Research Article

Gender differences in frequencies of overweight and obesity among patients with anxiety disorder unspecified, at Truman medical center

Abstract

Aim: To determine the gender differences in frequencies of overweight and obesity among patients with Anxiety Disorder Unspecified (ADU), and to compare them with a control group.

Methods: The data of 28,236 ADU patients and 3,607controls were analyzed. The primary dependent variable was a diagnosis of ADU through International Classification of Diseases [ICD]-9-CM/ICD-10 classification codes. Subjects were classified into Group A (18 to 50years old) and Group B (subjects >50 yo). Using a comparative statistic test of proportions (statistic Z), we compared the frequencies of overweight and obesity between patients and controls. We also determined differences in the frequencies of overweight and obesity between male and female ADU patients with (w-/tx) and without anxiolytic-treatment (wo/tx). EPIDAT version 4.1 was used for the statistical analysis.

Results: In-group A, the population with obesity was higher in ADU patients w/tx than in the control group (59% vs. 51%, $p<.001$). Even higher than in ADU patients wo/tx (49%), $p<.0001$. In group B, there were no statistical differences between patients and controls comparing populations with obesity; however, the population with overweight in ADU patient w/tx was higher comparing with controls (42.5% vs 38.6%, p=.02).In-groups A and B, population with obesity was higher in female than in male ADU patients w/tx, (64% vs. 52%, $p<.0001$, and 49.5% vs. 42%, p=.0004), being the results for groups A and B, respectively. The population with morbid obesity also was higher in female than in male ADU patients ($p<.00001$)

Conclusion: Population with obesity is more frequent in ADU patients of 18 to 50years than controls. Obesity and morbid obesity are more frequent in ADU female patients in comparison with male ADU patients.

Keywords: anxiety disorder unspecified, gender, overweight, obesity, anxiolytic treatment

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Abbreviations: ADU, anxiety disorder unspecified; NHANES, national health and nutrition examination survey; BMI, body mass index; NESARC, national epidemiologic study of alcohol and related conditions; HPA, hypothalamic-pituitary-adrenal; CRH, corticotrophin releasing hormone; AVP, arginine vasopressin; ACTH, adrenocorticotropic hormone; GAD, generalized anxiety disorder; PTSD, posttraumatic stress disorder; OCD, obsessive-compulsive disorder; TMC, truman medical center

Highlights

a. Females have higher frequency (67.9%) of Anxiety Disorder Unspecified (ADU) than males (32.1%).

b. The frequency of obesity was 10% higher in ADU patients under anxiolytic treatment than in controls.

c. Populations with obesity and morbid obesity were 11% higher in female than in male ADU patients.

Introduction

The prevalence of obesity in developed and developing nations is increasing. According to the National Health and Nutrition Examination Survey (NHANES) data, it is estimated that more than one third of adults in the United States are obese.[1] Obesity is also ranked as the second leading cause of preventable death and disability in the U.S.[1] Obesity leads to increased risk of all-cause mortality, hypertension, type 2 diabetes, hyperlipidemia, coronary heart disease, stroke, obstructive sleep apnea (OSA), osteoarthritis, cancer, and mental illness.[2]

In the United States, anxiety disorders are the most common class of mental health disorders.[3] It is important to note that rates of obesity are higher than normal in several psychiatric disorders. A study done on obese candidates for bariatric surgery showed higher levels of stress, anxiety, depression, and food craving when compared to normal-weight controls.[4] A cross-sectional epidemiologic survey using self-reported body mass index (BMI) showed obesity is associated with an approximately 25% increase anxiety disorders.[5]

Sex differences in obese patients exist in a wide variety of mental health disorders. This gender difference varies across different mental health pathologies.[6] An investigation using the data from the National Epidemiologic Study of Alcohol and Related Conditions (NESARC)

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evaluated gender differences in the association between BMI and psychopathology. It was found that for all anxiety disorders, there was a significant association with BMI in women but not in men. However, the study presented with limitations since participants self-reported their height and weight for calculation of BMI.[7]

BMI is a tool commonly used in medicine as a predictor for the debilitating comorbidities associated with obesity.[8] There have been several reasons cited, of why obesity and some common psychiatric disorders could be linked:

i. Neurotransmitter imbalance,

ii. The hypothalamic-pituitary-adrenal (HPA) axis dysregulation, or

iii. For psychosocial factors.[9]

