Severity of fibromyalgia symptoms is associated with socioeconomic status and not obesity in Korean patients

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ABSTRACT

Objective. *Several studies conducted in Western countries have shown that obese or overweight patients with fibromyalgia (FM) exhibit more severe symptoms than patients of normal weight. However, there has been no study on the relationship between obesity and FM symptom severity in Asian patients. In this study, we evaluated the association between obesity, and other related factors such as socioeconomic status (SES), and FM symptom severity in Korean patients.*

Methods. *A total of 343 participants were enrolled in this prospective cohort study, which used a nationwide survey of FM patients who were followed on an annual basis. We investigated health-related quality of life (QoL) and associated factors, such as demographic characteristics, SES, and physical and psychological function. The FM patients were assessed using the following self-reported questionnaires: the Medical Outcomes Study Short-Form Health Survey, the Fibromyalgia Impact Questionnaire, the Brief Fatigue Inventory, the Beck Depression Inventory, the State-Trait Anxiety Inventory, the Self-Efficacy Scale, and the Social Support Scale.*

Results. *Of the 343 patients, 76 (22.1%) were obese; these patients did not differ from the non-obese patients in terms of tender points or self-reported questionnaire scores. FM patients with lower SES–as indexed by unemployment, lower income, and education levels–had more severe symptoms, and poorer QoL and function compared to those with higher SES.*

Conclusion. *In contrast to Western patients, symptom severity in Korean FM patients is associated with SES, but not with obesity.*

Introduction

Fibromyalgia (FM) is a common, chronic pain disorder characterised by widespread musculoskeletal pain over the entire body and a wide range of related symptoms (1). Patients with FM present with various neurological, psychological, and constitutional symptoms, including sleep disturbances, depression, anxiety, and irritable bowel syndrome (2). The long-term pain and mental and physical disabilities associated with FM may lead to poor health-related quality of life (QoL) and a substantial economic burden (3).

There are several lines of evidence showing that FM is associated with overweight and obesity (4-6); the prevalence of overweight and obesity in female FM patients is extremely high, exceeding 45% in several reports (7-9). In one longitudinal study, body mass index (BMI) was an independent risk factor for FM at the 11-year follow-up in a large (n=15,990), unselected female population without FM at baseline. Furthermore, overweight or obese females had a 60–70% higher risk of FM relative to those of normal weight (10). Overweight and obese patients with FM exhibit higher pain sensitivity, reduced physical functioning, poorer sleep quality and quantity, and reduced QoL compared to normal-weight FM patients (7, 11-13). In addition to obesity, several other factors influence the severity of FM symptoms, such as emotional stress, trauma, infection, a range of autoimmune diseases, and smoking (14, 15). However, there have been no reports on the relationship between FM and relevant risk factors, including obesity, in Asians. Considering that the prevalence of obesity and overweight in Asia is generally lower than in the West, investigating the association between FM and obesity in Korean FM patients should prove highly informative. The purpose of this study was to determine whether obesity was associated with FM symptom severity in a Korean cohort. Furthermore, we also investigated other factors that may be associated with symptom severity, such as socioeconomic status (SES).

Patients and methods

Study design and population

We enrolled 343 patients with FM, recruited from 11 medical centers, from the cohort of a Korean nationwide FM survey. In the prospective survey, FM patients are followed annually. The study used a cross-sectional study to identify the association between FM symptom severity and relevant risk factors in Korean FM patients. All of the patients fulfilled the 1990 American College of Rheumatology criteria for FM (16). Their mean age was 48.1±10.9 years, their mean duration of symptoms before diagnosis was 8.5±8.3 years, and the mean time since diagnosis was 1.9±3.0 years. All of the patients provided informed consent at the time of study initiation; the study was approved by the Institutional Review Board of each medical center.

Data collection

The patients were interviewed to determine their demographic characteristics, SES, physical and psychological function, and health-related QoL. Demographic characteristics, including age, gender, BMI, symptom duration, and tender point counts and scores, were recorded at the time of enrolment.

BMI was calculated as body weight divided by the square of height (kg/m^2). Height was measured to the nearest 0.1 cm using a standard height scale. Weight was recorded to the nearest 0.01 kg using a metric weight scale. Each subject was asked to remove outer clothing and shoes before stepping on the scale. Patients with a BMI ≥25 were considered obese based on the World Health Organisation (WHO; Asia-Pacific) classification system (17).

