The Libyan International Medical University

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(Relationship between obesity and heart failure)

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Abstract

In sufferers with heart failure (HF), higher body mass index (BMI) has been related to decrease rates of hospitalization and mortality (obesity paradox). signs and symptoms are antecedents of hospitalizations, however little is thought about the connection between BMI In this cross-sectional correlational study, patients (N = 247) provided data on BMI **,**The overweight II/III institution had extra severe HF signs and symptoms than different groups handiest in male patients. In male patients, older age, Caucasian race, greater comorbidities, and extra intense depressive signs and symptoms had been additionally related to extra severe signs and symptoms. In lady patients, greatersevere depressive signs and symptoms, more comorbidities, and better sodium consumption had been associated with greater intense symptoms**.**

Introduction:

Obesity is a disorder of body weight regulatory systems characterized by an accumulation of excess body fat،inexpensive foods in industrialized societies has undoubtedly contributed to an obesity epidemic. As adiposity has increased, so has the risk of developing associated diseases, such as type 2 diabetes (T2D), cardiovascular disease, hypertension, cancer, and arthritis[(1)].

Heart failure, often called congestive heart failure (CHF), is a common, usually progressive condition with a poor prognosis. Each year in the United States, CHF affects nearly 5 million individuals (approximately 2% of the population), necessitates over 1 million hospitalizations, and is the primary or contributing cause of death of an estimated 300,000 people ،CHF occurs when the heart is unable to pump blood at a rate sufficient to meet the metabolic demands of the tissues or can do so only at an elevated filling pressure [(2)].

Heart failure is a leading cause of morbidity and mortality and its prevalence continues to rise. Because obesity has been linked with heart failure, the increasing prevalence of obesity may presage further rise in heart failure in the future. Obesity-related factors are estimated to cause 11% of heart failure cases in men and 14% in women. Obesity may result in heart failure by inducing haemodynamic and myocardial changes that lead to cardiac dysfunction, or due to an increased predisposition to other heart failure risk factors. Direct cardiac lipotoxicity has been described where lipid accumulation in the heart results in cardiac dysfunction inexplicable of other heart failure risk factors.[(3)]

Methods and materials :

Body mass index—weight in kilograms divided by square height in meters—strongly correlates with total fat mass and was used as the primary index of obesity in our study, BMI was calculated based on height in centimeter and weight in kilogram. Nurses in the General Clinical Research Centers at each site measured height and weight. BMI was calculated by dividing weight in kilograms by the square of height in meters. BMI was used as a continuous variable and also a categorical variable in two different models. As a categorical variable, patients were categorized into four groups based on the calculated BMI: normal/underweight (< 25 kg/m^2), overweight ($25 – 29.9$ kg/m^2), obese class I ($30–34.9$ kg/m^2), and obese class II/III (≥ 35 kg/m^2)researchers combined the group of weight loss with the group of normal weight and obesity of the second degree with the category of obesity of the third category

because of the presence of small numbers in the group of the underweight and the group of obese.[1].

Data on other sociodemographic characteristics (age, education level, marital status, gender, and race) and clinical characteristics (etiology of HF] functional class, comorbidity) were collected using a sociodemographic questionnaire and a clinical questionnaire. Data on comorbidities were collected through patient interview and medical record review using the Charlson Comorbidity Index,38 which was included in the clinical questionnaire. Sodium intake was assessed using 24-hour urine sodium, and patients were divided into two groups (< 3 g vs. ≥ 3 g per day).

Result :

The total sample show The mean age was 61 years (standard deviation [SD]: ±11.6). The majority of the patients were Caucasian (74.1%), and 67.2% were males. More males than females were married (59% vs. 39.5%, p = .004), and more had ischemic-originated HF (56% vs. 28.4%, p < .001) , There were no gender differences in age, education level, race, NYHA functional class, comorbidities, obesity, sodium intake, depressive symptoms, or HF symptoms (no table). **Table 1** presents sample features based on BMI groups in males and females.

In males, the patients in the obese II/III group were younger ,consumed more sodium, and had more severe HF symptoms than the normal/underweight group and/or the overweight group. In addition, more patients in this group were minority races than all other groups.

