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Impact of obesity on quality of life and depression in patients with heart failure

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Abstract

Background—The effect of obesity on health related quality of life (HRQOL) and depression in a number of disease states is well documented, but its impact in heart failure (HF) patients remains speculative. We therefore examined the relationship between obesity, HRQOL, and depression in 358 patients with HF.

Methods and results—Comparative analyses were conducted to determine if body mass index (BMI) was associated with HRQOL and depression in three groups of patients with HF—normal weight (BMI 18.5–24.9 kg/m^2, n =100), overweight (BMI 25–29.9 kg/m^2, n =141), and obese (BMI≥30 kg/m^2, n =117). Obese patients were younger than normal and overweight participants; all other demographic and clinical characteristics were similar. HRQOL and depression scores were significantly higher (worse) for obese patients. Body mass index was significantly correlated with all 3 scales of HRQOL (overall, r^2=.160; physical, r^2=.162; and mental, r^2=.217) as well as with depression (r^2=.166).

Conclusion—Obese patients with HF are more likely to have poorer HRQOL, physical health, emotional well-being and depressive symptoms. Poorer HRQOL is predictive of worse outcomes in patients with HF; however, given the apparent obesity paradox in HF, further investigation of the impact of obesity in HF is urgently required.

Keywords

Heart failure; Obesity; Health-related quality of life; Depression

In recent years, there has been extensive interest in health-related quality of life (HRQOL) and associated variables such as depression, in obese subjects. However, most of what is

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known about HRQOL and depression in obese subjects has been derived from studying individuals in weight loss treatment settings [1]. The impact of obesity on HRQOL and depression in subjects who were obese but had no other chronic conditions has also been documented, with obesity being generally acknowledged to compromise HRQOL and mental well-being [2]. However, while the relation of excess body weight to HRQOL in otherwise healthy subjects has been studied, the impact of body weight on the HRQOL and depressive symptoms of patients with heart failure (HF) has not been quantified. As a consequence, there are uncertainties regarding the association between obesity and HRQOL or depression in patients with HF, and speculation about differences in HRQOL and depressive symptoms among normal weight, overweight, and obese patients with HF are merely tentative.

Patients with HF have markedly impaired HRQOL [3,4] and high levels of depression [5,6], both of which are independently related to worse morbidity and mortality. Whether these impairments are potentiated in the presence of obesity, a condition that also results in physiologic and psychological abnormalities, is not clear. Therefore, the current study was conducted to examine the associations between body weight and self-reported HRQOL and depression in patients with HF. We aimed to answer two specific research questions: (1) Are HRQOL impairments and depression more prevalent in obese patients with HF compared to normal weight and overweight patients and (2) Is obesity an independent predictor of HRQOL and depression in patients with HF?

1. Methods

1.1. Study subjects and data source

All patients had a primary diagnosis of HF and were receiving care at a single university-based, tertiary HF clinic. Patients were included in the study if they were alert and oriented, able to understand English and agreed to give informed consent. Patients were excluded if they had major or acute physical or psychological traumas including surgery, major stressors, major injuries, personal losses or substance abuse within the six months prior to data collection. Potential subjects were also excluded if they lacked the cognitive capabilities or psychiatric stability to respond to the data collection procedures.

Height and dry weight were determined after patients were clinically or haemodynamically optimized on medical therapy. Patients were categorized into three BMI groups using the criteria proposed by the World Health Organization (WHO) and later modified by the Third National Health and Nutrition Examination: BMI 18.5–24.9 kg/m^2=normal weight; 25–29.9 kg/m^2=overweight; and ≥30 kg/m^2= obesity [7].

1.2. Procedures

The appropriate Institutional Review Board reviewed and approved the study, and patients signed an informed consent prior to enrolment in the study. Patients were given a questionnaire to complete during their wait at a routine HF clinic visit. On average, questionnaire completion time was 10–15 min.

Patients also performed symptom-limited exercise testing as part of their routine medical care. The workload started at 25 watts (W) and increased by 25 W every 5 min. Patients exhaled through a one-way valve connected to a system to determine respiratory gas exchange data continuously throughout the exercise test. Patients were encouraged to exercise to exhaustion. Measures of peak oxygen uptake (VO_2 max), corresponding to the mean oxygen uptake in the last 3 min of exercise, were obtained and recorded.

