Fibromyalgia’s Key Symptoms in Normal-Weight, Overweight, and Obese Female Patients

V. A. Aparicio, BSc,*,†,‡ F. B. Ortega, PhD,†,§ A. Carbonell-Baeza, PhD,*,§ C. Gatto-Cardia, BSc,* M. Sjöström, MD,† J. R. Ruiz, PhD,† and M. Delgado-Fernández, PhD*

**Abstract:**
Factors affecting the symptomatology of fibromyalgia (FM) are not fully understood. The aim of the present study was to analyze the relationship of weight status with pain, fatigue, and stiffness in Spanish female FM patients, with special focus on the differences between overweight and obese patients. The sample comprised 177 Spanish women with FM (51.3 ± 7.3 years old). We assessed tenderness (using pressure algometry), pain and vitality using the General Health Short-Form Survey (SF36), and pain, fatigue, morning tiredness, and stiffness using the Fibromyalgia Impact Questionnaire (FIQ). The international criteria for body mass index was used to classify the patients as normal weight, overweight, or obese. Thirty-two percent were normal-weight, 35% overweight, and 32% obese. Both overweight and obese patients had higher levels of pain than normal-weight patients, as assessed by FIQ and SF36 questionnaires and tender point count (p < .01). The same pattern was observed for algometer score, yet the differences were not significant. Both overweight and obese patients had higher levels of fatigue, and morning tiredness, and stiffness (p < .05) and less vitality than normal-weight patients. No significant differences were observed in any of the variables studied between overweight and obese patients. In conclusion, FM symptomatology in obese patients did not differ from overweight patients, whereas normal-weight patients had higher levels of pain than normal-weight patients, as assessed by FIQ and SF36 questionnaires and tender point count (p < .01). The same pattern was observed for algometer score, yet the differences were not significant. Both overweight and obese patients had higher levels of fatigue, and morning tiredness, and stiffness (p < .05) and less vitality than normal-weight patients. No significant differences were observed in any of the variables studied between overweight and obese patients. In conclusion, FM symptomatology in obese patients did not differ from overweight patients, whereas normal-weight patients significantly differed from overweight and obese patients in the studied symptoms. These findings suggest that keeping a healthy (normal) weight is not only associated with decreased risk for developing FM but might also be a relevant and useful way of improving FM symptomatology in women.

© 2013 by the American Society for Pain Management Nursing
(Wolfe, Smuthe, Yunnus, Bennet, Bombardier, Goldenberg, Tugwell, Campbell, Abeles, Clark, Fam, Farber, Fiechtner, Michael Franklin, Gatter, Hamaty, Lessard, Lichtbroun, Masi, McCain, John Reynolds, Romano, Jon Russell, and Sheon, 1990). The pathophysiology of FM includes a dysfunction of pain modulatory systems within the central nervous system and neuroendocrine dysfunction (Abeles, Pillinger, Solitar, & Abeles, 2007; Nielsen & Henriksson, 2007; Tanriverdi, Karaca, Unluhizarci, & Kelestirm, 2007). Among the FM symptoms, muscle pain, fatigue, stiffness, and nonrestorative sleep have been reported as the most relevant (Bennett, Jones, Turk, Russell, & Matallana, 2007; Silverman, Harnett, Zlateva, & Mardekan, 2010; Wilson, Robinson, & Turk, 2009; Wolfe et al., 1990).

In the general population, a high body mass index (BMI) is associated with back pain (Shiri, Solovieva, Husgafvel-Pursiainen, Taimel, Saarikoski, Huumponen, Viikari, Raitakari, & Viikari-Juntura, 2008; Lake, Power, & Cole, 2000), head pain as migraine (Bond, Roth, Nash, & Wing, 2010), and increased general pain (Janke, Collins, & Kozak, 2007). In a recent study, overweight and obese twins were more likely to report low back pain, tension-type or migraine headache, fibromyalgia, abdominal pain, and chronic widespread pain than normal-weight twins (Wright, Schur, Noonan, Ahumada, Buchwald, Buchwald, & Afari, 2010). Moreover, in the longitudinal Norwegian HUNT study (Mork, Vasseljen, & Nilsen, 2010), conducted on 15,990 women, overweight and obesity was associated with a 60%-70% higher risk of incident FM.

