Published in final edited form as:

Orthop Nurs. 2013 ; 32(2): 113–119. doi:10.1097/NOR.0b013e3182879c08.

Correlates of Body Mass Index in Women with Fibromyalgia

Gayle M. Timmerman, Gayle M. [Associate Professor], **Nicolina A. Calfa, MC [Doctoral Candidate, Counseling Psychology]**, and **Alexa K. Stuifbergen, PhD, RN, FAAN [Professor]**
The University of Texas at Austin, School of Nursing, Department of Educational Psychology

Abstract

Excess weight in women with fibromyalgia (FMS) may further contribute to joint pain and fatigue. With little research addressing weight issues in this population, this study examined the relationship of body mass index (BMI) to quality of life (QOL) as measured by the SF-36, severity of FMS, nutritional intake, Barriers to Health Promoting Behaviors for Disabled Persons (BS), and self-efficacy for health promoting behaviors (SRAHP) in women with FMS. Baseline data was collected on 179 women diagnosed with FMS. Controlling for age, BMI was significantly ($p < .05$) correlated with SF-36 subscales of physical functioning, bodily pain and vitality, severity of FMS using the Tender Point Index (TPI), calories, protein, fat, saturated fat, BS, and SRAHP subscale for exercise. The findings support a growing body of evidence that excess weight is negatively related to QOL and pain in women with FMS.

Although it is well-established that obesity increases the risk for a variety of chronic illnesses such as diabetes, hypertension, and cardiovascular disease (National Heart Lung & Blood, 1998), the impact of obesity on the quality of life and the severity of specific, chronic, disabling conditions, like fibromyalgia, has not been thoroughly explored. Fibromyalgia (FMS) is a debilitating, chronic illness characterized by fatigue, sleep disturbances, and widespread musculoskeletal pain with discrete tender points (Shaver, Wilbur, Robinson, Wang, & Bunting, 2006). With the absence of a cure or treatments that completely alleviate symptoms (Sueiro Blanco, Estévez Schwarz, Ayán, Cancela & Martín, 2008), identifying factors which exacerbate or improve FMS symptoms is essential. One possible factor is excess weight which may further contribute to joint pain and fatigue. Yet, we have only recently started to accumulate research evidence that weight impacts symptom severity and quality of life in the FMS population.

The purpose of this study was two fold: 1) to examine the relationship between BMI and the health outcomes of health-related QOL and severity of FMS (pain and tenderness); and 2) to explore the relationship of BMI to nutritional intake and other health promotion variables such as self-efficacy and barriers to health promotion in women with FMS. As excess weight continues to be an endemic problem, further research is needed to understand how weight impacts existing chronic health conditions, like FMS.

Correspondence: Gayle Timmerman PhD, RN, The University of Texas at Austin, School of Nursing, 1710 Red River, Austin, TX 78701, (h) 512-569-7663, (w) 512- 471-9087; fax 512-471-4910, gtimmerman@mail.utexas.edu.

Impact of Obesity of Health-Related Quality of Life and FMS Symptoms

In general, obesity negatively impacts the QOL in those with chronic illness, especially measures that reflect physical functioning (Katz, McHorney, & Atkinson, 2000). In women with FMS, four recent, cross-sectional studies supported the association between BMI and QOL (Neumann et al., 2008; Przekop, Haviland, Morton, Oda, & Fraser, 2010; Shaver et al., 2006; Yunas, Arslan & Aldag, 2002). Heavier participants reported lower QOL, especially related to physical health and functioning. This was further supported in comparisons of individuals with FMS by weight category (normal, overweight, moderately obese and severely obese), in which researchers found significant lower in QOL scores (SF-36 subscales of physical functioning, pain, general health perceptions and role emotional) for those in the heavier categories (Kim, Luedtke, Vincent, Thompson, & Oh, 2012).