A study evaluating the impact of biological stress systems (i.e., the hypothalamic–pituitary–adrenal [HPA] axis, autonomic nervous system [ANS] and inflammation) showed increased hyperlipidemia and obesity risk in patients with severe anxiety disorders and depression. This is partially due to increased chronic inflammation in these subjects.[10] Both physical and psychological stressors activate the HPA axis through the secretion of corticotrophin releasing hormone (CRH) and arginine vasopressin (AVP).[11] The neuropeptides then activate the synthesis and resultant release of adrenocorticotropic hormone (ACTH) from the anterior pituitary.[12] ACTH stimulates the adrenal cortex to synthesize glucocorticoids. Cortisol plays a major role on both physiological manifestations and mood.[13]

Anxiety disorders include generalized anxiety disorder (GAD), panic disorder, phobic disorders, posttraumatic stress disorder (PTSD), obsessive-compulsive disorder (OCD), and anxiety disorder unspecified (ADU).[14] There are limited studies done evaluating the relationship of gender, ADU, and obesity. Many studies have evaluated patients with low body weight but those with high body weight are limited. Therefore, the objective of the present study was to determine the gender differences in frequencies of overweight and obesity among patients with Anxiety Disorder Unspecified (ADU), and to compare them with a control group. This proposed study will enable us to utilize clinical data to evaluate gender differences in overweight and obese patients with clinical diagnosis of anxiety disorder, unspecified at Truman Medical Center (TMC).

Methodology

Study design

A cross sectional study carried out in Kansas City, Missouri at Truman Medical Center (TMC). TMC is one the Kansas City area's only safety net hospitals. This leads to the opportunity to influence many patients' lives. The first step is to recognize the extent of the problem at TMC.

Electronic health record data

Data in i2b2 were extracted from the electronic medical record (EMR) of TMC between 2012 and 2017. This database uses an EMR system to capture hospital procedures (e.g. endoscopy to obtained biopsies), diagnostic information (e.g., diagnosis of General Anxiety Disorder), demographics, medical history, admission, discharge, drug prescriptions, and laboratory test over time; i2b2 is a de-identified real-world database used to conduct data-driven research for biomedical discovery and to gain insights into usage and comparative effectiveness of treatment. Encounters may include pharmacy, clinical and microbiology laboratory, admission, and billing information from

affiliated patient care locations. All admissions, medication orders and dispersals, laboratory orders, and specimens are date and time stamped, providing a temporal relationship between treatment patterns and clinical information. TMC established policies of de-identification for health research. This research was registered by the University of Missouri-Kansas City Department of Biomedical Health Informatics, and complied with the rules for conducting clinical research in human subjects established by the Declaration of Helsinki.[15]

General characteristics of the sample

The study population included patients who receive healthcare from the outpatient and inpatient settings at Truman Medical Center. The inclusion criteria for patients were:

i. Adults between the ages of 18 and 90years,

ii. Patients with anxiety disorder, unspecified with ICD-9-CM/ICD-10 classification codes recorded medical diagnosis,[16] and

iii. No missing data for age sex, weight, height, or BMI.

Patients were excluded when they have the following characteristics:

a) Children and adolescents under 18years of age,

b) With duplicate inpatient and/or outpatient encounters, and

c) Missing data for age sex, weight, height or BMI.[17,18]

Under those clinical criteria, 28,236 patients were eligible, 20,597(18-50years of age) and 7,645 (>50years). From the total 28,236 ADU patients, 18,192 were not under anxiolytic treatment and 10,044 were under anxiolytic treatment. Nevertheless, for the gender, statistical analysis we only considered 20,560 patients who had the gender variable; 14,030 females and 6,530 males (Figure 1).

For this study, there are several potential sources of bias:

i. The age of patients,

ii. Sex,

iii. Use of anxiolytic or antidepressant drugs, or use of cortisol or any other drug that causes changes in body weight; and

iv. Diseases such as hypothyroidism, Cushing's disease, polycystic ovary syndrome, which relate to weight gain.

Therefore, in this investigation, we decided to evaluate a control group of patients of similar age to the study group, without clinical diagnosis of anxiety; or psychiatric diseases; and who were not under anxiolytic treatment; or using any drugs that modified their body weight.