1.3. Study instruments

Health-related quality of life, which is defined as the degree to which aspects of patients' physical, social, functional, and emotional well-being are impacted by health [6], was measured using the Minnesota Living with Heart Failure Questionnaire (LHFQ). This disease-specific, 21-item tool, asked participants to indicate the extent to which various symptoms they have experienced in the previous month have prevented them from living as they wanted to. The items can be combined to form an overall HRQOL score as well as physical health (eight items) and emotional health (five items) scores. The physical subscale contains items associated with the fatigue and dyspnoea of HF. The emotional subscale contains items such as being worried or feeling down. An additional eight items include questions about other areas of life affected by HF and were used to compute the overall HRQOL score [8]. Response options are presented as six-point ordinal scales ranging from 0 (none) to 5 (very much), with a total maximum score of 105 (40 for physical and 25 for emotional health); a lower LHFQ score indicates better HRQOL [8].

Depressive symptoms were measured using the Beck Depression Inventory (BDI), an instrument widely used and well validated in chronically ill populations [9]. The BDI is a self-report inventory designed to measure severity of depressive mood or symptoms. The 21-item inventory consists of a Likert-type scale from 0 (absence of symptom) to 3 (severe or persistent presence of the symptom). Five of the BDI items pertain to somatic symptoms of depression (e.g., loss of appetite and sleep disturbance) and 16 of the items reflect non-somatic symptoms of depression (e.g., hopelessness and social withdrawal). Scores on the BDI range from 0 to 63. Patients with BDI scores 0–9 are considered as having minimal symptoms of depression, scores 10–16 mild, scores 17–29 moderate, and scores 30–63 as having severe symptoms of depression [10].

Demographic information was collected through a simple self-administered form. The form asked participants about their age, sex, race, marital status, education, current employment status and annual income. Information pertaining to medical history (e.g. aetiology of HF) was obtained through self-reports and verified by chart reviews. Results of diagnostic tests (e.g. bicycle ergometry and echocardiography) and information related to the participant's current clinical status (e.g. New York Heart Association [NYHA] class, HF aetiology, current medications) was obtained from medical records.

1.4. Data analysis

Data were analyzed using SPSS for Windows (version, 10.0, SPSS, Inc, Chicago, IL) [11]. Descriptive statistics including means, ranges, and standard deviations were used to describe sociodemographic and clinical characteristics and levels of BMI, HRQOL, and depressive

symptoms. Comparative analyses of demographic and clinical characteristics and HRQOL were computed for normal, overweight, and obese patients using ANOVA or chi-square, depending on the levels of measurement.

We conducted univariate analyses using Pearson product moment correlation coefficients to explore relationships between demographic (e.g. age, sex, ethnicity) and clinical characteristics (e.g. NYHA class, HF aetiology, maximum oxygen consumption [VO_2 max]), HRQOL scores, depressive symptoms and BMI. A step-wise linear multiple regression was conducted to identify factors associated with HRQOL (overall, physical and emotional well-being) and depressive symptoms of patients with HF. Variables that achieved univariate significance of <0.05 were included in a multivariate analyses in a hierarchical fashion. Demographic characteristics (age, sex) were included as covariates and were entered first. Next, to depict the impact of clinical variables on patients' HRQOL and depressive symptoms, NYHA classification and VO_2 max were entered as a second step. Body mass index (as a continuous variable) was added as the third and final step in the model. Criteria for entry and removal of variables were based on the likelihood ratio test with enter and remove limits set at $p \leq 0.05$ and $p \geq 0.100$.

2. Results

The demographic and clinical characteristics of the normal (n =100), overweight (n =141) and obese (n =117) subjects are summarized in Table 1. Obese patients were significantly younger than their counterparts. There were no significant differences in sex, race, marital status, education, and employment status between normal, overweight, and obese participants, Additionally, there were no significant differences among the BMI groups with regard to ejection fraction, VO_2 max, NYHA class and HF aetiology. Rates of ACE-inhibitor, beta-blocker, loop diuretic, and digoxin use were also similar in all groups.

Mean overall HRQOL for this sample was 43.8± 24.7. This is significantly impaired given a possible range of 5 to 105. Mean physical and emotional subscale scores also reflected poor HRQOL, being 18.2± 11.1 and 9.9± 7.4, respectively. The mean scores for HRQOL (overall, physical health and emotional health) and depressive symptoms in normal weight, overweight, and obese patients are summarized in Table 2. Post hoc analyses revealed that there were significant differences between normal and overweight participants only on emotional well-being scores. However, obese patients had significantly higher (worse) HRQOL (overall, physical, and emotional) and depression scores than both normal weight and overweight patients.