Table 1.

Sample Characteristics by Body Mass Index Group in Males and Females (N =

Characterist	Males (n = 166)					Females (n = 81)				
	BMI Mean (± SD) om (%)				p value	BMI Mean (± SD) n or (%)				p value
	NW n = 39	OW n = 55	OB I n = 36	OB II/III n = 36		NW n = 22	OW n = 14	OB I n = 25	OB II/III n = 20	
Mean age, years (SD)	61.8(±12.7)	64.2(±10.3)	60.4(±13.3)	55.2(±11.0)	.005	65.9(±11.9)	58.4(±12.2)	59.6(±8.2)	60.4(±10.1)	.122
Education, mean years (SD)	13.9(±3.6)	13.8(±3.4)	14.3(±3.0)	13.7(±2.8)	.881	14.4(±2.8)	13.6(±3.0)	12.8(±2.8)	12.8(±3.4)	.209
Marital status (% married)	17.0(43.6)	34.0(61.8)	25.0(69.4)	22.0(61.1)	.127	13.0(59.1)	4.0(28.6)	9.0(36.0)	6.0(30.0)	.163
Race (% Caucasian)	34.0(87.2)	46.0(83.6)	28.0(77.8)	20.0(55.6)	.005	17.0(77.3)	13.0(92.9)	12.0(48.0)	13.0(65.0)	.023
Etiology (% ischemic)	22.0(56.4)	35.0(63.6)	20.0(55.6)	16.0(44.4)	.353	8.0(36.4)	6.0(42.9)	4.0(16.0)	5.0(25.0)	.248
NYHA (% III/IV)	16.0(41.0)	19.0(34.5)	18.0(50.0)	19.0(52.8)	.287	7.0(31.8)	9.0(64.3)	9.0(36.0)	15.0(75.0)	.012
Comorbidities	2.8(±1.7)	2.7(±1.5)	3.7(±2.5)	3.5(±2.3)	.057	2.6(±1.5)	3.5(±2.0)	2.8(±1.8)	3.6(±2.1)	.207
Sodium intake (%> 3 g /day)	17(43.6)	35(63.6)	28(77.8)	28(77.8)	.004	5(22.7)	7(50.0)	12(48.0)	16(80.0)	.003
Depressive symptoms	10.5(±9.5)	9.6(±7.2)	11.4(±7.3)	11.9(±10.0)	.588	10.2(±8.1)	14.1(±10.1)	8.6(±7.5)	11.1(±7.4)	.257
Physical symptoms	18.9(±15.1)	19.7(±12.2)	26.7(±15.1)	29.8(±19.9)	.003	20.2(±11.5)	28.6(±16.4)	22.1(±11.3)	35.4(±20.9)	.007

In individual HF symptom analyzes, edema was the only variable that showed a difference between the sexes, with females receiving the highest total edema scores from males (3.37 vs. 2.46, p = .048), although there were no statistically significant differences in presence, Frequency, intensity, and tightness this show (**Table 2**).

Table 2.

Table 2 : Symptoms in Males and Females

Symptom	Total Score			Presence			Frequency			Severity			Distress		
	Male	Female	P value	Male	Female	P value	Male	Female	P value	Male	Female	P value	Male	Female	P value
Dyspnea during daily activities	4.26	4.58	.510	65%	72 %	.304	% 55	% 53	.756	% 15	% 5	.061	% 20	% 16	.468
dyspnea when lying down	2.42	2.24	.720	37%	36 %	.885	% 53	% 41	.326	% 12	% 17	.452	% 13	% 11	.728
Fatigue	5.61	630	.127	84%	% 90	.177	% 56	% 63	.333	% 21	% 11	.071	% 25	% 33	.187
Edema	2.46	3.37	.048	43 %	% 54	.088	% 44	% 46	.851	% 10	% 16	.335	% 8	% 14	.208
Sleeping difficulty	3.91	4.69	.171	53 %	% 59	.354	% 68	% 69	.945	% 31	% 33	.751	% 18	% 27	.077
Chest pain	1.64	1.60	.915	30%	% 30	.986	% 33	% 24	.441	% 10	% 12	.768	% 7	% 9	.567
Dizziness	2.93	3.20	.541	57%	% 56	.803	% 36	% 33	.743	% 8	% 9	.941	% 11	% 16	.246

Total score: Mean. Presence: presence of the symptom. Frequency: 3–5 times per week to almost daily. Severity: severe or very severe. Distress: quite a bit or very much.