A physical examination, to assess tender point counts and scores, was performed by a trained rheumatologist at each participating center, according to the standardised manual tender point survey. Tender points were identified by direct palpation at 18 specific sites, with a force of 4.0 kg delivered through direct thumb palpation in accordance with a standardised tender point examination protocol (18). The intensity of each tender point was graded as follows: 0, no tenderness; 1, light tenderness (patient confirmed answer when asked); 2, moderate tenderness (spontaneous verbal response); and 3, severe tenderness (withdrawal). The total tender point score was calculated as the sum of scores across each point, such that the number of tender points ranged from 0 to 18, and total tender point scores ranged from 0 to 54.

Measures of SES in FM patients included education level, employment status, and income. Each patient's level of objective income was measured indirectly according to whether they were covered by health insurance or medical aid; all Koreans are covered under either the National Health Insurance (NHI) or Medical Aid programs. The NHI program is a social insurance benefit that covers the entire population and provides short-term insurance; compulsory contributions are determined according to each individual's ability to pay. The Medical Aid program is a public assistance scheme that provides medical services for low-income households. NHI contributions are calculated based on an employee's wage. In 2013, any individual who earned <124% of the minimum cost of living (1,668,329 Korean won per month [US $1,540.61]), calculated on the basis of a four-person household, was classified as a potential welfare recipient; all such individuals are covered by the Medical Aid program.

All of the participants were required to complete the following self-reported questionnaires: the 36-item Medical Outcomes Study Short-Form Health Survey (SF-36), the Fibromyalgia Impact Questionnaire (FIQ), the Brief Fatigue Inventory (BFI), the Beck Depression Inventory (BDI), the State-Trait Anxiety Inventory (STAI), and the Self-Efficacy Scale. The SF-36, used to evaluate QoL, includes eight items pertaining to physical and mental health that are grouped into two components: the physical component summary (PCS) and the mental component summary (MCS). The PCS includes four subscales: physical functioning, role-physical, bodily pain, and general health perceptions. The MCS also comprises four subscales: vitality, role-emotional, social functioning, and mental health (19). Scores on each scale range from 0 to 100: a lower score indicates greater disability. The Korean version of the FIQ, which was used to assess functional abilities on a 100-point scale for each item (20), consists of 10 items. Each item has 10 sub-items of which the maximum possible score is 100. Severity of fatigue was measured using the Korean version of the BFI, which consists of nine items measured on numeric scales ranging from 0~10 (21). The Korean version of the BDI, which was used to measure the severity of depression in our FM patients (22), consists of 21 multiple-choice questions; each item is scored on a scale ranging from 0 to 3 such that the maximum possible score is 63. The presence and severity of anxiety, and the extent to which it was generalised, was measured using the Korean version of the STAI (23). This instrument, which comprises the STAI-I (anxiety concerning a specific event) and STAI-II (anxiety as a stable personality characteristic) subscales, has 40 items (20 items each in the STAI-I and STAI-II). The Korean version of the arthritis management Self-Efficacy Scale, which assesses patients' confidence in their ability to perform specific tasks or behaviours and to cope with the consequences of illness (24), consists of 14 items spread across the following three subscales: self-efficacy for managing pain (3 items); self-efficacy for physical function (5 items); and self-efficacy for controlling other symptoms (6 items).

Statistical analysis

Statistical analyses were performed using the SPSS for Windows software package (ver. 20; SPSS Inc., Chicago, IL, USA). Continuous variables were compared using the non-parametric Mann-Whitney U-test; categorical variables were compared using the chi square test. We adjusted for age, gender, and symptom duration using propensity score-matching. A p-value <0.05 was considered statistically significant.

Results

In total, 343 participants enrolled in the study, of whom 76 (22.1%) were obese based on the classification system of the WHO (Asia-Pacific) (17). Obese patients did not differ from non-obese patients in terms of tender point palpation or self-reported questionnaire scores (Table I). After adjusting for age, gender, and symptom duration using propensity score-matching, the results did not differ (Table II). The results were also unchanged when obesity was defined as a BMI >30 (data not shown).

We stratified SES according to employment status, income, and education level; unemployed patients tended to be older and female and had higher FIQ (*p*=0.011), BFI (*p*=0.013), BDI (*p*=0.005) and STAI-II (*p*=0.041) scores, and lower self-efficacy (*p*=0004) and SF-36 PCS and MCS scores (*p*=0.012 and 0.005, respectively) compared to employed patients (Table III). However, there was no significant association between SES and tender point count or score.

