cross-tabulation was used for the distributive analysis of each factor between the depressive symptom group and the general group. Distribution differences were examined with the chi-square test. Significant factors in the univariate analysis were used as variables to identify factors related to depressive symptoms in a multiple logistic regression. Model 1 was analyzed before correction of variables and Model 2 was analyzed after correction.

## RESULTS

### Socioeconomic and demographic features of the study subjects

The depressive symptom group included 371 subjects (26.0%) among 1,426 patients with low back pain (Table 1). The test group was comprised of 400 males (28.1%) and 1,026 females (71.9%). In total, 124 subjects (8.7%) were 20-34 years old, 250 (17.5%) were 35-49 years, 387 (27.1%) were 50-64 years, and 665 (46.6%) were over 65 years. A total of 1,351 subjects (94.7%) were married. A total of 793 subjects (55.6%) had less than an elementary school education. For family income, 386 subjects (27.2%) were in the first quartile, 375 (26.4%) were in the second quartile, 339 (23.9%) were in the third quartile, and 319 (22.5%) were in the fourth quartile. There were

**Table 1.** General Characteristics of the Study Subjects

Characteristics		Total (N=1,426) No. (%)
Sex	Male	400 (28.1)
	Female	1,026 (71.9)
Age	20-34	124 (8.7)
	35-49	250 (17.5)
	50-64	387 (27.1)
	65+	665 (46.6)
Living with spouse (missing=1)	Single	74 (5.2)
	Married	1,351 (94.7)
Education	≤Elementary school	793 (55.6)
	≤Middle school	167 (11.7)
	≤High school	324 (22.7)
	≥University	142 (10.0)
Income (quartile) (missing=7)	1st (lowest)	386 (27.2)
	2nd	375 (26.4)
	3rd	339 (23.9)
	4th (highest)	319 (22.5)
Medical security (missing=5)	Medical Aid	121 (8.5)
	National Health (local)	462 (32.5)
	National Health (Employee)	838 (59.0)
Perceived health	Good	678 (47.5)
	Not good	748 (52.5)
ADL (missing=1)	Independent	780 (54.7)
	Dependent	645 (45.3)
Number of chronic disease	0	650 (45.6)
	1	430 (30.2)
	2	241 (16.9)
	≥3	105 (7.4)
Cancer	No	1,359 (95.3)
	Yes	67 (4.7)
BMI (missing=3)	Underweight	55 (3.9)
	Normal weight	858 (60.3)
	Obese	510 (35.8)
Smoking status (missing=1)	Current smoker	205 (14.4)
	Ex-smoker	226 (15.8)
	Non-smoker	994 (69.8)
Drinking frequency	<1 time per month	893 (62.6)
	1-4 times per month	321 (22.5)
	≥2 times per week	212 (14.9)
Depressive symptom	No	1,055 (74.0)
	Yes	371 (26.0)

ADL: Activities of daily living, BMI: Body mass index, Chronic disease: Stroke, hypertension, diabetes, ischemic heart disease, liver cirrhosis, arthritis, asthma, and chronic renal failure, Cancer: Stomach, liver, lung, cervical, breast, colon, and other cancers

838 (59.0%) employee health-insurance subscribers 462 (32.5%) local health-insurance subscribers, and 121 (8.5%) medical-aid beneficiaries. For perceived health, 748 subjects (52.5) were “not good” and 780 subjects (54.7%) were independent with their ADL. A total of 650 subjects (45.6%) showed no accompanying disease, 430 (30.2%) showed one, 241 (16.9%) showed two, and 105 (7.4%) showed more than three diseases. The cancer group contained 67 subjects (4.7%). In total, 510 subjects (35.8%) were obese, 858 (60.3%) were normal weight, and 55 (3.9%) were underweight. For smoking status, 205 subjects (14.4%) were current smokers, 226 (15.8%) quit smoking, and 994 (69.7%) were non-smokers. For drinking frequency, 893 subjects (62.6%) drank less than once per month, 321 (22.5%) drank 1-4 times per month, and 212 (14.9%) drank more than twice per week.

### Comparison of characteristics according to depressive symptoms

Depressive symptoms were significantly higher in females ( $p<0.001$ ) (Table 2). Depressive symptoms were higher as education level ( $p=0.003$ ) and family income ( $p=0.001$ ) decreased, and higher in medical-aid beneficiaries ( $p<0.001$ ) than in health insurance subscribers. Depressive symptoms were significantly higher in the “not good” group of perceived health ( $p<0.001$ ) and in the ADL “dependent” group ( $p<0.001$ ). Cancer ( $p=0.010$ ), stroke ( $p=0.042$ ), myocardial infarction or angina pectoris ( $p=0.009$ ), and arthritis ( $p=0.007$ ) showed significant results for relevance to accompanying chronic diseases, and more depressive symptoms were observed as the number of chronic diseases increased ( $p=0.018$ ). The underweight group tended to show more depressive symptoms than the normal or overweight groups, but it was not statistically significant. Depressive symptoms were significant higher in the ex-smoker and non-smoker groups than those in the current smoker group ( $p=0.006$ ). Depressive symptoms were significantly higher in the groups who drank alcohol “less than once per month” and “1 to 4 times per month” than those who drank “more than twice per week” ( $p=0.026$ ).