Control subjects

Figure 1, presents the flow diagram of the selection of patients and controls. For the control group, we selected patients from the i2b2 database without ICD-9-CM/ICD-10 code classification of clinical diagnosis of endocrine, nutritional, metabolic, and immunity disorder; neither ICD-9-CM/ICD-10 code classification of clinical diagnosis of mental disorder.[16] Following that criteria, we found 5649 patients, 4071 with clinical diagnosis of pharyngitis (ICD-10-CM J02) and 1578 patients with clinical diagnosis of naso-pharyngitis (ICD-9-CM/ICD-10 460 and J00, respectively). From 5649 patients, 2042 were excluded for the following reasons: they did not have age-range from 18 to 90years, others were under pharmacotherapy associated with

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weight changes (atypical antipsychotics, SSRIs, TCAs, or lithium), or they missing data for age sex, height, weight or and BMI. After exclusions, 3,607 subjects conform the control group; of them 3,131 with clinical diagnosis of pharyngitis and 476 had clinical diagnosis of acute naso-pharyngitis.
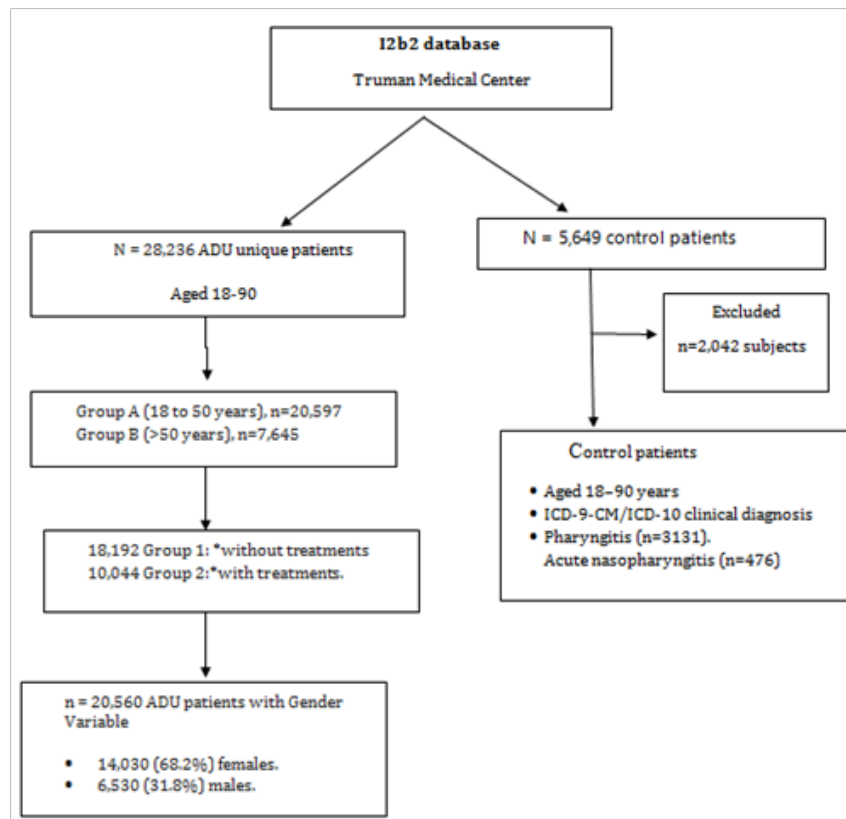

Figure 1 Flow diagram of the selection of patients analyzed in the study.

*, anxiolytic treatment

Study variables

The study variables included:

i. The primary dependent variable was to have a clinical diagnosis of anxiety disorder, unspecified through International Classification of Diseases [ICD]-9-CM/ICD-10 classification codes 300.00 and F41.9, respectively;

ii. Demographic characteristics: age 18-50 and >50years, sex (male and female); and

iii. Clinical history and anthropometrical variables.

For this study, we considered the World Health Organization (WHO) parameters to determine patients who were underweight (<18Kg/mt2), overweight (from >25 to<30kg/mt2), obesity (from >30 to 39kg/mt2) and morbid obesity (>40Kg/mt2).[17,18]

Statistical analysis

Statistical analysis was conducted using EPIDAT 4.1 software (http://dxsp.sergas.es). Descriptive and inferential statistics were performed on the primary dependent variable. For data analysis, male and female subjects in the study and control groups were stratified: Group A (patients 18 to 50years), and Group B (patients over 50years). Patients with clinical diagnosis of ADU also were classified into the following groups: Group 1 (patients with anxiolytic treatment) and Group 2 (untreated patients at the time of the study).

