Article

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Posted Date: 12 September 2025

doi: 10.20944/preprints202509.1079.v1

Keywords: obesity; lifestyle; inpatients; depression; binge-eating disorder

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The Influence of Depression and Binge Eating Disorder in Inpatient Treatment of Obesity

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Abstract

Obesity is a global health problem causing millions of deaths from noncommunicable diseases. Individuals with obesity are also at increased risk for mental disorders, such as depression (DEP) and binge eating (BED). The aim of this study was to evaluate the effectiveness of an inpatient lifestyle-based intervention program for the treatment of obesity in persons with and without DEP and BED. This is a retrospective cohort study involving patients enrolled in a specialized inpatient hospital facility for the treatment of obesity. Participants underwent a long-term program composed by low-calorie diet and intensive lifestyle changes. Data from 997 adult patients were included. Participants were divided into 4 groups: depression group (DG), binge-eating disorder group (BG), depression and binge-eating disorder group (DBG), and a control group (CG). Anthropometric data were obtained at admission and discharge. Most participants were females, sedentary and were hospitalized for more than 3 months. Patients with DEP, BED and with DEP+BED presented equally significant improvements when compared to the CG. Treatment duration was positively associated with reductions in weight and BMI in all patients. In conclusion, patients with DEP, BED with DEP+BED presented equally significant reductions in BMI and waist circumference when compared to the CG, and reduction in body weight was directly associated with the length of the intervention.

Keywords: obesity; lifestyle; inpatients; depression; binge-eating disorder

1. Introduction

Overweight and obesity worldwide have more than doubled among adults since the 1990s (WHO, 2025). Although the prevalence varies among countries, in the Americas, 67% of the population are living with excessive body weight (WHO, 2025). Obesity is characterized as a chronic, relapsing, multifactorial, heterogeneous disease, in which treatment and sustained weight loss remain among the main challenges in clinical practice (Messias et al., 2024).

The development of obesity is a complex process, involving genetics, environmental, cultural and socioeconomic factors, besides eating behavior and lifestyle (Li et al., 2025), leading to an imbalance of energy intake (determined by the mechanism of hunger, satiety and hedonic eating) and expenditure (equivalent to resting energy expenditure, thermogenic effect of food and exercise) (WHO, 2025).

The rise in obesity rates is a global health problem that in 2021 caused around 3.7 million deaths from noncommunicable diseases (NCDs) such as cardiovascular diseases, diabetes, cancers, chronic respiratory diseases, and others (GBD, 2021). Individuals with obesity are also at increased risk for mental disorders, and likewise, depression (DEP), one of the most common mental disorders, has been shown to elevate the risk of developing obesity, establishing a bidirectional relationship

 doi:10.20944/preprints202509.1079.v1

between the two comorbidities (Cho et al., 2025; Luppino, 2010).Internalization of weight stereotypes may influence the link between obesity and mental health outcomes, as the stigma is associated with negative health consequences (Pearl and Puhl, 2018).

Patients with depressive symptoms tend to present significant weight changes (APA, 2022). The presence of symptoms as psychomotor retardation, fatigue or loss of energy, loss of interest or pleasure in activities, among others, which can contribute to weight gain or a sedentary life. The severity of obesity, i.e., body mass index, also exerts an influence, increasing the strength of the obesity-depression relationship, especially in patients with grade III obesity (Zhou et al., 2025; Faulconbridge, 2014).

Another condition commonly associated with obesity is binge eating disorder (BED), characterized by regular binge eating episodes in which individuals ingest large amounts of food and experience loss of control during the overeating episode (APA, 2022). BED is the most prevalent eating disorder among adults and is strongly associated with obesity and with increased risk for psychiatric and other medical comorbidities (Giel et al., 2022; Grilo and Juarascio, 2023). Remission from binge eating is associated with weight loss (Grilo et al., 2011), which also results in numerous other long-term health benefits, and can be obtained from lifestyle intervention programs (Grilo and Juarascio, 2023).

