Research Article
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Battle of the super obese sexes: female versus male variation in pre-operative clinical characteristics among 1,673 surgical patients undergoing bilio-pancreatic bypass/duodenal switch (BPD/DS)

Abstract

Introduction/Purpose: Super-obese patients present to every surgical practice. Every insight helps these fragile individuals. However, clinical differences between super-obese women and men are unknown. Objective: to identify clinical variations between super-obese females versus males pre-operative for BPD/DS.

Methods: Pre-operative data from 1,673 Surgical Review Corporation BOLD database patients planning to undergo BPD/DS was analyzed retrospectively in two groups: Females (n=1217) and Males (n=456). Statistical analyses: ANOVA compared age, weight, and Body Mass Index (BMI) and Chi-squared assessed dichotomous variable distribution.

Results: Pre-operative female/male weight (138 +- 27/174 +/- 34 kg), BMI (51+-9/53+- 10) and age (45 +/11, 46+- 11) varied by sex ($p<0.05$), as did Medicaid/Medicare/Private/Self-Pay insurance status (female %9.7/9.6/77/4.1 and male %5.4/11.5/81/2.5. $p<0.05$). Female abdominal panniculitis, asthma, cholelithiasis, GERD, stress urinary incontinence, depression, fibromyalgia ($p<0.01$) and mental health diagnosis ($p<0.05$) (8 comorbidities) were higher. Male alcohol use, CHF, hypertension, ischemic heart disease, dyslipidemia, obstructive sleep apnea (OSA), diabetes, gout ($p<0.01$), liver disease and unemployment ($p<0.05$) (10 comorbidities) were higher than female. Race, abdominal hernia, angina, back pain, DVT/PE, impaired functional status, lower extremity edema, musculoskeletal pain, obesity hypoventilation syndrome, peripheral vascular disease, pseudotumor cerebri, psychomotor impairment, pulmonary hypertension, and substance/tobacco abuse did not vary by sex.

Conclusions: Among super-obese patients clinical characteristics varied by sex. Asthma, panniculitis, hepatobiliary and psychological issues were higher in women. Males were older, heavier, unemployed, drank more, suffered increased cardiac dysfunction, liver disease, OSA, and diabetes. This advance knowledge may help optimize super-obese surgical patients.

Keywords: obesity, co-morbidities, BPD/DS, sex, variation

Volume 9 Issue 2 - 2019

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Received: March 19, 2019 | **Published:** April 09, 2019

Introduction

Morbid obesity has risen steadily over the last three decades with Body Mass Index (BMI) increasing at 0.4 kg/m^2 per decade worldwide.[1] Obese patients have become integral to every surgical practice, not just bariatric surgeons. Every clinical insight helps manage these medically fragile individuals. In this context, understanding differences between sexes in clinical characteristics and in weight-related medical problems between women and men with the most extreme levels of obesity would be important to surgeons. Some medical problems vary between normal weight males and females. Cardiomyopathies occur more commonly in men and more women are affected by asthma and autoimmune disorders.[2] In chronic obstructive pulmonary disease (COPD), females suffer more metabolic disorders, gastrointestinal diseases, gallstones and osteoporosis, and males higher cardiopulmonary co-morbidities such as pneumonia, pleural effusions and respiratory failure.[3] Whether or not these sex differences in co-morbid conditions translate to super-obese patients is unknown. Previously we have reported clinical variation by sex in patients who were pre-operative for laparoscopic Roux-en-Y gastric bypass.[4] Nevertheless, whether or not these variations by sex affect also the most severely obese, high-risk surgical patients is unknown. Therefore, the objective of this study was to identify variation in weight, demographics, and the distribution of pre-operative clinical characteristics between super obese females versus males who chose to undego BPD/DS.

Methods

With the approval of the Surgical Review Corporation (SRC) Data Access Committee and the IRB of Our Lady of Lourdes Medical Center, Camden, NJ, pre-operative data from the SRC's Bariatric Outcomes Longitudinal Database (BOLD) on 1,673 patients with

severe obesity who underwent BPD/DS between June 1, 2007 and December 31, 2010 was analyzed in two groups: Women (n=1,217) and men (n=456).[5] The BOLD BPD/DS population was selected for this investigation because it was comprised largely of patients with BMI in the super-obese range who had chosen BPD/DS for surgical treatment of their obesity, thus possibly making them a more homogeneous group.