BMI was also positively related to fatigue, self-reported pain ratings, number of tender points, and tenderness threshold, which is the amount of pressure at tender points perceived as painful (Aparicio et al., 2011; Neumann et al., 2008; Przekop et al., 2010; Yunas et al., 2002). For pain severity, the lower body tender points indicated significantly ($p < .001$) more pain for the obese group, indicating the mechanical loads from carrying additional weight may also be contributing to the pain experienced (Okifuji, Donaldson, Barck & Fine, 2010). There has been some suggestion that there is a link between pain sensitivity and obesity with obese participants having a higher sensitivity to pain that normal weight controls (Buskila et al., 2002). These studies support the need to further examine the role of BMI as a factor influencing FMS symptom severity and QOL.

FMS Symptoms and Weight Loss

Three studies were found linking weight loss to improved FMS symptoms and QOL. In a 20 week behavioral weight loss intervention, which included both exercise and nutrition components, percent of weight lost predicted improvements in FMS symptoms, pain interference, and QOL in overweight/obese women (n = 31) with FMS (Shapiro, Anderson, & Danoff-Burg, 2005). The other two studies examined the impact of weight lost from bariatric surgery (i.e., laparoscopic Roux-en-Y gastric bypass) on FMS symptoms.Saber et al. (2008) found major improvements in median pain scores (reduced from 9 to 3) and tender point scores (reduced from 18 to 3.5) after significant weight loss in patients with FMS (n = 10). In a study examining the impact of weight loss on musculoskeletal symptoms after bariatric surgery, those participants reporting FMS symptoms (n = 12) had significantly fewer symptoms after weight loss (Hooper, Stellato, Hallowell, Seitz, & Moskowitz, 2007). Although the findings are promising, all three studies had small samples, requiring further research to substantiate the role weight and weight loss plays in FMS.

Health Promoting Variables Affecting BMI

The conceptual model used to guide this study was based on Pender's Health Promotion Model (HPM), an explanatory model for engaging in health promoting behaviors that has been used with a variety of populations (Pender, Murdaugh & Parsons, 2006). Across studies, self-efficacy (confidence in one's ability to perform the behavior) and barriers encountered were consistently and significantly related to engaging in health behaviors (Pender et al., 2006). Self-efficacy and barriers may also influence the frequency that one engages in health promoting behaviors (Stuifbergen et al., 2010). Since successful weight management requires that the individual engage in a variety of health promoting behaviors consistently over time (Wing & Klem, 2002), it seems likely that fewer barriers and higher levels of self-efficacy would promote successful weight management. Dealing with barriers to healthy eating patterns along with self-monitoring are considered primary components of cognitive behavioral treatment for obesity (Foreyt, 2002). With BMI being an independent risk factor for FMS (Mork, Vasseljen & Nilsen, 2010), further study of possible variables (e.g., self-efficacy and barriers) impacting BMI is warranted. No research, to date, was found that examined these variables in women with FMS.

Research Questions

The research questions examined in this study include:

1. What is the relationship between BMI and health-related quality of life (SF-36) and severity of FMS (Tender Points Index; TPI) in women with FMS?
2. Are there differences in health-related quality of life (SF-36) and severity of FMS (TPI) among women with FMS in different BMI categories (normal weight, overweight, obese, and morbidly obese)?
3. What is the relationship between BMI and nutrition intake variables (calories and macronutrients), and health promotion variables (barriers to health promoting behaviors and self-efficacy for health promoting behaviors) in women with FMS?

Methods and Procedures

This study was a secondary analysis of a randomized controlled clinical trial, 'Lifestyle Counts,' examining the impact of a wellness intervention on women with fibromyalgia (Stuifbergen et al., 2010). Data reported here was collected at baseline from participants in both the intervention and attention control group. Human subject approval was obtained from the Institutional Review Board prior to data collection, and written, informed consent was obtained from participants.

Participants

The sample consisted of women who were diagnosed by physicians with fibromyalgia for at least six months (Beal, Stuifbergen & Brown, 2009). Additional inclusion criteria included: 1) being 20 to 75 years old; 2) able to understand, read, and write English; and 3) willing to participate in an eight month study involving education, skill building, and support. Participants were excluded for pregnancy or medical conditions in which altering diet and exercise could be considered risky (Stuifbergen et al., 2010).