Overweight and obese FM patients have higher pain sensitivity (Janke, Collins, & Kozak, 2007; Neumann, Lerner, Glazer, Bolotin, Shefer, & Buskila, 2008; Yunnus, Arslan, & Aldag, 2002), increased sensitivity to tender points palpation, reduced physical functioning and lower-body flexibility, shorter sleep duration, and greater restlessnes during sleep than normal-weight FM patients (Mork et al., 2010; Okifuji, Bradshaw, & Olson, 2009; Okifuji, Donaldson, Barck, & Fine, 2010). Although a few studies have examined the differences in key symptoms across weight status categories (Neumann et al., 2008; Okifuji et al., 2009; Okifuji et al., 2010), it is unknown if there is a dose-response association between weight status and FM major symptoms, particularly whether obese FM patients have a worse symptomatology than overweight patients.

The aim of the present study was to compare pain, fatigue, and stiffness levels across weight status categories in Spanish female FM patients, with special focus on the differences between overweight and obese patients.

**METHODS**

**Study Sample**

We contacted a FM Association in Granada, Spain, with 440 members. One hundred ninety-three potentially eligible patients diagnosed as having FM by a rheumatologist following the American College of Rheumatology criteria (Wolfe et al., 1990) responded, and gave their written informed consents after receiving detailed information by the association about the aims and procedures of the study. Exclusion criteria for the data analysis were having other rheumatic diseases and/or severe somatic or psychiatric disorders, such as cancer, severe coronary disease, or schizophrenia, and not having a valid BMI measurement. The final study sample comprised 177 women aged 51.3 ± 7.3 years. The study was reviewed and approved by the Ethics Committee of the ‘Hospital Virgen de las Nieves’ (Granada, Spain).

**Procedures**

**Anthropometric Assessment.** Height (cm) was measured using a stadiometer (Seca 22, Hamburg, Germany) and weight (kg) with an 8-polar tactile-electrode impedanciometer (InBody 720; Biospace, Seoul, Korea). The validity of this impedanciometer has been reported elsewhere (Malavolti, Mussi, Poli, Fantuzzi, Salvioli, Bottstini, & Bedogni, 2003; Sartorio, Malavolti, Agosti, Marinone, Calti, Bottstini, & Bedogni, 2005). BMI was calculated as weight (kg) divided by height (m) squared. Patients were categorized according to the international criteria: underweight (<18.5 kg/m²), normal weight (18.5-24.99 kg/m²), overweight (25.0-29.99 kg/m²), and obese (≥30.0 kg/m²).

**Pain Assessed by Four Different Indicators.**

1. We used the Spanish version (Rivera & Gonzalez, 2004) of the Fibromyalgia Impact Questionnaire (FIQ) (Burckhardt, Clark, & Bennett, 1991) to assess FM-related symptoms. The FIQ assesses the components of health status that are believed to be most affected by FM. It is composed of ten subscales: physical impairment, overall well being, work missed, and seven subscales using a 10-cm-long visual analog scale (VAS) marked in 1-cm increments, on which the patient rates work difficulty, pain, fatigue, morning tiredness, stiffness, anxiety, and depression. The FIQ score ranges from 0 to 100, and a higher value indicates a higher impact of the disorder (Bennett, 2005). We used the FIQ-pain subscale to assess pain.

In the analysis of reliability and stability of the FIQ, correlation coefficients between test and retest were between 0.58 for VAS-anxiety and 0.83 for days of work missed. Internal consistency showed an alpha coefficient of 0.82 for the total items of the FIQ, 0.79 for...
the eight items not concerning work, and 0.86 for the nine items concerning physical impairment (Rivera & Gonzalez, 2004).

2. The Short-Form Health Survey 36 (SF36) is a generic instrument for assessing health-related quality of life which has been validated for Spanish populations (Alonso, Prieto, & Anto, 1995). This questionnaire is composed of 36 items, which include questions about both physical and mental health. It assesses eight subscales: physical functioning, physical role, bodily pain, general health, vitality, social functioning, emotional role, mental health, and general health. Each subscale score is standardized (range 0-100), where 0 indicates the worst possible health status and 100 the best possible. In the present study, we assessed pain by means of the SF36–bodily pain subscale.

In the analysis of reliability and stability of the SF36, correlation coefficients between test and retest were between 0.58 for SF36–emotional role to 0.99 for SF36–physical role. Internal consistency showed an alpha coefficient between 0.78 for SF36–vitality and 0.96 for SF36–physical role (Alonso, Prieto, & Anto, 1995).

3. A trained physiotherapist assessed the 18 tender points count according to the American College of Rheumatology (Wolfe et al., 1990) with a standard pressure algometer (FPK 20, Effegi, Italy). The pain threshold at each tender point was determined by applying increasing pressure, with the algometer perpendicular to the tissue, at a rate of ~1 kg/s. Patients were asked to say ‘stop’ at the moment that pressure became painful. The mean of two successive measurements at each tender point was used for the analysis. A tender point scored as positive when the patient noted pain at pressure of ≥4 kg/cm². The total of such positive tender points was recorded as the individual’s tender points count.