The cohort was also stratified according to the presence or absence of medical insurance, used as a proxy for level of income. In total, 10% of the patients were in the Medical Aid group, reflecting lower income levels. Comparison of the Medical Aid (n=34) and NHI (*n*=302) patients revealed that the Medical Aid group had higher FIQ (*p*=0.04), BDI (*p*<0.001) and self-efficacy (*p*=0.016) scores, and lower SF-36 PCS and MCS scores (*p*=0.047 and 0.006, respectively). However, there were no differences between the Medical Aid and NHI groups in terms of tender points or symptom duration (Table IV).

We also assessed differences among patients according to level of education. A total of 76 (23.7%) patients were high school graduates or above. Table V shows that lower education level (≤12 years of education) was significantly associated with poorer health status, indexed by higher tender point counts (*p*=0.034) and BDI (*p*=0.007) and STAI II scores (*p*=0.045) relative to patients with >12 years of education. Patients who were of lower SES and unemployed, and had a low income and lower level of education, tended to have more severe FM symptoms and a poorer QoL.

Table I. Comparison of structured questionnaire results between obese and non-obese patients with fibromyalgia.

	Obese (n=73, 22.1%)	Non-obese (n=259)	*p*-value
Age, years	49.5 ± 10.2	47.3 ± 10.7	0.119
Female	61 (83.6%)	247 (95.4%)	0.725
BMI	27.8 ± 2.20	21.4 ± 2.08	<0.001
Symptom duration, years	9.11 ± 8.73	7.99 ± 7.99	0.285
Tender point count (0–18)	13.4 ± 4.2	14.1 ± 3.93	0.442
Tender point score (0–54)	25.8 ± 13.0	25.8 ± 13.0	0.391
FIQ	60.3 ± 19.3	58.3 ± 15.8	0.425
BFI	6.16 ± 2.26	6.48 ± 4.23	0.391
SF-36 PCS	35.9 ± 7.9	35.9 ± 7.28	0.944
SF-36 MCS	27.5 ± 8.74	33.7 ± 11.7	0.752
BDI	18.3 ± 0.1	18.5 ± 10.5	0.189
STAI I	47.9 ± 11.8	49.2 ± 12.2	0.414
STAI II	50.2 ± 11.6	51.1 ± 11.0	0.587
Self-efficacy	701.8 ± 292.9	741.3 ± 255.3	0.301

BMI: body mass index; FIQ: fibromyalgia impact questionnaire; BFI: brief fatigue inventory; SF-36: medical outcomes study short-form health survey; PCS: physical component summary; MCS: mental component summary; BDI: Beck depression inventory; STAI: state-trait anxiety inventory. Data are shown as mean ± SD.

Table II. Comparison of structured questionnaire results between obese and non-obese patients with fibromyalgia (analyses adjusted for age, gender, and symptom duration using propensity score-matching).

	Obese (n=73)	Non-obese (n=73)	*p*-value
Age, years	49.5 ± 10.2	49.3 ± 10.5	0.904
Female	61 (83.6%)	61 (83.6%)	0.725
BMI	27.8 ± 2.20	21.8 ± 1.91	<0.001
Symptom duration, years	9.11 ± 8.73	8.98 ± 8.28	0.928
Tender point count (0–18)	13.4 ± 4.2	14.4 ± 13.5	0.189
Tender point score (0–54)	25.8 ± 13.0	26.9 ± 12.8	0.607
FIQ	60.3 ± 19.3	59.5 ± 15.8	0.785
BFI	6.16 ± 2.26	6.81 ± 5.31	0.343
SF-36 PCS	35.9 ± 7.9	36.7 ± 7.24	0.848
SF-36 MCS	27.5 ± 8.74	32.6 ± 14.2	0.731
BDI	18.3 ± 0.1	18.8 ± 10.5	0.803
STAI I	47.9 ± 11.8	50.3 ± 11.9	0.223
STAI II	50.2 ± 11.6	50.2 ± 10.9	0.964
Self-efficacy	701.8 ± 292.9	726.3 ± 252.0	0.590

BMI: body mass index; FIQ: fibromyalgia impact questionnaire; BFI: brief fatigue inventory; SF-36: medical outcomes study short-form health survey; PCS: physical component summary; MCS: mental component summary; BDI: Beck depression inventory; STAI: state-trait anxiety inventory. Data are shown as mean ± SD.

Discussion

In this study, FM symptom severity was associated with SES, but not with obesity, in Korean patients. Obesity was not independently associated with pain sensitivity on tender point palpation or self-reported questionnaire scores. However, FM patients of lower SES, indexed by unemployment, lower income, and a lower level of education, had greater symptom severity and poorer QoL and function compared to those of higher SES.