Participants were recruited in a variety of ways including fliers in physician offices, targeted mailings to women on the Arthritis Foundation mailing list, notices in Arthritis Foundation newsletters, contact with support groups, and word of mouth. Women, responding to the recruitment fliers, were screened by phone (Stuifbergen et al., 2010). Those who were interested and eligible went into the pool of potential participants. Participants were randomly selected from the pool, and baseline data was collected within three weeks prior to the intervention.

The original study included 200 women, six participants were excluded due to missing BMIs or food frequency data. Participants whose dietary analysis indicated consuming less than 1,000 calories/day (n = 12) were also excluded due to likely underreporting of food intake. Additionally, women who were underweight with a BMI of less than 18.5 kg/m^2 (n = 3) were excluded as outliers. The final sample used in this study was 179.

Instruments

Demographics including age, ethnicity, educational status, and disease characteristics such as severity of illness were gathered using a Background Information Sheet. BMI was calculated from measured weights using a highly accurate electronic scale and measured heights using a stadiometer.

The following variables were also measured: 1) health-related quality of life (SF-36); 2) severity of FMS using the Tender Points Index (TPI); 3) nutrition intake using the Harvard School of Public Health Food Frequency Questionnaire (FFQ); 4) Barriers to Health Promoting Behaviors for Disabled Persons (BS); and 5) self-efficacy for health promoting behaviors using the Self-Rated Abilities for Health Practices Scale (SRAHP).

The Medical Outcomes Study 36-Item Short Form Health Survey (SF-36, Ware & Sherbourne, 1992) is a commonly used measure of health-related quality of life with eight subscales including physical functioning (PF), role limitations due to physical health (RP), bodily pain (BP), general health perceptions (GH), vitality, social functioning (SF), role limitations due to emotional issues (RE), and mental health (MH). Higher quality of life on this summated scale is indicated by higher scores. Using Cronbach’s alpha, the internal consistency for this sample's subscales were: PF = .89, RP = .90, BP = .80, GH = .79, vitality = .74, SF = .85, RE = .92, and MH = .87. The Cronbach's alpha for the total SF-36 score was .93.

Illness severity was measured using the Tender Point Index (TPI). To determine the TPI, a dolorimiter was used to apply a standard amount of pressure to tender points, and participant reactions were rated according to a 5-point scale (0= no pain to 4= patient untouchable/ withdrawal without palpation). A total TPI score was calculated by adding scores for the individual tender points (Buckelew et al., 1998).

The Harvard School of Public Health Food Frequency Questionnaire (FFQ) was used to measure nutritional intake (calories, total protein, total and saturated fat, total carbohydrates, sucrose, and dietary fiber) by assessing the frequency foods consumed during the previous month using food lists. The 20-page version of the FFQ was chosen because it contained more low fat foods, providing more accurate measurement of fat intake than shorter versions. FFQs have been used with populations that are chronically ill (Feskanich et al., 1993) and are not as burdensome or reactive as food diaries (St. Jeor, 2002). Concurrent validity was established by comparing FFQs with food diaries; correlations for total fat, saturated fat and calcium intake ranged from .53 to .76 (Willett et al., 1985; Willett, Reynolds, Cottrell-Hoerhner, Sampson, & Browne, 1987). The reproducibility of FFQs made at two points in time ranges from .5 to .7 (Willett & Lenart, 1998). Although self-reported measures of food intake tend to be under-reported, the error created by under-reporting would be distributed randomly among the group, which would not lead to a systematic change in relative values (De Castro, 1994).To reduce inaccuracies from under-reporting, participants whose average daily caloric intake was less than 1,000 (n=12) were excluded from the study.

Barriers to Health Promoting Activities for Disabled Persons Scale (BS) measures how often the listed barriers interfere with ability to take care of one's health (Becker, Stuifbergen & Sands, 1991). BS is an 18 item, 4-point self-report scale with responses ranging from 1 “never” to 4 “routinely.” Responses are summed for a total score with higher scores indicating greater perceived barriers. Validity and reliability of this instrument was established by Becker et al., (1991) for both disabled and non-disabled individuals. The internal consistency for this sample was a Cronbach's alpha of .80.