Lifestyle modification is the standard care in obesity treatment (Yumuk et al., 2015). It is also recommended to mitigate depressive symptoms (Wong et al., 2021). Nevertheless, the presence of mental disorders in patients with obesity may worsen adherence to lifestyle interventions, hindering weight loss and reducing patient's motivation (Hoffmann et al., 2022). In this sense, comprehensive inpatient treatments are usually superior to outpatient interventions regarding weight loss and treatment of obesity-related comorbidities (Rondanelli et al., 2023). However, to the best of our knowledge, no study so far has investigated the impact of an inpatient intervention aimed at reducing body weight in persons with obesity who also struggle with DEP and/or BED.

Thus, the aim of this study was to evaluate the impact of inpatient lifestyle-based intervention program for the treatment of obesity in persons with and without DEP and/or BED. Understanding how lifestyle modifications impact patients with obesity and mental disorders is crucial for providing them with efficient treatment options.

2. Materials and Methods

This is a retrospective cohort study involving patients enrolled in a specialized multiprofessional inpatient hospital for the treatment of severe obesity. Participants underwent a long term (1-6 months) program composed by a low-calorie diet and intensive lifestyle changes (eating behavior, physical activity, sleep patterns). The program follows the Brazilian guidelines for the management of obesity (ABESO, 2022), and comprises daily physical activities, psychotherapy, educational interventions and individualized medical support with the assistance of a multidisciplinary team. Data were collected between 2016 and 2022, after the ethical approval of the Bahia State University ethics committee (protocol number 65578822.1.0000.0057).

Data from 997 adult patients (> 18 years old), diagnosed with obesity class II or higher (body mass index - BMI >35kg/m^2) at baseline were included in this study. Patients treated for less than 1 month were excluded from the sample. Diagnosis of depression and binge-eating disorder was confirmed by a physician at admission, through clinical interview according to DSM-5 (APA, 2013). Demographic (age and gender) and lifestyle data were collected from the sample, and physical activity habit was categorized as sedentary or non-sedentary.

Participants were divided into 4 groups according to the presence or absence of depression and binge-eating disorder: depression group (DG), binge-eating disorder group (BG), depression and binge-eating disorder group (DBG), and a fourth group, without diagnosis of depression and/or binge-eating disorder (CG).

Anthropometric data were obtained at admission and discharge by the same evaluator, and consisted of measures of height and body weight, and perimeter measurements, in specific, pre-

 doi:10.20944/preprints202509.1079.v1

marked as using an inextensible measuring tape, graded in millimeters (WHO, 2023). Three sites were evaluated: waist (2 cm below the last rib), hip (at the greater trochanter area), and calf (at the wider circumference of the dominant leg). Each participant was positioned at rest, standing with feet naturally spaced at hip width.

Data were analyzed by the statistical package SPSS v.27 for windows and expressed as n (%) or mean ± standard deviation. Demographic data were treated with descriptive statistics, and one-way ANOVA was employed to evaluate differences in the continuous variables (age, time of hospitalization, Δ weight and Δ BMI) among groups. The difference in the prevalence of the categorical variables (gender and sedentary behavior) was evaluated by Pearson's Chi-square test. The comparison of anthropometric data before and after the intervention was conducted through two-way ANOVA. Associations between the reductions in weight and BMI and the length of the treatment were evaluated Pearson's correlation coefficient and classified as follows: 0.0 to 0.19 - very weak association; 0.2 to 0.39 - weak association; 0.4 to 0.69 - moderate association; 0.7 to 0.89 - strong association; 0.9 to 1.0 - very strong association. In all cases, the significance level α was set at 5%.

3. Results

The sample of this study was composed by 997 adult patients with obesity, divided into 4 groups: patients diagnosed with depression (DG, n=279), with binge-eating disorder (BG, n=58), with both conditions (DBG, n=38), and a group without DEP and/or BED (CG, n=622). Most participants were females, sedentary and were hospitalized for more than 3 months (Table 1). Patients in DBG were younger than participants of the other groups, and the predominance of females was smaller in the CG.