### Predictable factors for depressive symptoms

In the Model 1 analysis, females showed more depressive symptoms than males (OR, 2.465; 95% CI, 1.817-3.344), and the second (OR, 1.480; 95% CI, 1.038-2.109) and first

**Table 2.** Sociodemographic and Medical Factors Influencing Depressive Symptom in Patients with Chronic Low Back Pain

		Depressive symptom		p-value
		No	Yes	
Sex	Male	340 (85.0)	60 (15.0)	.000
	Female	715 (69.7)	311 (30.3)	
Age	20-34	93 (75.0)	31 (25.0)	.337
	35-49	196 (78.4)	54 (21.6)	
	50-64	283 (73.1)	104 (26.9)	
	65+	483 (72.6)	182 (27.4)	
Living with spouse	Single	56 (75.7)	18 (24.3)	.790
	Married	998 (73.9)	353 (26.1)	
Education	≤Elementary school	557 (70.2)	236 (29.8)	.003
	≤Middle school	130 (77.8)	37 (22.2)	
	≤High school	252 (77.8)	72 (22.2)	
	≥University	116 (81.7)	26 (18.3)	
Income	1st (lowest)	267 (69.2)	119 (30.8)	.001
	2nd	272 (72.5)	103 (27.5)	
	3rd	257 (75.8)	82 (24.2)	
	4th (highest)	254 (79.6)	65 (20.4)	
Medical security	Medical Aid	72 (59.5)	49 (40.5)	.000
	National Health (local)	335 (72.5)	127 (27.5)	
	National Health (employee)	647 (77.2)	191 (22.8)	
Perceived health	Good	570 (84.1)	108 (15.9)	.000
	Not good	485 (64.8)	263 (35.2)	
ADL	Independent	630 (80.8)	150 (19.2)	.000
	Dependent	424 (65.7)	221 (34.3)	
Number of chronic disease	0	500 (76.9)	150 (23.1)	.018
	1	318 (74.0)	112 (26.0)	
	2	170 (70.5)	71 (29.5)	
	≥3	67 (63.8)	38 (36.2)	
Cancer	No	1,015 (74.7)	344 (25.3)	.010
	Yes	40 (59.7)	27 (40.3)	
BMI	Underweight	39 (70.9)	16 (29.1)	.165
	Normal weight	621 (72.4)	237 (27.6)	
	Obese	392 (76.9)	118 (23.1)	
Stroke	No	1,021 (74.5)	350 (25.5)	.042
	Yes	34 (61.8)	21 (38.2)	
Hypertension	No	708 (74.4)	244 (25.6)	.654
	Yes	347 (73.2)	127 (26.8)	
Diabetes	No	932 (74.2)	324 (25.8)	.641
	Yes	123 (72.4)	47 (27.6)	
IHD	No	1,033 (74.5)	353 (25.5)	.009
	Yes	22 (55.0)	18 (45.0)	

Table 2. Continued

		Depressive symptom		p-value
		No	Yes	
Liver cirrhosis	No	1,051 (74.0)	370 (26.0)	.999
	Yes	4 (80.0)	1 (20.0)	
Arthritis	No	759 (76.1)	239 (23.9)	.007
	Yes	296 (69.2)	132 (30.8)	
Asthma	No	1,010 (74.5)	345 (25.5)	.051
	Yes	45 (63.4)	26 (36.6)	
CRF	No	1,051 (73.9)	371 (26.1)	.578
	Yes	4 (100)	0 (0)	
Smoking status	Current smoker	167 (81.5)	38 (18.5)	.006
	Ex-smoker	178 (78.8)	48 (21.2)	
	Non-smoker	709 (71.3)	285 (28.7)	
Drinking frequency	<1 time per month	642 (71.9)	251 (28.1)	.026
	1-4 times per month	242 (75.4)	79 (24.6)	
	≥2 times per week	171 (80.7)	41 (19.3)	