Self-Rated Abilities for Health Practices Scale (SRAHP) measured specific self-efficacy for performing health promoting behaviors (Becker, Stuifbergen, Oh & Hall, 1993). SRAHP consists of 28 summated items with four subscales (i.e., exercise, nutrition, responsible health practice, and psychological wellbeing) (Beal et al., 2009). Participants rated their perceived ability for performing health behaviors (0 = “not at all” to 4 = “completely”) with higher scores denoting greater perceived self-efficacy. The Cronbach’s alpha for this study was .92.

Results

Participants ranged in age from 24–74 years old with an average age of 53.3 years (*SD* = 10.0). The majority of women were either White (84.4%) or Hispanic/Latino (14%), married (63.7%) with at least some college (60.3%). The average time since diagnosis was 8.9 years (*SD* = 5.6). More than half of participants (62%) reported being slightly active and 19% reported being sedentary. Descriptive statistics for the nutritional intake variables are presented in Table 1.

Average BMI for the sample was 30.34 kg/m^2 (*SD* = 6.73). Using established weight categories for BMI (NHLBI, 1998), only 20.7 % (n=37) of participants fell into the normal weight category (18.5- 24.9 kg/m^2) with 31.8 % (n = 57) overweight (25 kg/m^2 to 29.9 kg/m^2), 39.1 % (n=70) obese (30 kg/m^2 to 39.9 kg/m^2), and 8.4% (n=15) morbidly obese (≥ 40 kg/m^2).

Relationship of QOL and FMS Severity to BMI

Using partial correlations, controlling for age, the SF-36 subscales of physical functioning ($p < .001$), bodily pain ($p = .05$) and vitality ($p = .04$) were all significantly related to BMI (See Table 2). Participants that were heavier were more likely to have lower physical functioning, less vitality, and more bodily pain. None of the other subscales were significantly related to BMI. The severity of FMS, as measured by the TPI, was also significantly related to BMI ($p < .001$). The greater the severity of the individual’s FMS (i.e., more painful at tender points), the higher their BMI.

Comparison of QOL and FMS Severity by BMI Category

ANOVAs were used to determine if statistically significant differences existed among participants in the different BMI categories as previously identified (See Table 3). There were statistically significant differences based on BMI category for SF-36 subscale of physical functioning [$F(3, 174) = 12.15$, $p<.001$] and tender point total score [$F(3, 175) = 7.17$, $p<.001$]. Employing a Tukey HSD post-hoc test, statistically significant differences in physical functioning were found between overweight and obese participants ($p < .05$) and overweight and morbidly obese participants ($p < .01$). In addition, statistically significant differences in tender points were found between normal weight participants and overweight participants ($p < .01$), between normal weight participants and obese participants ($p < .01$), and between normal weight participants and morbidly obese participants ($p < .01$).

Relationship between Nutritional Intake, Health Promotion Variables and BMI

The partial correlations, controlling for age, between nutrition intake variables, health promotion variables, and BMI are presented in Table 2. BMI was significantly correlated with the nutritional variables of calories ($p = .05$), protein ($p = .04$), fat ($p = .02$), and saturated fat ($p = .01$). For the health promoting variables, BS ($p = .01$) was significantly related to BMI. The more barriers to performing health promoting behaviors experienced, the higher the BMI. For the measures of self-efficacy, only the SRAHP subscale for physical activity (partial $r = -.18$; p =.02) was related to BMI with heavier participants having lower confidence in their performance of physical activity.

The relationship between the health promoting variables and the nutrition intake variables identified several trends. Only caloric, carbohydrate and sucrose intake were associated with other health promoting variables in the study. Caloric intake was positively associated with barriers to performing health promoting behaviors (BS; $p = .01$) and severity of FMS (TP; $p = .02$).

Total carbohydrate intake was positively related to barriers (BS; $p = .001$). Sucrose, which is one component of total carbohydrate intake, had a similar association (BS; $p = .001$). Additionally, carbohydrate intake was negatively related to 4 of 8 SF-36 subscales, while sucrose intake was negatively related to 6 out of 8 SF-36 subscales. Sucrose intake was also related to severity of FMS (TP; $p < .001$). Higher intake of carbohydrate and sucrose was associated with lower QOL.