Univariate analyses of the key variables that were examined for the study revealed that age correlated with NYHA class (r =.197, p <.001). Age was also inversely related to BMI (r = −.174, p < .001) and VO_2 max (r =−.250, p <.001). Sex related differences were observed in overall HRQOL, physical health, mental health, and depression scores in our sample; men faired better than women on all scales. Intuitively, men had better VO_2 max, indicating a higher functional capacity than women. Finally, we found that BMI was related to overall HRQOL (r =.158, p <.001), physical health (r =.174, p <.001), emotional health (r = .212, p < .001), and depression (r = .108, p < .001); obese patients had poorer HRQOL on all

measures. Multivariate analyses revealed that sex, NYHA class and BMI influenced overall HRQOL, physical health, emotional health, and depression of patients with HF (Table 3). These three predictors accounted for approximately 20% of the variance in the overall HRQOL, physical health, emotional health, and depression scores of the sample.

3. Discussion

Our findings from this study confirmed findings from our previous studies [3,12,13] that report impaired HRQOL and depressive symptoms among patients with HF. Although patients adapt their expectations as their clinical status declines, their HRQOL still decreases as the physical symptoms of HF become more pervasive. Previous research on HRQOL has been characterized by the lack of association of many variables, such as ejection fraction, that one might assume would be associated with HRQOL. However, no investigators have examined the relationship between obesity and HRQOL.

In the current study, we found that obesity was associated with decreasing HRQOL, including both physical health and emotional well-being. Obesity was also significantly associated with depression. Despite the significant physical disability that attends HF, particularly related to decreased functional status and increased symptomatology, the deterioration in HRQOL related to obesity in this cohort of patients, was more evident in the emotional dimension than in the physical dimension of HRQOL. In the emotional dimension, differences were observed between normal weight and overweight patients and overweight and obese patients; in the physical dimension, differences between normal weight and overweight patients with HF were not significant. It appears that the incremental difference in weight between patients with normal BMI and BMI>25 was not significant enough to overshadow the physical symptomatology of HF.

Our data also revealed that overweight women reported more impaired HRQOL than men. This is consistent with other studies that obese women have more impaired HRQOL than obese men [14]. Clinicians treating overweight and obese individuals need to be aware of women's poorer HRQOL relative to men, perhaps in part because of their tendency toward greater dissatisfaction about body image then men.

Negative changes in HRQOL, particularly depressive symptoms, are important in the setting of HF because of strong evidence that reduced HRQOL and increased depression are related to increased mortality and morbidity [15]. The mechanisms of this relationship are not clear. However, investigators have hypothesized that negative emotional states can lead to poor adherence [16] and/or to physiologic changes, including hyperactivation of the sympathetic nervous system and proinflammatory cytokine production [17]. Each of these alone or together may contribute to poorer outcomes in patients with HF. Having emphasized the relationship between HRQOL and mortality, it is important to note that numerous investigators have found obesity to be protective when examining HF mortality [18–20]. It will be essential in future studies of obesity and mortality among patients with HF to include HRQOL measures so that a possible interaction between obesity and HRQOL can be elucidated.

There are several study limitations that must be noted. First, we used a HRQOL that focused on HF symptoms, which may not have captured issues specific to obesity. However, we believe that the use of obesity-specific health state measures, although likely to present a slightly different picture than the one presented here, would have been unlikely to alter the results significantly because of the focus of the LHFQ on functional status, which is a significant component of obesity. Second, the cross-sectional nature of the study design limits any conclusions that can be drawn with regard to the causal mechanisms underlying the observed associations. Third, information was not collected regarding the duration of obesity or whether obese subjects had ever attempted to lose weight. These factors may be important in explaining the association between BMI, HRQOL, and depression. Fourth, the authors recognize that the HF population in the current study was composed of patients who were receiving care at a single university-based, tertiary HF clinic, and thus typically younger, and not clearly representative of the HF population in general. Thus, attempts to include a less homogeneous sample in future studies examining obesity, HRQOL and depression are warranted to better understand and generalize our findings to the HF population. Finally, the study findings are limited by the fact that actual body fat composition and distribution was not measured. Although dry weight was measured after patients were clinically and haemodynamically stabilized, we cannot be completely certain about the total amount of weight lost due to different diuretic responses according to varying diuretic doses per weight.

Additional studies that examine HRQOL and depression in obese patients with HF are needed to further determine the extent to which the presence of co-morbidities is responsible for HRQOL impairments. Of particular interest in our group is the role of health care behaviours (i.e. diet restrictions, exercise) in HRQOL and obesity in patients with HF. Future work might include whether weight loss is associated with increased HRQOL.

4. Summary

The results of our study support an inverse relationship between obesity and HRQOL. High body weight is a modifiable risk factor, and proper weight management could potentially improve the already low HRQOL of patients with HF. However, given the apparent obesity paradox in patients with HF, it is imperative that future studies be conducted to investigate the complex relationships between HRQOL, obesity and outcomes so that appropriate interventions can be developed.

