Relation Between Obesity and Survival in Patients Hospitalized for Pulmonary Arterial Hypertension (from a Nationwide Inpatient Sample Database 2003 to 2011)

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There have been numerous studies reporting lower mortality rates in obese patients with various cardiovascular disorders than in nonobese patients, a phenomenon known as the "obesity paradox." Limited data exist regarding the effect of obesity on prognosis in patients with pulmonary arterial hypertension (PAH). We used the National Inpatient Sample database for years 2003 to 2011 to identify all patient hospitalizations aged ≥18 years with a primary diagnosis of PAH. Patients with a diagnosis of obesity were identified using Elixhauser co-morbidity measure provided in Nationwide Inpatient Sample database, based on *International Classification of Diseases, Ninth Revision, Clinical Modification*, codes and the diagnosis-related groups. Multivariable logistic regression was used to compare in-hospital mortality between obese and nonobese patients with PAH. Of the 18,450 patients with a primary diagnosis of PAH, 14.7% were obese. Obese patients with PAH were younger, more often women, and more often black compared with nonobese white patients. After risk adjustment for demographics, hospital characteristics, and baseline co-morbidities, obese patients with PAH had lower observed in-hospital mortality compared with nonobese patients with PAH (3.5% vs 8.1%; adjusted odds ratio 0.66, 95% confidence interval 0.51 to 0.85, p = 0.001). In conclusion, from a 9-year nationwide cohort of patients with PAH, we observed significantly lower risk-adjusted in-hospital mortality in obese patients compared with nonobese patients. **(Am J Cardiol 2017;■:■−■)**

Although obesity is an important independent cardiovascular (CV) risk factor, data exist supporting better survival outcomes for obese compared to non-obese patients in multiple clinical conditions, including coronary heart disease, heart failure, hypertension, and chronic obstructive pulmonary disease.[1−6] This epidemiologic observation has been termed the "obesity paradox." Pulmonary arterial hypertension (PAH), the result of pathophysiological changes in pulmonary vasculature leading to abnormally high pulmonary artery pressures, is an important CV condition leading to poor outcomes including right-sided heart failure and death. Little is known about the effect of obesity on prognosis in patients with PAH, and the need for studies examining the role of obesity in pulmonary vascular diseases has been emphasized previously.[7−10] Hence, we analyzed the association of obesity with mortality in the Nationwide Inpatient Sample (NIS) databases from 2003 to 2011.

Methods

We used NIS of the Healthcare Cost and Utilization Project, the largest publicly available all-payer inpatient care database in the United States with discharge-level data available for approximately 8 million hospital stays each year and which is designed to approximate a 20% stratified sample of US hospitals.[11] The first diagnosis is referred to as the "principal diagnosis" and is considered the primary reason for admission to the hospital. The NIS also provides ≤25 secondary diagnoses during that hospitalization and carries information on patient demographics, hospitalization characteristics, insurance status, co-morbidities, hospitalization outcome, and length of stay and cost of hospitalization. The internal and external validity of the NIS database are maintained through annual data quality assessments and comparison with other databases, such as National Hospital Discharge Survey and MedPar Statistics. These reports are published on the NIS Web site: http://www.hcupus.ahrq.gov/db/nation/nis/nisrelatedreports.jsp.

All hospitalizations with the principal diagnosis of PAH in patients with age ≥18 years were identified using the *International Classification of Diseases, Ninth Revision, Clinical Modification* (*ICD-9-CM*) codes 416.0, as used previously.[12] Obese patients were identified using the Agency for Healthcare Research and Quality−defined co-morbidity measure, CM_Obese.[11] Agency for Healthcare Research and Quality co-morbidities that are provided in NIS were originally described by Elixhauser et al[13] using *ICD-9-CM* diagnoses and the diagnosis-related group in effect on the discharge/death date.[11] The definition of

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See page 4 for disclosure information.

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Table 1
Baseline demographics, hospital characteristics, and comorbidities of pulmonary artery hypertension patients

Variable	Overall	Obesity		*p*-value
		NO	YES	
	n=18,450	n=15,735	n=2,715	
Age, mean ± SD (years)	55.4± 17.5	55.8 ±17.9	53.1±14.8	<0.001
Women	76.8%	75.6%	83.9%	<0.001
White	65.7%	66.0%	64.0%	
Black	17.2%	16.5%	20.7%	
Hispanic	9.8%	9.9%	9.3%	
Asian or Pacific Islander	2.3%	2.4%	1.5%	
Native American	1.3%	1.3%	1.3%	
Other	3.7%	3.8%	3.1%	
Payer status				
Primary expected payer				<0.001
Medicare	45.4%	46.6%	38.8%	
Medicaid	16.4%	15.9%	19.0%	
Private insurance	32.1%	31.8%	33.8%	
Self-pay	3.5%	3.2%	5.0%	
No charge	0.4%	0.3%	0.7%	
Other	2.2%	2.1%	2.7%	
Median household income (percentile)				<0.001
0 to 25th	25.6%	25.4%	27.1%	
26th to 50th	25.6%	25.2%	27.7%	
51st to 75th	25.8%	25.7%	26.3%	
76th to 100th	23.0%	23.7%	18.8%	
Admission characteristics				
US Region				<0.001
Northeast	23.8%	24.3%	20.8%	
Midwest	19.6%	19.6%	19.8%	
South	31.9%	32.2%	30.2%	
West	24.7%	23.9%	29.2%	
Bed size				0.68
Small	7.3%	7.3%	7.6%	
Medium	18.0%	18.0%	18.4%	
Large	74.7%	74.8%	74.0%	
Urban location	92.5%	92.5%	92.7%	0.68
Teaching Hospital	68.9%	69.9%	63.2%	<0.001
Elective admission	20.3%	20.7%	18.5%	0.01
Weekend admission	14.3%	14.1%	15.6%	0.04
Comorbidities*				
Smoking	17.8%	17.4%	20.3%	<0.001
Diabetes mellitus (uncomplicated)	18.8%	16.4%	32.6%	<0.001
Diabetes mellitus (complicated)	4.3%	3.4%	9.1%	<0.001
Hypertension	36.3%	33.9%	49.9%	<0.001
Dyslipidemia	15.5%	14.4%	21.8%	<0.001
Alcohol abuse	2.3%	2.4%	1.4%	<0.001
Prior myocardial infarction	2.9%	2.8%	2.9%	0.84
Atrial fibrillation	15.5%	16.1%	12.1%	<0.001
Congestive heart failure	36.0%	35.7%	38.1%	0.01
Chronic Pulmonary Disease	30.1%	28.9%	36.9%	<0.001
Obstructive Sleep Apnea	10.1%	6.4%	31.4%	<0.001
Peripheral vascular disease	3.4%	3.2%	4.4%	<0.01
Renal Failure	12.6%	12.3%	14.6%	0.001
Valvular heart disease	14.4%	14.9%	11.8%	<0.001
Acquired immune deficiency syndrome	0.7%	0.8%	0.7%	0.60
Deficiency anemia	16.6%	16.0%	20.6%	<0.001
Rheumatoid arthritis/collagen vascular diseases	8.1%	8.7%	4.8%	<0.001
Chronic blood loss anemia	0.8%	0.7%	1.2%	0.01
Coagulopathy	10.0%	10.5%	7.5%	<0.001
Depression	9.8%	9.3%	12.6%	<0.001
Drug abuse	2.7%	2.8%	2.4%	0.29
Hypothyroidism	14.1%	13.5%	17.5%	<0.001

(*continued*)