Discussion

Weight continues to be an important issue affecting the quality of life and symptom severity for women with FMS. The percentage of participants in this study who fell into the obese category was 47.5% (including morbidly obese), which is consistent with past studies in this population which ranged between 44.8% and 47% (Kim et al., 2012; Okifuji et al., 2010). The prevalence of obesity continues to be higher for this sample (about 12% higher) compared to women in national data sets (Flegal, Carroll, Ogden & Curtin, 2010). It makes sense that the prevalence of obesity is higher among women with FMS now that obesity has been identified in a longitudinal research study as being an independent risk factor for FMS (Mork et al., 2010).

The study findings support the growing body of evidence that excess weight is negatively related to QOL, especially in the area of physical functioning (Neumann et al., 2008; Przekop et al., 2010; Shaver et al., 2006; Yunas et al., 2002), and is positively related to pain (Aparicio et al., 2011; Neumann et al., 2008; Okifuji et al., 2010; Przekop et al., 2010; Yunas et al., 2002). Although there are several hypothesized mechanisms for the link between increased weight and increased pain (e.g., increased pain sensitivity), perhaps the more important point is that these findings point to tangible interventions centered on weight management that may provide some relief to those suffering from FMS. Although the efficacy of weight loss as an intervention in managing FMS symptoms needs to be examined further, several studies, looking at both behavior weight loss interventions (Shapiro et al., 2005) and weight loss from bariatric surgery (Hooper et al., 2007; Saber et al., 2008), have demonstrated positive improvements in symptom severity.

Earlier FMS literature recounted improvements in FMS symptoms from vegetarian and vegan diets (Arranz, Canela & Rafecas, 2010; Sueiro Blanco et al., 2008). Perhaps the improvements noted in participants were due to weight loss rather than specific composition of the recommended diet. Unfortunately, it is difficult to draw any conclusions, since these few studies had very small sample sizes (ranging from 18–30) and weight or weight loss was not always addressed (Donaldson, Speight & Loomis, 2001; Kaartinen et al., 2000).

In addition to providing further support for the link between obesity and FMS severity, this study fills in gaps in the literature by exploring the relationships between nutritional and health promotion variables and BMI, QOL, and FMS severity. Of particular note is the relationship between barriers to performing health promoting behaviors and BMI. Successful weight management requires sustained efforts often in both managing nutritional intake (calories & fat) and exercise, which can be difficult for any individual. Women with FMS in this study, who reported experiencing greater barriers to engaging in health promoting behaviors, were more likely to have higher BMIs. Since higher BMI was also associated with lower physical functioning, the participants with higher BMIs may have perceived more barriers from a variety of sources. Fatigue, a hallmark of FMS, may be one of those barriers, making it even more difficult for women with FMS to engage successfully in weight management. Innovative weight management strategies may need to be developed for this population that takes into account their fatigue level and works within the context of their illness.

One of the more unexpected findings was that higher carbohydrate and sucrose/sugar intake was associated with lower QOL on many of the subscales. Increased sucrose/sugar intake was also related to greater severity of pain as measured by tender points. The average sucrose intake for this sample was 43 grams per day which translates into about 9 teaspoons of sugar. Current recommendations by the American Heart Association (Johnson et al., 2009) suggest that for women the daily amount of sugar consumed should be limited to 25 grams (i.e., 6 teaspoons), which translates into 100 non-nutritive calories per day. Perhaps foods high in carbohydrates and sugar serve as comfort foods, which may be used as coping strategies for women experiencing more severe problems with FMS and fewer resources. However, these additional calories may contribute to additional weight gain, possibly contributing to a vicious cycle. Further investigation of these interesting findings is warranted in future studies.

The study had several limitations. With the use of nonrandom sampling, generalizing the findings to other samples beyond this study should be done with caution. Most of the measures were based on self-reported data which may affect its accuracy. Despite these limitations, this study provides data on an understudied population in the area of weight, nutritional intake, and health promoting variables that may be useful as we search for ways to improve the quality of life and symptom severity of women with FMS.