4. An algometer score was calculated as the sum of the pain-pressure values obtained for each tender point.

**Fatigue and Stiffness.** Fatigue levels were assessed by means of the FIQ-fatigue subscale, FIQ–morning tiredness subscale, and the SF36-vitality subscale. Higher scores in FIQ-fatigue or FIQ–morning tiredness indicate worse status and therefore more fatigue, whereas higher scores on SF36-vitality subscale indicate better status and therefore lower fatigue. Stiffness was assessed by means of the FIQ-stiffness subscale. Higher scores indicate more stiffness.

**Statistical Analysis**
All analyses were performed using the Statistical Package for Social Sciences (SPSS version 16.0 for Windows; SPSS, Chicago, IL), and the level of significance was set at .05. Partial correlation coefficients adjusted by age were used to examine the relationships of BMI with key FM symptoms. One-way analysis of covariance with adjustment by age was used to compare pain, fatigue, and stiffness across weight status categories. Pairwise comparisons were performed with Bonferroni adjustment.

**RESULTS**

**Demographics and Sample Characteristics**
Demographic and clinical characteristics of the study sample are presented in Table 1.

Physical characteristics of the study sample are presented in Table 2. Thirty-two percent of the FM patients were normal-weight, 35% were overweight, and 32% were obese. Only one patient was underweight, and was excluded from the analyses.

**Body Mass Index and Symptomatology**
Partial correlations between BMI and pain, fatigue, and stiffness are presented in Table 3. BMI showed

---

**Table 1.**
Demographic and Clinical Characteristics of the Study Sample

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years since clinical diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤5 years</td>
<td>65</td>
<td>52</td>
</tr>
<tr>
<td>&gt;5 years</td>
<td>61</td>
<td>48</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>94</td>
<td>73</td>
</tr>
<tr>
<td>Unmarried</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Separated/divorced/widowed</td>
<td>21</td>
<td>16</td>
</tr>
<tr>
<td>Educational status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unfinished studies</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Primary school</td>
<td>53</td>
<td>42</td>
</tr>
<tr>
<td>Secondary school</td>
<td>26</td>
<td>21</td>
</tr>
<tr>
<td>University degree</td>
<td>37</td>
<td>29</td>
</tr>
<tr>
<td>Occupational status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housewife</td>
<td>71</td>
<td>60</td>
</tr>
<tr>
<td>Student</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Working</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Unemployed</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Retired</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Income*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤1,200.00 €</td>
<td>51</td>
<td>42</td>
</tr>
<tr>
<td>1,201.00-1,800.00 €</td>
<td>20</td>
<td>17</td>
</tr>
<tr>
<td>&gt;1,800.00 €</td>
<td>50</td>
<td>41</td>
</tr>
<tr>
<td>Fibromyalgia Impact Questionnaire, mean ± SD</td>
<td>67.4 ± 13.2</td>
<td></td>
</tr>
</tbody>
</table>

*1,676.70 € was the average salary in Spain in 2007 (Instituto Nacional de Estadística, 2009).
a correlation with SF36-pain ($r = 0.243; p = .001$) and with FIQ-pain ($r = 0.169; p < .05$). BMI was not correlated with tenderness as measured by algometer score and tender points count. BMI was correlated with FIQ-fatigue ($r = 0.189$), FIQ-morning tiredness ($r = 0.176$), and FIQ-stiffness ($r = 0.170$; all $p < .05$), but not with SF36-vitality. In all the correlations, higher BMI was related to worse symptomatology (Table 3).

Weight Status and Pain

Figure 1 shows the differences in pain, as measured by four different indicators, across weight status categories. Both overweight and obese groups had higher levels of pain than their normal-weight peers, as assessed by FIQ, SF36, and tender points count ($p < .01$; $p < .001$; and $p < .05$; respectively). The same pattern was observed for algometer score, yet those differences were not significant. The analysis of single tender points showed that the main differences across weight status categories were observed in the occiput, second rib, and knee tender points ($p$ values .03, .005, and 0.02, respectively; data not shown).

**Weight Status, Fatigue, and Stiffness**

The differences in fatigue (measured by FIQ-fatigue, FIQ-morning tiredness, and SF36-vitality subscales) and stiffness (measured by FIQ-stiffness) across weight status are shown in Figure 2. Both overweight and obese patients had higher levels of FIQ-fatigue and FIQ-morning tiredness and lower SF36-vitality ($p < .05$; $p < .01$; and $p < .05$; respectively). Overweight as well as obese patients also had higher levels of FIQ-stiffness ($p < .01$). No significant differences were observed between overweight and obese patients in any of the variables studied.