In contrast to previous Western studies, our results demonstrated that obesity was not significantly associated with FM symptom severity. According to a United States study, overweight and obesity are consistently related to FM and chronic, widespread pain (25). In another United States study, 888 patients with FM were assessed; severe obesity (BMI ≥35 kg/m^2) was associated with more-severe FM symptoms and lower QoL (7). Neumann *et al.* (4) also found that BMI was negatively correlated with QoL and tenderness threshold, and positively correlated

Table III. Comparison of structured questionnaire results between employed and unemployed patients with fibromyalgia.

	Employed (n=110)	Unemployed (n=220)	*p*-value
Age, years	45.7 ± 9.2	49.3 ± 10.3	0.005
Female	91 (82.7%)	204 (92.7%)	0.005
BMI	22.9 ± 3.55	22.7 ± 3.34	0.642
Symptom duration, years	7.31 ± 6.65	8.98 ± 8.83	0.081
Tender point count (0–18)	13.8 ± 4.06	14.0 ± 3.96	0.601
Tender point score (0–54)	26.2 ± 13.1	27.6 ± 13.4	0.310
FIQ	55.5 ± 17.8	60.8 ± 17.9	0.011
BFI	5.78 ± 2.26	6.71 ± 4.48	0.013
SF-36 PCS	37.3 ± 7.57	35.1 ± 7.38	0.012
SF-36 MCS	36.2 ± 13.0	32.2 ± 11.2	0.005
BDI	16.6 ± 9.48	19.9 ± 10.2	0.005
STAI I	47.4 ± 12.5	50.2 ± 10.2	0.051
STAI II	49.4 ± 11.6	52.1 ± 11.1	0.041
Self-efficacy	787.6 ± 240.4	768.3 ± 270.1	0.004

BMI: body mass index; FIQ: fibromyalgia impact questionnaire; BFI: brief fatigue inventory; SF-36: medical outcomes study short-form health survey; PCS: physical component summary; MCS: mental component summary; BDI: Beck depression inventory; STAI: state-trait anxiety inventory. Data are shown as mean ± SD.

Table IV. Comparison of structured questionnaire results between fibromyalgia patients with medical aid and health insurance.

	Medical aid (n=34)	Health insurance (n=302)	*p*-value
Age, years	49.6 ± 12.9	47.9 ± 10.6	0.469
Female	29 (85.3%)	270 (89.4%)	0.560
BMI	23.0 ± 4.79	22.7 ± 3.23	0.628
Symptom duration, years	8.87 ± 9.63	8.23 ± 7.98	0.714
Tender point count (0–18)	14.0 ± 4.64	14.0 ± 3.86	0.895
Tender point score (0–54)	29.1 ± 16.5	26.9 ± 12.8	0.357
FIQ	65.2 ± 18.1	58.3 ± 17.8	0.040
BFI	6.80 ± 2.06	6.36 ± 4.03	0.295
SF-36 PCS	33.3 ± 7.68	36.2 ± 7.36	0.047
SF-36 MCS	28.0 ± 11.9	34.3 ± 11.8	0.006
BDI	26.8 ± 13.3	17.9 ± 10.0	<0.001
STAI I	53.5 ± 13.7	48.7 ± 11.8	0.057
STAI II	54.7 ± 12.3	50.8 ± 11.1	0.085
Self-efficacy	611.2 ± 289.9	742.0 ± 256.1	0.016

BMI: body mass index; FIQ: fibromyalgia impact questionnaire; BFI: brief fatigue inventory; SF-36: medical outcomes study short-form health survey; PCS: physical component summary; MCS: mental component summary; BDI: Beck depression inventory; STAI: state-trait anxiety inventory. Data are shown as mean ± SD.

with physical dysfunction and tender point count in FM patients. Furthermore, in a Spanish study that examined FM patients according to obesity status, not being overweight or obese was associated with improved symptomatology, QoL, and functional capacity (26). Our findings differ from these previous Western studies. First, the proportion of FM patients that were obese was lower compared to Western populations (the prevalence of severe obesity in Korea is also extremely low). Bennett *et al*. (25) conducted a large survey of 2,596 FM patients, and reported that 70% had a BMI >25 kg/m^2 and 43% had a BMI >30 kg/m^2. In our study, 22.1% of patients had a BMI >25 kg/m^2 and the prevalence of severe obesity (BMI >30 kg/m^2) was only 2.04%. These proportions are similar to those reported in the general population; according to the 2012 Korea National Health and Nutrition Examination Survey, the obesity (BMI ≥25 kg/m^2) rate among adults is 32.8% (27). The mechanisms underlying the differences in FM symptom severity according to obesity status remain unclear. According to a longitudinal, multi-racial study, there are racial/ethnic differences in the long-term impact of obesity on functional impairment; furthermore, compared to Caucasians, African Americans and Hispanics are more likely to develop functional impairment at the same BMI (28). There may also be differences between ethnic groups in the degree to which obesity status determines FM symptom severity. Further investigation is required to elucidate the effect of obesity on FM symptom severity in Asian patients.