Weight, BMI, age, race, health insurance status, and the percent frequency of obesity related co-morbidities were collected, including hypertension (HTN), angina, congestive heart failure (CHF), peripheral vascular disease (PVD), pulmonary hypertension (PHTN), obstructive sleep apnea (OSA), obesity hypoventilation syndrome (OHS), asthma, ischemic heart disease, deep vein thrombosis/pulmonary embolism (DVT/PE), abdominal hernia, abdominal panniculitis, cholelithiasis, gastroesophageal reflux disease (GERD), liver disease, stress urinary incontinence, diabetes mellitus, gout, dyslipidemia, pseudotumor cerebri, back pain, lower extremity edema and musculoskeletal pain, mental health diagnoses, impaired functional status, depression, psychological impairment, alcohol use, substance abuse, tobacco use, and fibromyalgia. Statistical analysis: Continuous variables used ANOVA with treatment in the models. Pair-wise comparisons were performed on the least squares means of the treatments calculated from the ANOVA model. Distribution of obesity co-morbidities was examined by a general linear model with treatment in the model and modified for binomial distribution.[6]

Results

Pre-operative age (46 +-11 years, range 18-75 years vs 45+-11 years, range 18-73 years), weight (174 +- 34kg, range 99-284kg vs 140 +- 27kg, range 78-333kg), and BMI (53 +- 10, range 38-92 vs 51 +- 9, range 34-97) were higher in men than women ($p<0.05$). More men had Medicare and Private insurance while more women had Medicaid and Self-Pay ($p<0.05$). Male unemployment was highest ($p<0.0001$). Distribution of African-American, Caucasian, Asian, Hispanic, and Other races did not vary by sex. Cardiopulmonary co-morbidities are listed in Table 1. Women only had higher asthma ($p<0.0001$). Men had more congestive heart failure, hypertension, obstructive sleep apnea, and ischemic heart disease ($p<0.01$). Abdominal and Hepatobiliary co-morbidities are displayed in Table 2. Women had higher cholelithiasis, GERD, stress incontinence and panniculitis ($p<0.01$). Male liver disease was increased ($p<0.05$). Endocrine and Metabolic co-morbidities are indexed in Table 3. Women more commonly had fibromyalgia ($p<0.0001$). Diabetes, gout, and dyslipidemia were higher in men ($p<0.01$). Psychological and Behavioral co-morbidities are cataloged in Table 4. Women had more depression and mental health diagnoses. Men consumed more alcohol. The use of tobacco/recreational drugs or psychological impairment did not vary by sex. Female/male back pain (60%/62%), impaired functional status (6.7%/8.3%) and musculoskeletal pain (51%/47%) did not vary significantly. Overall, super-obese women had higher rates of eight obesity co-morbidities and men were higher in ten weight-related conditions.

Table 1 Super-Obese Female versus Male Variation in Cardiopulmonary Co-Morbidities

Cardiopulmonary Comorbidities	HTN	CHF	OSA	Lower Extremity Edema	OHS
Female	58.92%	3.29%	54.31%	47.66%	1.89%
Male	73.25%	6.58%	78.07%	48.46%	2.63%
Chi-Square Probability	<0.0001	0.0027	<0.0001	0.7687	0.3452

Cardiopulmonary Comorbidities	PHTN	DVT/PE	Ischemic Heart Disease	PVD	Angina	Asthma
Female	12.98%	3.78%	2.55%	2.14%	3.29%	25.47%
Male	11.84%	3.73%	6.58%	2.85%	4.39%	16.67%
Chi Squared Probability	0.5323	0.9605	<0.0001	0.3885	0.2817	0.0001

HTN, Hypertension; CHF, Congestive Heart Failure; OSA, Obstructive Sleep Apnea; OHS, Obesity Hypoventilation Syndrome; PHTN, Pulmonary Hypertension; DVT/PE, Deep Venous Thrombosis/Pulmonary Embolism; PVD, Peripheral Vascular Disease.

Table 2 Super-Obese Female versus Male Variation in Abdominal and Hepatobiliary Co-Morbidities

Abdominal and Hepatobiliary Comorbidities	Abdominal Hernia	Cholelithiasis	Gerd	Panniculitis	Liver Disease	Stress Incontinence
Female	10;27%	25;97%	54;56%	22;43%	5;42%	45;69%
Male	10;96%	10;53%	40;57%	15;13%	8;11%	7;24%
Chi Squared Probability	0;6797	<0;0001	<0;0001	0;001	0;0415	<0;0001

GERD, gastroesophageal reflux disease.