**DISCUSSION**

The results of the present study suggest that both overweight and obese FM patients have higher levels of pain (as measured by FIQ, SF36, and tender points count), fatigue (FIQ-fatigue, FIQ-morning tiredness, and SF36-vitality), and stiffness (FIQ-stiffness) than normal-weight patients. Interestingly, no significant differences were observed between overweight and obese patients in any of the FM symptoms studied, suggesting that only by keeping a normal weight are the benefits on FM symptomatology achieved. Of note is that the correlations between BMI and symptoms observed in the present study were weak, which is probably due to the fact that no significant differences were observed between overweight and obese subjects.

As mentioned above, ~70% of the sample studied was overweight or obese (~35 and ~32%, respectively). Despite this alarming figure, similar (Okifuji et al., 2009; Yunnus et al., 2002) or even higher (Neumann et al., 2008; Okifuji et al., 2010) percentages have been observed in earlier studies conducted in female FM patients. Furthermore, among the general Spanish population, overweight and obesity prevalence in women of the same age and geographic area is extremely high (~43 and ~28%, respectively) (Aranceta-Bartrina, Serra-Majem, Foz-Sala, & Moreno-Esteban, 2005; Sotillo, Lopez-Jurado, Aranda, et al., 2007).

**Weight Status and FM Key Symptoms**

In the present study, both overweight and obese FM patients showed higher levels of pain, as assessed by different indicators, than normal-weight patients, which concurs with other studies (Okifuji et al., 2009; Okifuji...
et al., 2010; Yunnus et al., 2002). Yunnus et al. (2002) observed a higher tender points count in overweight/obese female FM patients. They also studied pain with the use of the FIQ and self-rated pain with a 4-point Likert-type question (from none = 1 to severe = 4) and observed no significant difference between normal-weight and overweight/obese patients. Okifuji et al. (2010) studied whether the tender points count differed across weight status categories in female FM patients. Those authors observed significant differences across the three groups (higher weight status was related to more pain), but no pairwise comparisons were conducted. The authors additionally reported that the group differences were more pronounced in the lower body sites (i.e., gluteal, greater trochanter, and knee sites). We found both lower body (knee) and upper body (occiput, second rib) tender points to be different across weight status categories. Okifuji et al. (2010) also assessed pain by the FIQ and observed no significant difference across weight status groups, in agreement with Yunnus et al. (2002) and in contrast with the present results. Neumann et al. (2008) observed a borderline relationship between weight status and tender points count in female FM patients, such that the higher the weight status, the higher the pain. However, those authors did not test between which groups (i.e., normal-weight, overweight, or obese) the differences were significant.

Two of the studies mentioned above additionally studied some indicators of fatigue and/or stiffness (Okifuji et al., 2010; Yunnus et al., 2002). Yunnus et al. (2002) did not observe differences across weight status groups in fatigue measured by the FIQ, but they observed higher levels of self-rated morning tiredness/fatigue in patients with higher weight status with the use of a 4-point Likert-type question. Okifuji et al. (2010) studied fatigue, morning tiredness, and stiffness by means of the FIQ and did not observe any difference across weight status groups, which does not concur with the present findings.

The mechanisms underlying the link between an excessive weight/fat mass and pain sensitivity are not fully understood. One of the possible mechanisms suggested might be related to the endogenous opioid system, that is involved in the regulation of mood and pain

**Figure 1.** Relationship between pain, as measured by four different indicators, and weight status. Values are shown as mean with 95% confidence interval. NW, normal weight (body mass index [BMI] 18.5-23.99 kg/m²); OW, overweight (BMI 25.0-29.99 kg/m²); OB, obese (BMI ≥30.0 kg/m²); SF36, General Health Short-Form Survey; FIQ, Fibromyalgia Impact Questionnaire. a,b Common superscripts indicate a significant difference (p < .05). Pairwise comparisons were performed with Bonferroni adjustment. For SF36 and algometer score, lower scores indicate more pain.
(McKendall & Haier, 1983) and has shown to be altered in obese Zucker rats (Roane & Porter, 1986). Obesity seems also to be linearly related to greater levels of inflammatory markers in FM patients, specifically interleukin-6 and C-reactive protein (Okifuji et al., 2009), which could play a role in hypothalamic-pituitary-adrenal axis regulation, increasing pain sensitivity (Kawasaki, Zhang, Cheng, & Ji, 2008; Okifuji et al., 2009). However, Hernandez et al. (2010) analyzed the BMI as a covariate of proinflammatory cytokines levels in FM patients and showed that serum tumor necrosis factor alpha and interleukin-6 levels were independent of BMI.