As researchers continue to unravel the mysteries involved in FMS, QOL remains an imperative consideration. We have only recently started accumulating evidence that implicates excess weight as aggravating symptom severity and reducing QOL in this population. Further inquiry needs to determine how women with FMS will respond to weight loss interventions, and what additional variables are unique to this population and may interfere with successful weight management. Weight management in our obesogenic society is challenging enough for most of us and typically requires consistent effort to be successful. How will we as health care providers facilitate weight management among a population of women with FMS that have numerous barriers, but especially fatigue which may deplete the motivation needed to sustain weight loss efforts?

Acknowledgments

This project was supported by grant number R01 HD0035047, the National Center for Medical Rehabilitation Research, National Institute of Child Health and Human Development, NIH.

References

Aparicio VA, Ortega FB, Carbonell-Baeza A, Gatto-Cardia C, Sjostrom M, Ruiz JR, Delgado-Fernandez M. Fibromyalgia's key symptoms in normal-weight, overweight, and obese female patients. Pain Management Nursing. 2011

Arranz LI, Canela MA, Rafecas M. Fibromyalgia and nutrition, what do we know? Rheumatology International. 2010; 30(11):1417–1427. [PubMed: 20358204]

Beal CC, Stuifbergen AK, Brown A. Predictors of a health promoting lifestyle in women with fibromyalgia syndrome. Psychology, Health & Medicine. 2009; 14(3):343–353.

Becker H, Stuifbergen AK, Oh HS, Hall S. Self-rated abilities for health practices: A health self-efficacy measure. Health Values. 1993; 17(5):42–50.

Becker H, Stuifbergen AK, Sands D. Development of a scale to measure barriers to health promotion activities among persons with disabilities. American Journal of Health Promotion. 1991; 5(6):449–454. [PubMed: 10171668]

Buckelew SP, Conway R, Parker J, Deuser WE, Read J, Witty TE, Kay DR. Biofeedback/relaxation training and exercise interventions for fibromyalgia: A prospective trial. Arthritis Care and Research. 1998; 11(3):196–209. [PubMed: 9782811]

Buskilla D, Neumann L, Frankel A, Bolotin A, Levi I, Press J. Increased enonarticular tenderness in obese women. Pain Clinics. 2002; 13(4):313–318.

De Castro JM. Methodology, correlational analysis, and interpretation of diet diary records of the food and fluid intake of free-living humans. Appetite. 1994; 23(2):179–192. [PubMed: 7864611]

Donaldson MS, Speight N, Loomis S. Fibromyalgia syndrome improved using a mostly raw vegetarian diet: An observational study. BMC Complementary and Alternative Medicine. 2001; 1(7)

Hooper MM, Stellato TA, Hallowell PT, Seitz BA, Moskowitz RW. Musculoskeletal findings in obese subjects before and after weight loss following bariatric surgery. International Journal of Obesity. 2007; 31:114–120. [PubMed: 16652131]

Feskanich D, Rimm EB, Giovannucci EL, Colditz GA, Stampfer MJ, Litin LB, Willett WC. Reproducibility and validity of food intake measurements from a semiquantitative food frequency questionnaire. Journal of the American Dietetic Association. 1993; 93(7):790–796. [PubMed: 8320406]

Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among US adults, 1999–2008. JAMA. 2010; 303(3):235–241. [PubMed: 20071471]

Foreyt, JP. Weight loss programs for minority populations. In: Fairburn, CG.; Brownell, KD., editors. Eating disorders and obesity: A comprehensive handbook (2nd ed). New York: The Guildford Press; 2002. p. 583-587.