In multiple regression analyzes, race, concomitant symptoms, depressive symptoms, and obesity as a continuous variable were associated with the symptoms of HF (R2 = .481, P <.001, Table 3). Patients who were minority sweat, had less burden of joint morbidity, fewer symptoms of depression, and had a lower BMI symptoms of less severe HF. The interaction between obesity and sex was not an important partner for HF symptoms, and obesity as a notably continuous variable was associated with HF symptoms in both males and females. In male patients, age, race, comorbidities, symptoms of depression, and obesity as a continuous variable were associated with symptoms of HF (R2 = .545, P <.001). Those who were younger and minorities, the burden of comorbidity was lower, symptoms of depression were lower, and body mass index was lower symptoms of HF were less severe. In female patients, lower burden of joint morbidity, fewer depression symptoms, lower sodium intake, and lower BMI were associated with less severe HF symptoms (R2 = .439, P <.001).

In general linear regression analyzes, comorbidities, symptoms of depression and obesity as a categorical variable were associated with the symptoms of HF (R2 = .481, P <.001, Table 3). Patients with lower comorbid burden had fewer symptoms of depression, lower BMI

symptoms of less severe HF symptoms. The interaction between sex and obesity was not an important partner for HF symptoms. In male patients, age, race, comorbidities, symptoms of depression, and obesity as a categorical variable were associated with symptoms of HF (R2 =. 568, P <.001). Those who were younger and minorities, the burden of comorbidity was lower, symptoms of depression were lower, and body mass index was lower symptoms of HF were less severe. In female patients, lower burden of comorbidity, fewer depression symptoms, and reduced sodium intake were associated with less severe HF symptoms (R2 = .441, P <.001), but obesity as a categorical variable was not associated with HF symptoms

Table 3.

Association between Obesity (Continuous Variable) and Heart Failure Symptoms

Variables	Total Sample		Males		Females	
	t Statistic	p Value	t Statistic	p Value	t Statistic	p Value
Age	1.674	.095	2.166	.032	−.379	.706
Education level	−1.359	.175	−1.055	.293	−1.594	.115
Race	1.990	.048	2.976	.003	−.280	.780
Comorbidities	4.170	<.001	3.631	< .001	2.120	.037
Left Ventricular Ejection Fraction	.178	.859	.654	.514	−.978	.331
Depressive symptoms	10.534	< .001	10.783	< .001	3.377	.001
Sodium intake	1.215	.226	−.157	.875	2.020	.047
Gender	−.575	.566	N/A	N/A	N/A	N/A
Obesity*Gender	1.009	.314	N/A	N/A	N/A	N/A
Obesity	2.866	.005	3.475	.001	2.017	.047
R^2 (adjusted R^2)	.481 (.459)		.545 (.522)		.439 (.377)	
F statistic	21.846		23.540		7.047	
p value	< .001		<.001		< .001	

Discussion

The results of the current study did not support the obesity paradox in the relationships between obesity and HF symptoms. Additionally, the results do not show the effects of the interaction of sex and obesity on the relationship to HF symptoms, although associates of HF symptoms in males and females differed slightly (multiple regression: male: R2 = .545, p <.001 and female: R2 =. 439, p <.001; general linear regression: male: R2 = .568, p <.001, and female: R2 = .441, p <.001). In females, the relationship between obesity and HF symptoms varied depending on the levels of measurement (continuous vs. categorical). The findings of the current study showed additional colleagues of HF symptoms such as comorbidities and symptoms of depression in both sexes, race in males, and sodium intake in

females. Consequently, the results of the current study can provide valuable information for developing interventions to improve HF symptoms considering gender differences.