The frequencies of underweight, overweight, obesity, and morbid obesity, using the WHO parameters mentioned above[17,18] were compared as follows:

a. Between ADU patients and controls;

b. Between ADU patients w/tx and wo/tx; and

c. Comparing males versus females in groups A and B, respectively. All statistical analysis were determined using the comparative test of proportions (statistic Z), using inference about parameters, in two populations, independent proportions, comparing the number of cases in sample 1 (sample size 1) vs. number of cases in sample 2 (sample size 2), using a confidence level of 95%. In all cases a p-value of ≤.05 was considered statistically significant.

Results

In this investigation we demonstrated that 28,236 patients were diagnosed with Unspecified Anxiety Disorder, from them 20,597 (72.9%; 95% IC, 72.4-73.5%) were from 18 to 50years and 7,645 (27.1%; IC, 95% 26.6%-27.6%) were older than 50years. From this ADU population, 18,192 (64.4%; IC, 95% 63.9%-64-9%) were not under anxiolytic treatment, and 10,044 (35.6%; IC, 95% 35%-36.1%) were under anxiolytic treatment.

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In Table 1, we demonstrated that in-group A (18-50years), the population of ADU patients with obesity was significantly higher in patients under anxiolytic treatment than in the group wo/tx (58.99% versus 49.3%, p<.0001). The population with obesity also was higher in ADU patients w/tx in comparison with the control patients (58.9% vs. 50.7%, p<.001). However, there were not significant differences between populations with obesity, comparing patient's wo/tx versus controls (p>.05).

Table I Frequencies of underweight, overweight, obesity and morbid obesity among unspecified anxiety disorder

| Variables | Group A | | | | | Group B | | | | |
| | 18-50 Years | | | | | >50 Years | | | | |
	ADU w/tx n (%)	p	ADU wo/tx n (%)	p	Control	ADU w/tx n (%)	p	ADU wo/tx n (%)	p	Control
UW	86 (1.14)*	0.009	64 (0.49)*	ns	12 -0.5	43 (1.73)&	0.01	41 (0.79)&	ns	8 -0.66
OW	2523 (33.36)*	0.001	5232 (40.16)*	0.04	889 -37.03	1054 (42.47)**	0.02	2018 (39.09)**	ns	466 -38.64
OB	4461 (58.99)*	<.001	6428 (49.33)*	ns	1218 -50.73	1156 (46.58)&&	ns	2570 (49.77)&&	ns	597 -49.5
MOB	492 (6.51)*	<.001	1305 (10.02)*	0.01	282 -11.75	229 (9.22)#	ns	534 (10.34)#	ns	135 -11.19
N total	7,562		13,029		2,401	2,482		5,163		1,206

P, "p values" patients versus control subjects; ADU w/tx, unspecified anxiety disorder patients underanxiolytic treatment; ADU wo/tx, unspecified anxiety disorder patients whose were not underanxiolytic treatment; UW, underweight; OW, overweight; OB, populations with obesity; MOB, morbid obesity. Significant differences between 18-50years old ADU patients with vs. without anxiolytic treatment, *<.0001; Differences between >50years old patients with and without treatment: &,.0004; **,.005; &&, .009; #non-significant

In-group A, we also demonstrated that the population of morbid obesity was significantly lower in ADU patients under anxiolytic treatment (6.5%) in comparison with controls (11.8%), p<.001; and even lower than patients without treatment (10%), p<.0001, respectively.

Contrary to the observed in the population 18 to 50years, in-group B (>50years), there were not statistical differences between patients and controls in the frequencies of obesity. In addition, the population with obesity was significantly lower among patient's w/tx (46.6% vs. 49.8%, p=.009), in comparison with ADU patient's wo/tx. However, the population with overweight in ADU patient's w/tx was significantly higher comparing with control group (42.5% vs 38.6%, p=.02). There were not significant differences in the frequency of populations with morbid obesity between ADU patient's in comparison with controls.

In this investigation, we demonstrated that from the total population of ADU (28,236) patients, 20,560(72.8%) had the gender variable: 14,030(68.2%) were female and 6,530(31.8%) were male. Difference in proportions 95%,(Confidence Interval [CI], 0.36-0.37), p<.00001.