Citation: Danielle TDO, Slotman G. Battle of the super obese sexes: female versus male variation in pre-operative clinical characteristics among 1,673 surgical patients undergoing bilio-pancreatic bypass/duodenal switch (BPD/DS). *Adv Obes Weight Manag Control.* 2019;9(2):47–51. DOI: 10.15406/aowmc.2019.09.00273

Table 3 Super-Obese Female versus Male Variation in Endocrine and Metabolic Co-Morbidities

Endocrine and Metabolic Comorbidities	Fibromyalgia	Glucose Metabolism	Pseudotumor Cerebri	
Female	6;57%	38;78%	1;48%	
Male	0;88%	50;88%	1;10%	
Chi Squared Probability	<0;0001	<0;0001	0;5496	
Endocrine and Metabolic Comorbidities	Dyslipidemia	Gout	Menstrual Irregularities	PCOS
Female	42;65%	2;79%	36;48%	10;52%
Male	50%	9;21%	0	0
Chi Squared Probability	0;0071	<0;0001	<0;0001	<0;0001

PCOZS, polycystic ovarian syndrome.

Table 4 Super-Obese Female versus Male Variation in Behavioral and Psychological Co-Morbidities

Behavioral and Psychological Comorbidities	Depression	Psychomotor Impairment	Mental Health Diagnosis	Alcohol Use	Substance Abuse	Tobacco Use
Female	44;78%	17;01%	12;82%	31;96%	0;90%	5;51%
Male	28;95%	13;60%	9;21%	41;89%	0;88%	7;89%
Chi-Square Probability	<0;0001	0;0907	0;0419	0;0001	0;9589	0;0702

Discussion

The results of this study identify statistically and clinically significant variations in clinical characteristics between super-obese women and men. Super-obese men were older, heavier, and had higher BMI than women. Women more frequently were insured by Medicaid or were Self-Pay while men had higher participation in Medicare and Private insurance and were more commonly unemployed. Cardiovascular obesity co-morbidities, including congestive heart failure, hypertension, ischemic heart disease, and dyslipidemia were increased among men versus women, while women were higher in none. Weight-related pulmonary problems also varied by sex, with women presenting with increased asthma and men with increased OSA. Abdominal and hepatobiliary co-morbidities included increased incidence of cholelithiasis, gastroesophageal reflux disease, panniculitis, and stress urinary incontinence in women and higher liver disease in men. Higher rates of female GERD may be related causally to increased asthma among women. Increased male alcohol consumption may have contributed to higher liver disease. Derangements in glucose metabolism, dyslipidemia and gout affected more men. Depression, mental health issues and fibromyalgia were increased among females. Race and fifteen other obesity co-morbidities did not vary by sex. Our review of the literature indicates that the variations in clinical characteristics between super-obese men and women observed here have not been reported previously and are significant findings of this study. In the report by Young et al. of 810,999 bariatric surgery patients, mean age was significantly higher for men.[7] Farinholt et al.,[8] demonstrated increased BMI and a more advanced stage of morbid obesity among male patients. These findings paralleled the findings in our investigation, which indicated older age and a higher BMI among men. Blair et al. reported variation by insurance status among bariatric patients[10] but did not evaluate their data by sex. The findings here confirmed the previously reported health care carrier variation, but more specifically identified significant insurance patterns between the sexes. Men more frequently had private insurance and Medicare while women more frequently were insured by Medicaid or Self-Pay. Employment status also varied as more women were homemakers and students while more men were unemployed or self-employed.

The cardiovascular co-morbidities hypertension, diabetes, dyslipidemia, congestive heart failure and ischemic heart disease in the present study were increased among morbidly obese men. These findings are consistent with the findings of Young et al.,[7] who reported a higher proportion of moderate, major and extreme severity of illness and had higher mean Elixhauser-van Walraven co-morbidity scores in men than women. Hypertension, diabetes, congestive heart failure, peripheral vascular disease, renal failure and pulmonary diseases were higher among men, as well. Our results confirmed these cardiovascular variations by sex in the BPD/DS population of extremely obese individuals. Importantly, our data represents a unique super-obese population undergoing BPD/DS. The data extracted by Young et al. were from a bariatric surgery population undergoing a variety of procedures including open Roux en-Y gastric bypass, laparoscopic gastric banding, laparoscopic sleeve gastrectomy and laparoscopic Roux-en-Y gastric bypass, the patient populations for which do not carry the more severe obesity characteristic of the BPD/DS patients in the present investigation.