ADL: Activities of daily living, BMI: Body mass index, IHD: Ischemic heart disease, CRF: Chronic renal failure, Chronic diseases: Stroke, hypertension, diabetes, ischemic heart disease, liver cirrhosis, arthritis, asthma, and chronic renal failure, Cancer: Stomach, liver, lung, cervical, breast, colon, and other cancers

quartile (OR, 1.742; 95% CI, 1.230-2.466) showed more depressive symptoms than the fourth quartile of family income. More depressive symptoms were shown for subjects with “less than an elementary school” education (OR, 1.890; 95% CI, 1.203-2.970) than those with “more than university”, and medical aid beneficiaries (OR, 2.305; 95% CI, 1.550-3.430) showed more depressive symptoms than those of employee health insurance subscribers (Table 3). The dependent group in ADL (OR, 2.189; 95% CI, 1.720-2.786) showed more depressive symptoms than those of the independent group. “Not good” in perceived health (OR, 2.862; 95% CI, 2.219-3.692) resulted in more depressive symptoms than those of the “good” group. Depressive symptoms were significantly higher for patients with cancer (OR, 1.992; 95% CI, 1.204-3.294), stroke (OR, 1.802; 95% CI, 1.032-3.146), myocardial infarction or angina pectoris (OR, 2.394; 95% CI, 1.269-4.516), and arthritis (OR, 1.416; 95% CI, 1.101-1.821). The group with more than three accompanying chronic diseases (OR, 2.097; 95% CI, 1.317-3.340), and past (OR, 2.038; 95% CI, 1.440-2.883) and present (OR, 1.719; 95% CI, 1.178-2.510) smokers had more depressive symptoms than the non-smoker group. However females (OR, 2.691; 95% CI, 1.724-4.199), medical-aid beneficiaries

(OR, 1.371; 95% CI, 1.039-1.810), the ADL dependent group (OR, 1.570; 95% CI, 1.180-2.087), ‘not good.’ for perceived health (OR, 2.309; 95% CI, 1.730-3.081) and the cancer group (OR, 1.803; 95% CI, 1.051-3.093) were the only statistically significant variables in the multivariate regression after the correction.

## DISCUSSION

Socioeconomic and demographic factors related to depressive symptoms in patients with chronic low back pain were studied based on the KNHANES IV (2009). Gender, medical security, ADL, perceived health and accompanied cancers were related to depressive symptoms after correcting for other variables.

Generally, the interrelationship between gender and depressive symptoms are well known. The prevalence rate in suspected patients with depression who scored more than 16 points on the Center for Epidemiological Studies-Depression Scale in Korea was 23.1% in males and 27.4% in females. In severe cases of depression (>25 points), the prevalence rate was 6.8% in males and 10.4% in females.<sup>13</sup> According to the type of medical security, depressive symptoms were significantly higher in medi-



**Table 3.** Risk Factors for Depressive Symptoms in Patients with Chronic Low Back Pain: Adjusted Odds Ratio from a Multivariate Logistic Regression Model

Factors		Odds ratio model 1*	95% CI	Odds ratio model 2 <sup>†</sup>	95% CI
Sex (ref=male)	Female	2.465	1.817-3.344	2.691	1.724-4.199
Income (ref=4th (highest))	3rd	1.247	0.862-1.803	1.404	0.961-2.053
	2nd	1.480	1.038-2.109	1.302	0.891-1.902
	1st (lowest)	1.742	1.230-2.466	1.049	0.710-1.549
Education (ref ≥University)	≤Elementary school	1.890	1.203-2.970	1.120	0.669-1.875
	≤Middle school	1.270	0.725-2.224	1.096	0.596-2.013
	≤High school	1.275	0.774-2.101	1.309	0.764-2.242
Medical security (ref=employee)	Local	1.284	0.990-1.666	0.818	0.515-1.297
	Medical aid	2.305	1.550-3.430	1.371	1.039-1.810
ADL (ref=independent)	Dependent	2.189	1.720-2.786	1.570	1.180-2.087
Perceived health (ref=good)	Not good	2.862	2.219-3.692	2.309	1.730-3.081
Cancer (ref=No)	Yes	1.992	1.204-3.294	1.803	1.051-3.093
Stroke (ref=No)	Yes	1.802	1.032-3.146	1.281	0.673-2.439
IHD (ref=No)	Yes	2.394	1.269-4.516	1.987	0.980-4.025
Arthritis (ref=No)	Yes	1.416	1.101-1.821	0.967	0.680-1.374
Chronic disease (ref=0)	1	1.173	0.886-1.553	0.970	0.554-1.701
	2	1.391	1.000-1.936	1.001	0.569-1.761
	≥3	2.097	1.317-3.340	1.092	0.587-2.030
Smoking (ref=Non-smoker)	Current smoker	1.719	1.178-2.510	0.847	0.523-1.372
	Ex-smoker	2.038	1.440-2.883	1.160	0.722-1.864
Drinking frequency (ref= <1 time per month)	1-4 times per month	1.198	0.894-1.605	1.095	0.718-1.669
	≥2 times per week	0.734	0.480-1.123	1.154	0.836-1.593