In Table 2, we demonstrated that in-group A, female population with obesity was significantly higher in ADU patients w/tx in comparison with the control group (63.6% vs. 57%, p<.0001). However, the population with obesity was higher in the female control group compared with ADU patient's wo/tx (57% vs. 51%, p<.0001).

It is important to point out that the population with morbid obesity was significantly higher in the group of ADU female patients whose were not under anxiolytic treatment, in comparison with the control group and even higher than in the group of ADU female patients under anxiolytic treatment (2.9%, 8.3% and 11.7%), respectively (Table 2).

Table 2, also showed the population of overweight and obesity were significantly higher in ADU male patients than controls (p<.0001). ADU male patient's w/tx had the highest frequency of obesity, being the results of 52.4%, 43.9%, and 37.12%, for ADU w/tx, ADU wo/tx, and controls respectively. It takes our attention that higher prevalence of morbid obesity was found in control subjects compared with patients (3.82%, 5.7%, and 30.6%), for ADU w/tx, ADU wo/tx, and controls respectively (p<.0001).

In the groups of 18-50years, when we compare female versus males ADU patients with anxiolytic treatment, we found that, overweight was significantly higher in male (43.7%) than in females (27%), p<.00001. The same tendency was observed when we compare female versus male ADU patients without treatment (36.4% vs. 49.9%, p<.00001). Nevertheless, female ADU patients with anxiolytic treatment showed higher frequency of obesity (63.6%) than male (52.4%) did, p<.00001. Same tendencies were observed for obesity in ADU female patients without treatment (51.4%) compare to ADU male patients (43.9%), p<.00001. Morbid obesity, also was significantly higher in ADU female patients with treatment (8.3%) in comparison with male (3.8%), p<.00001. Same results were found when we compare female versus male ADU patients without treatment (11.7% vs 5.7%), p<.00001, respectively.

Table 3, presents the results of groups >50years, and we demonstrated that comparing females ADU patients with control subjects, we did not find any significant difference. However, in male groups, again as in females, morbid obesity was significantly higher in control subjects than in ADU patients with treatment (9.4%, and 5.4%, p=.02), respectively

In the groups, older than 50years, comparing male versus female ADU patients with treatment, we found that, overweight was significantly higher in male (50.62%) than in females (37.02%), p<.00001. The same tendency was observed when we compare male versus female ADU patients without treatment (44.4% vs. 36.8%, p<.00001). However, female ADU patients with anxiolytic treatment, showed higher frequency of obesity (49.5%) than male did (42.1%),

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p=.0004. Same tendencies were observed for obesity in ADU patients without treatment, being the frequencies for female and male ADU patients of 50.7% vs. 47.7%, respectively, p=.05.

Table 3, also showed that morbid obesity, was significantly higher in ADU female patients with treatment (11.7%) in comparison to male (5.44%), p<.00001. Same results were found when we compare female versus male ADU patients without treatment (11.8% vs 6.98%), p<.00001, respectively.

Table 2 Frequencies of underweight, overweight, obesity and morbid obesity among male and female 18-50years, patients with diagnosis of unspecified anxiety disorder and controls

Variables	Females 18-50years					Males 18-50years				
	Controls n(%)	ADU w/tx n(%)	p	ADU wo/tx n(%)	p	Controls n(%)	ADU w/tx n(%)	p	ADU wo/tx n(%)	p
UW	9	52	0.05	45	ns	3	3	ns	19	<.001
	-0.55	(1.13)*		(0.47)*		-0.39	(0.10)&&		(0.52)&&	
OW	645	1244	<.001	3435	=.0.2	244	1279	<.001	1797	<.001
	-39.43	(27.03)&		(36.43)&		-31.9	(43.68)##		(49.89)##	
OB	934	2927	<.001	4846	<.001	284	1534	<.001	1582	<.001
	-57.09	(63.60)#		(51.41)#		-37.12	(52.39)£		(43.92)£	
MOB	48	380	<.001	1101	<.001	234	112	<.001	204	<.001
	-2.93	(8.26)**		(11.68)**		(30.59)	(3.82)€		(5.66)€	
N Total	1,636	4,603		9,427		765	2,928		3,602	