Kaartinen K, Lammi K, Hypen M, Nenonen M, Hanninen O, Rauma AL. Vegan diet alleviates fibromyalgia symptoms. Scandinavian Journal of Rheumatology. 2000; 29(5):308–313. [PubMed: 11093597]

Katz DA, McHorney CA, Atkinson RL. Impact of obesity on health-related quality of life in patients with chronic illness. Journal of General Internal Medicine. 2000; 15(11):789–796. [PubMed: 11119171]

Kim CH, Luedtke CA, Vincent A, Thompson JM, Oh TH. Association of body mass index with symptom severity and quality of life in patients with fibromyalgia. Arthritis Care & Research. 2012; 64(2):222–228. [PubMed: 21972124]

Johnson RK, Appel LJ, Brands M, Howard BV, Lefevre M, Lustig RH, Wylie-Rosett J. Dietary sugars intake and cardiovascular health: A scientific statement from the American Heart Association. Circulation. 2009; 120(11):1011–1020. [PubMed: 19704096]

Mork PJ, Vasseljen O, Nilsen TIL. Association between physical exercise, body Mass index, and risk of fibromyalgia: Longitudinal data from the Norwegian Nord-Trøndelag Health Study. Arthritis Care & Research. 2010; 62(5):611–617. [PubMed: 20191480]

National Heart Lung and Blood Institute. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults-The evidence report. Obesity Research. 1998; 6(S2): 51S–209S. [PubMed: 9813653]

Neumann L, Lerner E, Glazer Y, Bolotin A, Shefer A, Buskila D. A cross-sectional study of the relationship between body mass index and clinical characteristics, tenderness measures, quality of life, and physical functioning in fibromyalgia patients. Clinical Rheumatology. 2008; 27(12): 1543–1547. [PubMed: 18622575]

Okifuji A, Donaldson GW, Barck L, Fine PG. Relationship between fibromyalgia and obesity in pain, function, mood, and sleep. The Journal of Pain. 2010; 11(12):1329–1337. [PubMed: 20542742]

Pender, NJ.; Murdaugh, CL.; Parsons, MA. Health promotion in nursing practice. Upper Saddle River, NJ: Prentice Hall; 2006.

Przekop P, Haviland MG, Morton KR, Oda K, Fraser GE. Correlates of perceived pain-related restrictions among women with fibromylagia. Pain Medicine. 2010; 11(11):1698–1706. [PubMed: 21044260]

Saber AA, Boros MJ, Mancl T, Elgamal MH, Song S, Wisadrattanapong T. The effect of laparoscopic roux-en-Y gastric bypass on fibromyalgia. Obesity Surgery. 2008; 18:652–655. [PubMed: 18401670]

Shapiro JR, Anderson DA, Danoff-Burg S. A pilot study of the effects of behavioral weight loss treatment on fibromyalgia symptoms. Journal of Psychosomatic Research. 2005; 59:275–282. [PubMed: 16253617]

Shaver JLF, Wilbur J, Robinson FP, Wang E, Buntin MS. Women's health issues with fibromyalgia syndrome. Journal of Women's Health. 2006; 15(9):1035–1045.

St. Jeor, ST. Measurement of food intake. In: Fairburn, CG.; Brownell, KD., editors. Eating disorders and obesity: A comprehensive handbook (2nd ed). New York: The Guildford Press; 2002. p. 126-130.

Stuifbergen AK, Blozis SA, Becker H, Phillips L, Timmerman G, Kullberg V, et al. A randomized controlled trial of a wellness intervention for women with fibromyalgia syndrome. Clinical Rehabilitation. 2010; 24:305–318. [PubMed: 20360151]

Sueiro Blanco F, Estévez Schwarz I, Ayán C, Cancela JM, Martín V. Potential benefits of non-pharmacological therapies in fibromyalgia. The Open Rheumatology Journal. 2008; 2:1–6. [PubMed: 19088863]

Ware JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36)IConceptual framework and item selection. Medical Care. 1992; 30:473–483. [PubMed: 1593914]

Willett, WC.; Lenart, E. Reproducibilty and validity of food-frequency questionnaires. In: Willett, WC., editor. Nutritional epidemiology (2nd ed). New York: Oxford University Press; 1998. p. 101-147.