Table 1. Characterization of demographic, lifestyle, and time of hospitalization data.

	DG (n=279)	BG (n=58)	DBG (n=38)	CG (n=622)	p
Gender (%F)	226 (81)	42 (72.4)	30 (78.9)	390 (62.7)	<0.001
Sedentary	245 (87.8)	48 (82.8)	31 (81.6)	509 (81.8)	NS
Age (years)	48.3 ± 16.3[a]	43.1 ± 15.5[abc]	39.4 ± 13.5[b]	46.9 ± 16.4[ac]	0.004
Hospitalization (days)	117.7 ± 43.4	118.5 ± 54.2	120,3 ± 40.0	118.5 ± 50.5	NS

F= females, DG= depression group, BG= binge-eating disorder group, DBG= depression + binge-eating disorder group, CG= without DEP and/or BED group, NS= non-significant difference. Data expressed as n (%) or means ± standard deviations. Different letters mean a statistically significant difference.

The multiprofessional hospitalization treatment for patients with obesity was efficient in reducing body mass index (BMI) and all other anthropometric parameters (Table 2). Patients with depression, binge-eating disorder and with both conditions presented equally significant improvements in the variables assessed when compared to the control patients.

Table 2. Comparison of body composition variables before and after the treatment.

	DG (n=279)		BG (n=58)		DBG (n=38)		CG (n=622)		
	Before	After	Before	After	Before	After	Before	After	p
BMI	42.9±6.2	34.2±4.2	44.6±6.3	35.2±5.6	42.3±4.2	33.8±3.9	43,3±5,4	34.2±4.7	<0,001 *
WC	115.2±12.8	102.1±12.0	117.5±15.2	98.4±9.1	113.9±9.4	106.1±8.3	116.7±12.4	104.9±10.2	<0,001 *

 doi:10.20944/preprints202509.1079.v1

HC	131.5±11.5	122.0±9.9	134.7±14.6	115.4±10.2	130.3±8.3	117.7±8.0	131.9±11.4	121.1±8.5	<0,001 *
CC	43.3±4.4	40.6±4.4	44.4±4.5	42.8±4.1	44.0±3.8	40.8±3.8	44.4±4.6	42.5±4.7	<0,001 *

BMI= body mass index (kg/m²), WC= waist circumference (cm), HC= hip circumference (cm), CC= calf circumference (cm), DG= depression group, BG= binge-eating disorder group, DBG= depression + binge-eating disorder group, CG= control group without DEP and/or BED. Data expressed means ± standard deviations. *Comparison before and after the intervention, regardless of group.

The variations (Δ) of weight and BMI after the intervention are presented in Table 3. Groups exhibited similar reductions in weight and BMI after the inpatient treatment.

Table 3. Variation in weight and BMI after the intervention.

	DG (n=279)	BG (n=58)	DBG (n=38)	CG (n=622)	p
Δ weight	21.7 ± 10.4	25.4 ± 12.4	24.1 ± 9.0	24.8 ± 14.2	0.160
Δ BMI	8.6 ± 4.6	9.3 ± 4.0	8.5 ± 3.0	8.9 ± 6.0	0.845

DG= depression group, BG= binge-eating disorder group, DBG= depression + binge-eating disorder group, CG= without DEP and/or BED group, Δ= variation (after - before). Data expressed as means ± standard deviations.

The duration of the inpatient treatment was positively associated with the reductions in weight (Δ weight) and BMI (Δ BMI) in the total sample ($r=0.37$, $p<0.001$ and $r=0.30$, $p<0.001$, respectively). This same trend was observed in the analysis separated by study group, that revealed significant weak or moderate associations between these variables in most cases (Table 4).

Table 4. Association between Δ weight, Δ BMI and length of treatment.