P, "p values" patients versus control subjects; ADU w/tx; unspecified anxiety disorder patients with treatment; ADU wo/tx, unspecified anxiety disorder patients without treatment. UW, underweight; OW, overweight; OB, populations with obesity; MOB, morbid obesity; *<.00001; &<.00001; #<.00001; **<.00001; &&=.006; ##<.00001; £<.00001; €=.0007

Female vs. Male ADU patients´ w/tx, UW (p<.00001); OW (p<.00001); OB (p<.00001); MOB (p<.00001)

Female vs. Male ADU patients' wo/tx, UW (p=.02); OW (p<.00001); OB (p<.00001); MOB (p<.00001)

Control groups, Male vs. Female, UW (p=.84); OW (p=0004); OB (p<.00001); MOB (p<.00001)

Table 3 Frequencies of underweight, overweight, obesity and morbid obesity among male and female >50years with diagnosis of unspecified anxiety disorder patients and controls

Variables	Females>50years					Males>50years				
	Controls n(%)	ADU w/tx n(%)	p	ADU wo/tx n(%)	p	Controls n(%)	ADU w/tx n(%)	p	ADU wo/tx n(%)	p
UW	7	25	ns	27	ns	1	18	ns	14	ns
	-0.78	(1.66)*		(0.74)*		-0.31	(1.85)&&		(0.90)&&	
OW	324	561	ns	1330	ns	142	493	ns	688	ns
	-36.49	(37.20)&		(36.79)&		-44.66	(50.62)##		(44.44)##	
OB	452	746	ns	1832	ns	145	410	ns	738	ns
	-50.9	(49.47)#		(50.69)#		-45.6	(42.09)£		(47.67)£	
MOB	105	176	ns	426	ns	30	53		108	ns
	-11.82	(11.67)**		(11.78)**		-9.43	(5.44)€	0.02	(6.98)€	
N Total	888	1508		3615		318	974		1548	

P, "p values" patients versus control subjects; ADU w/tx, unspecified anxiety disorder patients with treatment; ADU wo/tx, unspecified anxiety disorder patients without treatment; UW, underweight; OW, overweight; OB, populations with obesity; MO, morbid obesity; *<.004; &=.81; #=.45; **=.94; &&=.06; ##=.003; £=.007; €=.15

Female vs. Male ADU patients' w/tx, UW (p=.84); OW (p<.00001); OB (p=.0004); MOB (p<.00001)

Female vs. Male ADU patient's wo/tx, UW (p=.67); OW (p<.00001); OB (p=.05); MOB (p<.00001)

Control Group, Male vs Female, UW (p=.62); OW (p=.01); OB (p=.12); MOB (p<.3)

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Discussion

Anxiety disorder, unspecified (ADU) and obesity are two frequent pathologies worldwide affecting millions of patients, yet studies evaluating the association of these two conditions in adults older than 50years are limited.[5] To our knowledge, this is the first study with a very large sample of ADU clinical diagnosis patients (N=28,236) which demonstrates differences by gender in the frequencies of overweight, obesity and morbid obesity. Most studies have focused on relationships between anxiety or depression in adolescence and obesity in either later adolescence[19] or early adulthood[20–22] with only a few examining adult anxiety and obesity.[5]

Anxiety disorder, unspecified, anxiolytic treatment and obesity

In the international literature, it has shown that psychiatric drugs produce weight gain in 24-100% of patients with the average weight-gain of 0.57 to 1.37kg per month.[14,23] Therefore, in this investigation, we stratified ADU patients in those under anxiolytic treatment, and those without treatment. We demonstrated that in the groups 18-50years, ADU patients under anxiolytic treatment had significantly higher frequency of obesity than ADU patients whose were not under anxiolitic treatment (59% vs 49%, p<.0001). Conversely, in the groups older than 50years, the frequency of obesity was lower in ADU patients under treatment in comparison with patients whose were not on anxiolytic treatment (47% vs. 49% p=.009). Comparing ADU patients under anxiolytic treatment versus controls in the group 18-50years, we observed higher patients with obesity than in control group (59% vs. 51%, p<.001); however, in the groups >50years, any significant difference was observed comparing ADU patients under treatment, and without treatment, and even compared with controls (p=ns). Different effects on body weight of anxiolytic drugs in patients over 50years could be explained by the following reasons:

I. Age-related changes such as altered absorption, altered distribution, and changed hepatic metabolism, reduced renal excretion, and altered neurophysiology all affect pharmacokinetics and pharmaco-dynamics, and therefore the treatment could have no effects on body weight.[24]

II. The end of reproductive life has linked with increased risk of overweight and obesity; as occurs during climacteric in women and during and ropause in males. This contributes to weight gain and obesity in >50years patients, even if they do not take anxiolytic drugs;[25] or

III. Probably within age patients do not consume the medication in the dose or in the appropriate form.[24]

IV. Therefore, it would be interesting to conduct longitudinal studies to determine the effect of anxiolytic drugs in body weight of men and women over 50years of age.