The levels of certain endocrine hormones, such as leptin and ghrelin, are related to changes in weight and overweight/obesity (Broberger, 2005). Circulating ghrelin levels negatively correlate with BMI, and ghrelin secretion is reduced in obese people (Tschop, Weyer, Tataranni, Devanarayan, Ravussin, & Heiman, 2001). Guneli et al. (2010) indicated that ghrelin could play a role in the obesity-pain relationship and could regulate other systems that are related to pain pathway. They suggested that a decrease in endogenous ghrelin activity might induce an increased pain sensitivity in obese subjects.

Poor physical conditioning, which is related to higher adiposity levels, has been considered as one of the potential contributors of pain sensitivity (Neumann et al., 2008; Okifuji et al., 2010), yet this association is probably bidirectional, whereas some physical and/or psychologic therapies, such as aquatic aerobic exercise (Gusi & Tomas-Carus, 2008), biodanza (Carbonell-Baeza, Aparicio, Martins-Pereira, et al., 2010), yoga (Carson, Carson, Jones, et al., 2010), and multidisciplinary interventions (Carbonell-Baeza, Aparicio, Ortega, et al., 2010), seem to reduce pain threshold in FM patients.

Weight loss has been shown to reduce musculoskeletal pain (Kotowski & Davis, 2010). One potential mechanism may be that a reduction of weight decreases the biomechanical stress on the load-bearing joints, reducing pain responses (Kotowski et al., 2010). Similarly, weight loss reduced headache frequency and severity in obese migraineurs (Bond et al., 2010). In the intervention reported by Shapiro et al. (2005), weight loss significantly predicted a reduction in FM-related symptoms, body satisfaction, and quality of life.
Clinical Implications
The present findings have important clinical implications. Particularly, pain management nurses should advise their patients to lose weight to reduce their FM’s key symptoms.

Behavioral weight-loss programs, with diet changes (Arranz, Canela, & Rafecas, 2010; Shapiro et al., 2005) and involving exercise designed for and adapted to this specific population (Busch, Schachter, Overend, Peloso, & Barber, 2008), may positively influence FM symptoms and overall quality of life. Finally, women with chronic pain are at an increased risk for metabolic syndrome (Loevinger, Muller, Alonso, & Coe, 2007).

The combination of a healthy diet together with increases in the physical activity level could improve FM symptoms at the same time that they could reduce metabolic syndrome by decreasing central obesity, dyslipidemia, hypertension, and glucose intolerance (Dragusha, Elezi, Dragusha, Gorani, & Begolli, 2010).

Strengths and Limitations
Some limitations of the present study need to be mentioned. First, information about sleep disturbances, a relevant symptom in FM, was not registered. On the other hand, the participants were volunteers, which could have affected their enthusiasm.

ACKNOWLEDGMENTS
The authors gratefully acknowledge all of the participants for their collaboration. The authors also acknowledge all of the AGRAFIM (the FM association from Granada, Spain) members involved in the field work for their efforts and great enthusiasm.

REFERENCES


Carbonell-Baeza, A., Aparicio, V. A., Ortega, F. B., Cuevas, A. M., Alvarez, I. C., Ruiz, J. R., & Delgado-Fernandez, M. (2010). Does symptomatology might have potentially affected the study findings. Fifth, physical activity levels of the patients was not registered. On the other hand, the equally distributed sample across weight status categories participating in this study and the pairwise comparison analyses between weight status groups provide new and relevant information and contribute to understand how adiposity relates to FM symptomatology.

CONCLUSIONS
The FM symptomatology in obese patients did not differ from overweight patients, whereas normal-weight patients had significantly fewer key symptoms than either overweight and obese patients, suggesting that keeping a healthy (normal) weight might be a relevant and useful way of improving FM symptomatology in women. Intervention studies focused on weight loss in overweight and obese FM patients will confirm or contrast the present findings. Further research is needed to clarify the mechanisms that link overweight/obesity and FM symptomatology. The measure of BMI and weight status might provide useful information to clinicians when assessing and interpreting the severity of the disease.

Acknowledgments
The authors gratefully acknowledge all of the participants for their collaboration. The authors also acknowledge all of the AGRAFIM (the FM association from Granada, Spain) members involved in the field work for their efforts and great enthusiasm.