In the current study, low SES was significantly associated with FM symptom severity. In a study by Fitzcharles (28), 246 FM patients with low SES (indexed by a lower level of education) had more severe FM symptoms, and poorer QoL and function compared to those with a higher education level. The British Birth Cohort Study reported a greater prevalence of musculoskeletal pain in those of lower social class (29), with similar findings reported in a Swedish population (30). In line with these studies, we demonstrated that patients with lower SES had higher FIQ, BFI, BDI, and STAI scores and tender point counts. It is well-known that SES can affect the severity of numerous diseases, by mediating the effect of factors such as poorer living and working conditions, isolation and lack of social networks, limited access to healthcare, abnormal illness-related behaviour, and more stressful environments (31). Similarly, it has been suggested that FM patients with low SES are more likely to have limited access to diagnostic and/or treatment options, poor-quality healthcare, and reduced availability of knowledgeable and sensitive health personnel; accordingly, symptoms including pain, fatigue, impaired function, and anxiety and depression are more severe and less controllable (32).

Although systematic, individualised FM management has not been previously reported, medication or non-pharmacological treatment can be tailored to an individual according to their SES. It has been suggested that patients with identical pain levels (on visual analogue scales), but who differ in SES,

Table V. Structured questionnaire results in fibromyalgia patients according to education level.

	Above high school (Education >12 years) (n=76)	High school or below (Education ≤12 years) (n=214)	*p*-value
Age, years	41.6 ± 7.6	49.9 ± 10.9	0.000
Female	68 (89.5%)	190 (88.8%)	0.869
BMI	22.0 ± 2.99	22.9 ± 3.55	<0.001
Symptom duration, years	6.71 ± 7.07	8.66 ± 8.47	0.052
Tender point count (0–18)	13.2 ± 4.73	14.3 ± 3.74	0.034
Tender point score (0–54)	25.4 ± 13.8	27.5 ± 12.3	0.276
FIQ	55.6 ± 18.3	58.5 ± 17.9	0.235
BFI	5.99 ± 2.31	6.48 ± 4.57	0.241
SF-36 PCS	36.6 ± 6.89	36.2 ± 7.56	0.701
SF-36 MCS	35.4 ± 11.8	32.9 ± 11.9	0.121
BDI	15.8 ± 9.61	19.5 ± 10.5	0.007
STAI I	46.9 ± 11.8	50.0 ± 12.0	0.057
STAI II	48.7 ± 11.8	51.9 ± 11.2	0.045
Self-efficacy	768.0 ± 281.0	719.9 ± 252.5	0.191

BMI: body mass index; FIQ: fibromyalgia impact questionnaire; BFI: brief fatigue inventory; SF-36: medical outcomes study short-form health survey; PCS: physical component summary; MCS: mental component summary; BDI: Beck depression inventory; STAI: state-trait anxiety inventory. Data are shown as mean ± SD.

may benefit from different types of therapies (32). Less-educated patients may benefit more from non-pharmacological treatment interventions including education, exercise, and physical therapies; similarly, unemployed or low-paid patients could benefit from psychiatric and psychological support, behavioural therapy, and importantly, education to encourage symptom self-management. This patient-centered care approach merits further investigation, including well-controlled studies evaluating its efficacy in terms of symptom severity, QoL, physical function, and cost-effectiveness.

Our study had several limitations. First, the research design was cross-sectional rather than longitudinal such that the results are all correlational; therefore, causality cannot be determined. Second, there was no comparison group without FM; therefore, we are unable to comment on any potential differences between FM patients and the general population. Furthermore, in the absence of biomarkers, the assessment of FM was dependent on subjective measurements. Currently, FM is understood to be a polysymptomatic condition with numerous somatic symptoms that differ in severity among patients. Therefore, studies of FM may be confounded by the particular characteristics of their patient populations.

In conclusion, there was no correlation between obesity and symptom severity in Korean FM patients. However, there was a significant association between SES and FM symptom severity. These relationships should be investigated using longitudinal designs to delineate the relationship between chronic pain and overweight and obesity, to inform appropriate, evidence-based interventions.

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