Chronic diseases: Stroke, hypertension, diabetes, ischemic heart disease, liver cirrhosis, arthritis, asthma, and chronic renal failure

\*Model 1: Crude odds ratio, <sup>†</sup>Model 2: Adjustment was performed

cal-aid beneficiaries than those in employee health insurance subscribers. In medical-aid beneficiaries, low level of education, single patients who lived alone, and low monthly average family income were considered in previous studies and selection standards were referred, so there might be indirect effects.<sup>14</sup> Depressive symptoms increased in the low-ability ADL group compared to those in the high-ability group, which was similar to a previous study.<sup>15</sup> Depressive symptoms increased as perceived health became poorer, and the reason is associated with studies about health-related quality of life and depressive symptoms.<sup>16</sup> The correlation between accompanied cancers and depressive symptoms has been revealed in many studies. In particular, patients with pancreatic cancer, oropharyngeal cancer, and breast cancer show more

depressive symptoms and the prevalence rates are 20-25%.<sup>17-20</sup>

Many studies have reported the relationship between depressive symptoms and chronic diseases. In this study, stroke, myocardial infarction or angina pectoris, and arthritis were significantly different in the univariate analysis. In previous studies of stroke, depressive symptoms were different by location of the lesion, and more depressive symptoms were observed when the lesion was located on the left side.<sup>21,22</sup> In previous studies about myocardial infarction or angina pectoris, many patients showed depressive symptoms and high morbidity rates, and the male result was similar to that of females, so our results agreed with those of previous studies.<sup>23,24</sup> In addition, depression and severity of de-

pression symptoms influences a decrease in arthritis symptoms.<sup>25,26</sup> In the univariate analysis, depressive symptoms increased as the number of chronic diseases increased. Thus, by contracting more chronic diseases, related physical symptoms would increase and functional disorders would occur, which would increase medical expenses. Therefore, increasing depressive symptoms were expected.<sup>27</sup>

In the univariate analysis results about smoking and depressive symptoms, the past and present smoker groups showed fewer depressive symptoms than those in the non-smoker group. According to previous studies, depressive symptoms increase remarkably when a smoker group was forbidden to smoke. However, smoking has generally been reported to increase depressive symptoms, so it is difficult to say that smoking has a positive effect on depressive symptoms.<sup>28-31</sup> The group who drank alcohol “less than once per month” showed more depressive symptoms than those who drank “more than twice per week” and this result was also different from previous studies.<sup>32,33</sup> This difference might have been caused by the plurality of females who showed less smoking and drinking rates among participants in this study.

The first limitation of this study is that it was cross-sectional, so it was difficult to interpret chronic low back pain and depressive symptoms as a simple cause and effect relationship. In general, chronic low back pain occurred first and then depressive symptoms followed but several factors related to depressive symptoms could also cause depressive symptoms, so previous studies have indicated careful interpretation of these types of data.<sup>34</sup> Questions about the intensity of low back pain were not used for patients with chronic low back pain, so depressive symptoms and the differences with ADL were not compared. In addition, a single question was provided to measure the degree of depression instead of established selection tools, so accuracy could be limited. However, the one question of “Do you often feel sad or depressed?” showed a sensitivity of 86%, a specificity of 78%, and positive predictive and negative predictive values of 82% in previous studies, so the error was thought to be small.<sup>35</sup> A self-writing method was used for the health survey, so accuracy could be limited. However, the survey was performed at a mobile clinic center with an investigator, so it was different with other methods

without an observer.

Despite these limitations, this study included every family in Korea so the results are representative, because it was not limited to specific hospitals or local areas. Relatively more patients with chronic low back pain were investigated compared to previous studies. Additionally, psychosocial risk factors as well as organic disturbances could be evaluated through socioeconomic and demographic approaches regarding factors related to patients with chronic low back pain and depressive symptoms. Therefore, this study suggests various ways to approach patients with low back pain.

## CONCLUSION

Low back pain is observed at least once in most people's lives and has a significant effect on society as well as each patient because it is chronic. In particular, psychological factors as well as organic disturbances act in a complex manner for a prognosis. Therefore, a diagnosis of depressive symptoms in patients with chronic low back pain and an analysis of related factors are essential for comprehensive rehabilitation.

Socioeconomic and demographic factors related to depressive symptoms were studied by KNHANES in patients who reported chronic low back pain more than 3 months during the past year. This result suggests preliminary data to grasp factors influencing depressive symptoms. Thus, more effects are expected when managing chronic low back pain by combining organic disturbance, which causes pain, and the emotional aspects during treatment.

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