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Table 1

Demographic and clinical characteristics of normal, overweight, and obese participants

	Normal weight	Overweight	Obese	*P* value
	***N* =100**	***N* =141**	***N* =117**	
Age, years (mean± SD)	56.63± 13.30	56.78± 12.13	52.53± 11.35	.020
Sex, *N* (%)				.233
Male	67 (67.0%)	106 (75.1%)	85 (72.6%)	
Female	33 (33.0%)	35 (24.9%)	32 (27.4%)	
Race, *N* (%)				.136
White	61 (61.0%)	83 (58.9%)	63 (53.8%)	
Black	20 (20.0%)	34 (24.1%)	34 (29.1%)	
Other	19 (19.0%)	24 (17.0%)	20 (17.1%)	
Marital status, *N* (%)				.734
Married	68 (68.0%)	102 (72.3%)	85 (72.6%)	
Single/divorced/widowed	32 (32.0%)	39 (27.7%)	32 (27.4%)	
Education, *N* (%)				.750
≤High school	19 (19.0%)	29 (20.6%)	27 (23.1%)	
Vocational or junior college	29 (24.0%)	36 (25.5%)	37 (31.6%)	
≥College	52 (52.0%)	76 (53.9%)	53 (45.3%)	
Employment Status, N (%)				.457
Employed	21 (21.0%)	29 (20.6%)	32 (27.4%)	
Unemployed/retired/disabled	79 (79.0%)	112 (79.4%)	85 (72.6%)	
Ejection fraction, % (Mean± SD)	25.44± 6.50	26.40± 6.52	27.35± 8.41	.184
VO_2 max, ml (mean ± SD)	15.36± 5.85	15.47± 5.19	14.05± 4.39	.154
HF aetiology, *N* (%)				.279
Ischaemic	32 (32.0%)	57 (40.4%)	34 (29.1%)	
Non-ischaemic	68 (68.0%)	84 (59.6%)	83 (70.9%)	
NYHA class, *N* (%)				.762
Class I	11 (11.0%)	17 (12.1%)	8 (6.8%)	
Class II	38 (38.0%)	59 (41.8%)	57 (48.7%)	
Class III	40 (40.0%)	52 (36.9%)	40 (34.2%)	
Class IV	11 (11.0%)	13 (9.2%)	12 (10.3%)	
Medications, N(%)				.888
ACE inhibitor	79 (79.0%)	108 (76.6%)	92 (78.6%)	
Beta-blocker	73 (73.0%)	98 (69.5%)	80 (68.4%)	
Diuretics	96 (96.0%)	132 (93.6%)	110 (94.0%)	
Digoxin	57 (57.0%)	82 (58.2%)	58 (49.6%)	

Table 2

Differences between normal, overweight, and obese subjects on HRQOL and depression scores

	Possible range	Normal weight	Overweight	Obese	*F* statistic	*P* value
		n **=100 (mean± SD)**	***n*** **=141 (mean± SD)**	***n*** **=117 (mean± SD)**		
LHFQ[a], overall	5–105	39.4± 23.1	44.0± 24.7	48.5± 24.2	4.45	.049
LHFQ[a], physical	5–40	16.0± 10.7	18.3± 11.0	20.5± 10.5	6.14	.024
LHFQ[a], emotional	5–25	8.5± 6.6	10.4± 7.6	12.4± 7.5	6.83	.003
Depressive symptoms[b]	0–63	9.1± 6.9	10.2± 6.7	12.0± 7.6	5.89	.027

[a] Minnesota Living with Heart Failure Questionnaire; higher scores indicate greater symptom interference and lower HRQOL.

[b] Measured using the Beck Depression Inventory; higher scores indicate increased (worse) depression.

Table 3

Predictors of HRQOL (overall, physical, emotional) and depression (*N* =358)

Variable	Adjusted R^2	Std. error of the estimate	*F* change	*P* value
LHFQ[a], *overall*				
Sex	.028	23.32	6.920	.009
NYHA class	.182	20.84	23.823	<0.001
Body mass index	.207	20.09	17.757	<0.001
LHFQ[a], *physical*				
Sex	.033	10.43	8.611	.004
NYHA class	.194	9.15	31.061	<0.001
Body mass index	.204	9.06	22.322	<0.001
LHFQ[a], *emotional*				
Sex	.035	7.02	8.347	.004
NYHA class	.157	6.64	20.059	<0.001
Body mass index	.236	6.32	18.518	<0.001
Depressive symptoms[b]				
Sex	.017	6.47	5.390	.022
NYHA class	.133	6.02	20.244	.005
Body mass index	.197	5.86	15.190	<0.001

[a] Minnesota Living with Heart Failure Questionnaire; higher scores indicate greater symptom interference and lower HRQOL.

[b] Measured using the Beck Depression Inventory; higher scores indicate increased (worse) depression.