The abdominal and hepatobiliary obesity co-morbidities, cholelithiasis, GERD, stress incontinence, panniculitis and liver disease all varied significantly by sex. Females dominated all of these categories except liver disease, which was increased among males. Young et al.,[7] & Farinholt et al., [8] reported higher incidences of liver disease for morbidly obese men versus women in broader, lower BMI populations. Increased alcohol intake, hyperglycemia, hyperlipidemia, hypertension and high BMI[11] all contribute to obesity-related liver

disease. All of these factors were increased for men versus women in the results here, suggesting a causative relationship with higher male liver disease. Obesity related pulmonary co-morbidities varied significantly by sex in super-obese patients, as more males suffered from OSA and more females had asthma. Bixler et al.,[12] evaluated the prevalence of OSA between genders with controls set for age and BMI, and identified a twofold higher risk of developing OSA in men. Obesity and increased BMI contribute to this higher risk as it potentiates the development of OSA.[13] Increased BMI and increased OSA among obese BPD/DS men over women in the current investigation validates previous reports.

Females with severe obesity in this study had both increased asthma and increased GERD compared with pre-BPD/DS men, possibly related to increased intrathoracic pressure and lung hyperinflation or decreased lower esophageal sphincter tone from asthma medications.[14] Conversely, poorly controlled GERD may contribute to the development of asthma, with aspirated gastric contents causing inflammation, vagal nerve stimulation, and increased airway resistance.[15] These factors may have interacted in the present findings, leading to higher asthma for women with obesity than men. Somatic co-morbidities did not vary between women and men. Back pain, impaired functional status and musculoskeletal pain all are increased in the morbidly obese population compared to their leaner cohorts.[17] The absence of somatic variation in the super-obese here may related to the impact of severely excessive weight has on skeletal structure of both sexes.

In this investigation, fibromyalgia, depression and mental health diagnoses were significantly higher among severely obese women than in men. Although the diagnosis of fibromyalgia continues to be vague, it is a diagnosis that is consistently higher among obese patients and almost exclusively carried by women[17,18] It is possible that male patients may have equivalent rates of depression and mental health diagnoses but may simply be under diagnosed secondary to cultural expectations.[19] The mechanisms underlying these observations are not clear from the data.

The use of tobacco/recreational drugs, abdominal hernia, psychological impairment. Lower extremity edema, DVT/PE, peripheral vascular disease, angina, pulmonary hypertension and obesity hypoventilation syndrome did not vary by sex in this study. There are several limitations to this investigation. It is a retrospective analysis of prospectively collected data, and, as such, carries typical confounders. Some of the data was self-reported or based on clinical diagnoses, rather than pathological diagnosis, such as, for example, since liver biopsies were not required, liver disease was diagnosed by clinical criteria only. The patients in this study also represent a self-selected population of super-obese men and women who chose to treat their weight with BPD/DS, and as such, might not apply perfectly to all super-obese individuals.

What is the clinical utility of the variation by sex reported here among super-obese surgical patients? This advance knowledge may facilitate optimized medical and pre-operative management of these complex and fragile morbidly obese patients. For example, in preparing super-obese men for surgery, knowing that their probability of hypertension, CHF and OSA is greatly increased compared with women can raise the index of suspicion, leading to potentially life-saving pre-operative evaluation and medical optimization. Similarly, closer clinical evaluation of increased pre-operative asthma in super-obese females could lead to pre-emptive pulmonary preparation before anesthesia induction. Increased awareness other organ system variations by sex from the findings of this investigation could facilitate peri-operative management as well. Whether or not surgical outcomes actually can be improved by applying these results clinically will require further prospective application and observation.

Conclusion

The results of this study identify significant variations in the pre-operative clinical characteristics of super-obese female versus male patients. Men are older, heavier, drink more alcohol and suffer from more cardiopulmonary and metabolic derangements. Women suffer from more psychological problems, gallstones and asthma. Of the 31 obesity co-morbidities analyzed by sex in this study, ten were increased significantly in men, and eight were higher among women. Although the patients in this study were self-selected in that they chose to have BPD/DS, the findings here still may be extrapolated to other super-obese medical and surgical patients and used to supplement clinical judgment in their management.

Acknowledgment

The authors gratefully acknowledge the assistance of Nicole O Stouffer in the statistical analysis. Presented at the SAGES & CAGS 16th World Congress of Endoscopic Surgery Meeting, April 11-14, 2018, Seattle, WA.

Funding

Departmental support only.

Conflicts of interest

The authors declare that they have no conflict of interest.