Willett WC, Reynolds RD, Cottrell-Hoehner L, Sampson L, Browne ML. Validation of a semi-quantitative food frequency questionnaire: Comparison with a 1-year diet record. Journal of the American Dietetic Association. 1987; 87(1):43–47. [PubMed: 3794132]

Willett WC, Sampson L, Stampfer MJ, Rosner B, Bain C, Witschi J, Hennekens CH, Speizer FE. Reproducibilty and validity of a semiquantitative food frequency questionnaire. American Journal of Epidemiology. 1985; 122(1):51–65. [PubMed: 4014201]

Wing, RR.; Klem, M. Characteristics of successful weight maintainers. In: Fairburn, CG.; Brownell, KD., editors. Eating disorders and obesity: A comprehensive handbook (2nd ed). New York: The Guildford Press; 2002. p. 588-592.

Yunus MB, Arslan S, Aldag JC. Relationship between body mass index and fibromyalgia features. Scandinavian Journal of Rheumatology. 2002; 31(1):27–31. [PubMed: 11922197]

NIH-PA Author Manuscript

NIH-PA Author Manuscript

Table 1

Descriptive Statistics for Daily Nutrient Intake (n = 179)

Variable	***M***	***SD***
Calories	1856.40	760.79
Total Protein	85.57 (gm)	36.05
Total Fat	70.50 (gm)	33.92
Saturated Fat	22.06 (gm)	10.86
Total Carbohydrates	224.67 (gm)	109.30
Sucrose	43.33 (gm)	27.70
Dietary Fiber	21.19 (gm)	11.3

Table 2

Relationships between Nutrition Intake, Health Promotion Variables, and BMI, Controlling for Age

	BMI	Total kcal	Total Protein	Total Fat	Total Saturated Fat	Total Carbohydrates	Sucrose	Dietary Fiber
SF-36 PF	−.39**	−.13	−.08	−.09	−.11	−.15*	−.18*	−.07
SF-36 RP	−.13	−.12	−.10	−.06	−.10	−.13	−.16*	−.11
SF-36 BP	−.15*	−.12	−.08	−.09	−.11	−.14	−.16*	−.10
SF-36 Vitality	−.15*	−.02	−.01	.01	−.05	−.03	−.05	.02
SF-36 GH	−.11	−.09	−.01	−.02	−.07	−.16*	−.10	−.09
SF-36 SF	−.10	−.12	−.06	−.07	−.08	−.14	−.15*	−.10
SF-36 RE	−.08	−.10	.00	−.03	−.06	−.15*	−.20**	−.08
SF-36 MH	.02	−.16	−.04	−.04	−.08	−.25**	−.28**	−.12
TP Total	.29**	.18*	.09	.09	.10	.24**	.26**	.14
BS	.19*	.19*	.11	.10	.11	.25**	.25**	.14
SRAHP Total	−.11	−.02	.09	.01	−.03	−.09	−.14	.13
BMI	1.00	.15*	.15*	.18*	.20**	.10	.07	.11

Note. For correlations with all subscales of the SF-36, n=178

* $p < .05$;

** $p < .01$

Table 3

Comparison of QOL and FMS Severity by BMI Group

	Normal Weight[a] (n=37)	**Overweight (n=57)**	**Obese (n=70)**	**Severely Obese (n=15)**
	Mean (SD)	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**
SF-36 PF***	55.8 (24.15)	44.7 (20.9)	34.9 (20.8)	22.7 (15.0)
SF-36 RP	35.1 (25.8)	35.1 (22.0)	33.4 (23.6)	23.8 (16.7)
SF-36 BP	37.7 (19.4)	31.6 (15.6)	30.3 (14.7)	32.8 (21.0)
SF-36 Vitality	28.5 (18.4)	28.3 (19.7)	27.2 (19.0)	16.3 (10.8)
SF-36 GH	39.1 (20.1)	40.7 (22.4)	38.3 (18.4)	29.6 (19.9)
SF-36 SF	46.5 (26.5)	47.8 (25.1)	49.5 (27.9)	37.5 (20.6)
SF-36 RE	55.3 (27.3)	59.2 (27.5)	60.5 (30.9)	46.1 (37.4)
SF-36 MH	51.9 (23.8)	59.2 (18.4)	61.1 (21.7)	53.7 (23.9)
TP Total***	32.1 (11.7)	40.7 (11.2)	40.9 (10.3)	44.1 (9.8)

Note.

[a]For SF-36 subscales, n=36.

***$p < .001$