Anxiety disorder unspecified, gender, overweight and obesity

It is noteworthy that in this investigation, the results indicated that females presented more than twice the frequency of anxiety when compared with males (67.9% vs. 32.1%, p<.001). This investigation reaffirms the results of various researches, that at the global level the affective disorders are more frequent in females than in males.[26] Certain habits such as poor food choice intake and overeating have been associated with anxiety.[23] "Comfort" foods are often chosen when people experience negative emotions and mood states. This

is a common behavior especially in female patients with anxiety.[23] The chronic consumption of high calorie foods ultimately leads to obesity;[27] conversely, obesity and high-fat diet can result in negative emotional states.[4,5,16] A previous study conducted in Brazil, reported high frequency of binge eating episodes, and anxiety in obese patients.[28] However, the investigators only evaluated patients with morbid obesity (40 to 82Kg/m2). In our investigation, when we compared the frequencies of overweight, obesity and morbid obesity between ADU female and male patients with- and without anxiolytic treatment, we observed that in all age groups (18-50 and >50years) male had significantly greater problems of overweight; however, women outnumber men in obesity. In this investigation we also demonstrated that female ADU patients, with- and without anxiolytic treatment presented with higher rates of morbid obesity in comparison with males.

Questions remain regarding the role of obesity in different subtypes of anxiety disorders. Anxiety disorders include generalized anxiety disorder (GAD), panic disorder, phobic disorders, posttraumatic stress disorder (PTSD), obsessive-compulsive disorder (OCD), and anxiety disorder unspecified (ADU).[14] ADU is one of the most frequent mental disorder pathologies worldwide;[29] for treatment response of weight-loss intervention to be effective, it is important to understand the bi-directional relationship of these two conditions. A previous study reported corticotropin-releasing hormone (CRH) was significantly elevated in patients with OCD when compared to their controls.[30] Another study reported high basal cerebrovascular fluid CRH concentrations and normal 24hour urinary-free cortisol excretion in study participants who were combat veterans with PTSD.[31]

The reasons why obesity and some common psychiatric disorders could be linked are possibly due to the following reasons:

A. Neurotransmitter imbalance,

B. The hypothalamic-pituitary-adrenal (HPA) axis dysregulation, or

C. For psychosocial factors.[9]

A study evaluating the impact of biological stress systems (i.e., the hypothalamic–pituitary–adrenal [HPA] axis, autonomic nervous system [ANS] and inflammation) showed increased hyperlipidemia and obesity risk in patients with severe anxiety disorders and depression. This is partially due to increased chronic inflammation in these subjects.[10] Both physical and psychological stressors activate the HPA axis through the secretion of corticotrophin releasing hormone (CRH) and arginine vasopressin (AVP).[11] The neuropeptides then activate the synthesis and resultant release of adrenocorticotropic hormone (ACTH) from the anterior pituitary.[12] ACTH stimulates the adrenal cortex to synthesize glucocorticoids. Cortisol is a stress hormone that plays a crucial role in weight leading to food craving behavior,[12] and plays a major role on both physiological manifestations and mood.[13]

Conclusion

ADU patients had higher frequency of obesity than control subjects did. Female ADU patients also had higher risk than male to be obese. Obesity and anxiety are two major health burdens. Appropriate attention to the correlation of these two conditions is necessary for success of the patient. Our study is one of the first to recognize the extent of the problem at a university-based hospital. Clinicians must recognize the correlation of these two conditions to be more efficient in management and prevention of these two conditions. Recognizing the problem early is necessary so physicians

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can implement motivational interviewing, behavioral interventions, and involvement of a multidisciplinary team. This will allow us to combat these comorbid conditions and enable the patients to have the treatment they need to be successful.

Conflict of interest

Author declares that there is no conflict of interest.

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