References

1. Finucane MM, Stevens GA, Cowan MJ, et al. National, regional, and global trends in body-mass index since 1980: systematic analysis of health examination surveys and epidemiological studies with 960 country-years and 9.1 million participants. *Lancet.* 2011;12;377(9765):557–567.
2. Regitz-Zagrosek V. Sex and gender differences in health: Science & Society Series on Sex and Science. *EMBO Reports.* 2012.
3. Dal Negro RW, Bonadiman L, Turco P. Prevalence of different comorbidities in COPD patients by gender and GOLD stage. Multidisciplinary Respiratory Medicine. *EMBO.* 2012;13(7):596–603.
4. Schwartz J, Bashian C, Kushnir L, et al. Variation in Clinical Characteristics of Women versus Men Preoperative for Laparoscopic Roux-en-Y Gastric Bypass: Analysis of 83,059 Patients. *Am Surg*. 2017;83:947–951.
5. DeMaria EJ, Pate V, Warthen M, Winegar DA. Baseline data from American Society for Metabolic and Bariatric Surgery-designated Bariatric Surgery Centers of Excellence using the Bariatric Outcomes Longitudinal Database. Surgery for Obesity and Related Disorders. *Surg Obes Relat Dis*. 2010;6(4):347–355.
6. SAS Institute Inc. SAS/STAT® 9.22 User's Guide. Cary, NC: SAS Institute Inc. 2010.
7. Young MT, Phelan MJ, Nguyen NT. A Decade Analysis of Trends and Outcomes of Male vs Female Patients Who Underwent Bariatric Surgery. *J Am Coll Surg*. 2016;222(3):226–231.
8. Farinholt GN, Carr AD, Chang EJ, et al. A Call to Arms: Obese Men

with More Severe Comorbid Disease and Underutilization of Bariatric Operations. *Surg Endosc*. 201;27(12):4556–4563.

9. Fuchs HF, Broderick RC, Harnsberger CR, et al. Benefits of bariatric surgery do not reach obese men. *J Laparoendosc Adv Surg Tech A*. 2015.
10. Blair K, Slotman G. Health insurance carrier does matter: clinically significant variation in weight-related diagnoses for medicaid vs medicare vs private insurance vs self pay in 83,059 morbidly obese patients. *Am J Gastroenterol*. 2018108:S473—S474.
11. Cheng HY, Wang HY, Chang WH, et al. Nonalcoholic Fatty Liver Disease: Prevalence, Influence on Age and Sex, and Relationship with Metabolic Syndrome and Insulin Resistance. *International Journal of Gerontology*. 2013;7(4):194–198.
12. Bixler EO, Vgontzas AN, Lin HM, et al. Prevalence of Sleep Disordered Breathing in Women: Effects of Gender. *Am J Respir Crit Care Med*. 2001;163(3):1.
13. Lopez P, Stefan B, Schulman CI, et al. Prevalence of Sleep Apnea in Morbidly Obese Patients Who Presented for Weight Loss Surgery Evaluation: More Evidence for Routine Screening for Obstructive Sleep Apnea Before Weight Loss Surgery. *Am Surg*. 2008;9:834–838.
14. Ates F, Vaezi MF. Insight In to the Relationship Between Gastroesophageal Reflux Disease and Asthma. *Gastroenterol Hepatol*. 2014;11:729–736.
15. Vincent D, Cohen-Jonathan AM, Leport J, et al. Gastro-oesophageal reflux prevalence and relationship with bronchial reactivity in asthma. *Eur Respir J*. 1997;10:2255–2259.
16. Weiss ST, Shore S. Obesity and asthma: Directions for research. *Am J Respir Crit Care MedAm J Respir Crit Care Med*. 2004;169(8):963–968.
17. Arreghini M, Manzoni GM, Castelnuovo G, et al. Impact of fibromyalgia on functioning in obese patients undergoing comprehensive rehabilitation. *PLoS One*. 2014;9(3):e91392.
18. Wolfe F, Ross K, Anderson J, et al. The prevalence and characteristics of fibromyalgia in the general population. *Arthritis Rheum*.1995;1:19–28.
19. Bray GA. Medical consequences of obesity. *The Journal of Clinical Endocrinology & Metabolism*. 2004;89(6):2583–2589.

Citation: Danielle TDO, Slotman G. Battle of the super obese sexes: female versus male variation in pre-operative clinical characteristics among 1,673 surgical patients undergoing bilio-pancreatic bypass/duodenal switch (BPD/DS). *Adv Obes Weight Manag Control.* 2019;9(2):47–51. DOI: 10.15406/aowmc.2019.09.00273