Relationships between obesity and HF symptoms differ slightly depending on the gender and the levels of measurement of obesity. When the BMI was used as a continuous variable, higher levels of BMI were associated with more severe HF symptoms in both males and females. Male patients in the obesity group II / III (BMI ≥ 35 kg / m2) had more severe HF symptoms than other groups regardless of obesity levels. When a conclusive variable BMI was used, female patients in the obese / II group had no more or less severe HF symptoms than other groups. Additionally, the study did not show fewer negative BMI effects on HF symptoms. Thus, the results in both males and females do not support the paradox of obesity in the relationship between obesity and HF symptoms. However, we cannot compare the results of this study with other results, because none of the other HF studies examined the relationship between obesity, HF symptoms, and gender differences in relationships. The important relationship or the absence of a significant relationship between obesity and HF symptoms in the present study differs from the relationship between obesity and mortality in another study, which showed that high BMI was linearly linked to a lower mortality rate [(4)]. The relationship in the current study also differs from the relationship between obesity and hospitalization observed in other studies, which showed the lowest rate of hospitalization in an overweight group compared to normal weight / underweight and obese groups.[(5),(6)]

These differences in the relationships between obesity, HF symptoms, between obesity, and mortality may reflect the fact that we did not separate the weight-loss group from the normal-weight group due to the small sample. In one study,[(5)] obesity relationships differed from deaths from all causes and to cardiovascular ethics and hospitalization associated with HF. Hence, it is also possible that obesity relationships to hospitalized HF symptoms, and deaths differ. Thus, more studies are needed to examine these relationships in patients with HF over time in order to determine appropriate BMI levels based on longevity not only with causes but also symptoms of HF and hospitalization with causes. Both Oga et al. Lavi et al. He acknowledged that obesity could be associated with a better diagnosis of HF, but he concluded that more larger studies are needed to determine the effects of obesity on HF symptoms, hospitalization, mortality and mechanism.[(7),(8)]

In the present study, some other modifiable factors associated with HF symptoms were observed by examining the effects of common variables on HF symptoms. For example, symptoms of depression were strongly associated with symptoms of HF, consistent with results of other study.[(9)] Thus, symptoms of depression must be evaluated and managed in

patients with HF in order to improve the symptoms of HF. In the current study, greater intake of sodium was associated with severe HF symptoms in female patients, and female patients also had higher edema degrees than male patients. In other studies,[9],[10] ingestion of sodium ≥ 3 g per day was associated with survival without occurring shorter than normal intake of sodium <3 g per day, and ingestion of more sodium was also associated with severe HF symptoms. Thus, it may be useful to educate patients with HF to control proper sodium intake by teaching them methods to estimate the sodium intake and delivering the sodium intake to the symptoms of HF, such as edema, especially in female patients. For example, a patient with HF can enter his nutritional intake into any of the free online nutrition programs to monitor and manage sodium intake based on observations of sodium intake.[11]Then, the patient can be trained to monitor how to consume sodium daily related to changes in body weight and also edema of the ankles or legs.

In the current study, another common disease associated with HF symptoms was comorbidity. Hence, it is important to check the diseases associated with managing HF symptoms. Age, educational level, race, concomitant, HF etiology, depressive symptoms, sodium intake, and obesity showed 44% to 57% of the variance in HF symptoms, indicating that there may be other variables affecting the symptoms of HF. Thus, more studies are needed to explore and study thesevariables.

Conclusion:

High BMI (> 35 kg / m2) was associated with more severe HF symptoms in male patients. Thus, obesity paradox on mortality and hospitalization did not extend to HF symptom status. There were gender differences in the relationship between obesity and HF symptoms and the associates of HF symptoms. In male patients, age, race, comorbidities, depressive symptoms, and obesity were associated with HF symptoms; while in female patients, comorbidity, depressive symptoms, and sodium intake were associated with less severe HF symptoms. Thus, it may be beneficial to consider these differences in developing interventions to improve HF symptoms in patients with HF. For example, clinicians may more focus on managing obesity, depressive symptoms, and comorbidities for male patients; while they may more focus on managing depressive symptoms, sodium intake, and comorbidities in female patients.

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