	Δ weight x length of treatment		Δ BMI x length of treatment	
	r	p	r	p
DG	0.39	<0.001	0.29	<0.001
BG	0.25	0.096	0.31	0.038
DBG	0.46	0.009	0.39	0.030
CG	0.38	<0.001	0.31	<0.001

DG= depression group, BG= binge-eating disorder group, DBG= depression + binge-eating disorder group, CG= group without DEP and/or BED, Δ= variation (after - before).

4. Discussion

This study aimed at evaluating the effectiveness of an inpatient lifestyle-based intervention program for the treatment of obesity in persons with and without DEP and BED. Patients with one or both diagnoses presented equally significant improvements in the anthropometric variables evaluated when compared to the group without DEP and/or BED. In the entire group, weight and BMI decreases are positively correlated with hospital stay duration.

Female gender prevailed in the sample of this study. This finding is aligned with data from the National Health and Nutrition Examination Survey (NHANES) where researchers found this condition to be more prevalent in women than in men (Flegal et al., 2016). Besides, women tend to be culturally more cautious about their health than men (Júnior et al., 2022; Gutmann et al., 2022), which may also contribute to this finding.

 doi:10.20944/preprints202509.1079.v1

The prevalence of sedentary behavior was over 80% in all study groups in reinforcing the relationship between sedentary lifestyle and obesity, a well-documented fact, especially among adults (Goyal and Rakhra, 2024). In this study, women showed a more sedentary lifestyle than men (Bauman et al., 2011). Data from a survey in South American countries (including Brazil) revealed that about 40% of the adult population were sedentary (not achieving 150 minutes per week of physical activity) (Werneck et al., 2019). Mean age of the participants was slightly different among groups, with DG presenting older and DBG younger participants. It is worth noticing that in Brazil, where the study was conducted, the greatest increase in the prevalence of obesity in recent years was in a very similar age group than that of the participants of this study (40-59 years-old) (Ferreira et al., 2021).

The length of the intervention varied from 1 to 6 months, according to individual needs and desire to remain in the inpatient program. The main advantage of such treatment modality is that the multidisciplinary team works in synergy with patients, providing them with daily specific and individualized health care in multiple areas of their expertise (Rondanelli et al., 2023).

In contrast to previous research, depressive symptoms and a comorbid diagnosis of binge eating disorder were associated with less significant weight loss outcomes (Pruccoli et al., 2023). However, the intervention implemented in the present study demonstrated efficacy in significantly reducing patients' BMI. Notably, individuals diagnosed with depression (DEP), binge eating disorder (BED), or both (DEP+BED) exhibited comparable reductions in BMI compared to those in the group without these conditions. These findings suggest that a hospital-based intervention may be an effective treatment strategy for obesity, even in the context of co-occurring psychiatric disorders (Rios et al., 2025). A key feature of this intervention is the comprehensive mental health assessment provided to all participants by a multidisciplinary team, including both a psychologist and a psychiatrist. This integrated approach to addressing psychiatric comorbidities may contribute to increased adherence to the hospital treatment protocol and, consequently, to more favorable weight loss outcomes when compared to outpatient care.

There were no differences in the magnitude of the reduction of weight and BMI among groups. Patients reduced, on average, more than 20kg of body weight, and more than 8.5 points in BMI. This was significantly associated with the duration of the inpatient treatment, regardless of the presence of DEP or BED. Outpatient interventions are usually less effective. A study focused on lifestyle changes conducted for 12 weeks involving regular visits to a hospital and multidisciplinary education observed a mean reduction of 5.35 points in BMI (Langan et al., 2020). In the primary care setting, even with the aid of prescription medication for an average of 130 days, a retrospective study registered the mean loss of 1.2kg of body weight.

At baseline, mean BMI in all 4 study groups were classified as obesity class III (>40) (WHO, 2010). After the inpatient intervention, DG, BG and CG exhibited mean BMI classified as obesity class I (30.0-34.9), and patients from DBG were also very close to this classification, presenting a mean BMI of 35.2. This significant reduction in BMI obtained through lifestyle changes in line with WHO guidelines is crucial to prevent premature death, cardiovascular and joint diseases, cancer and diabetes (WHO, 2010).

The intervention was efficient in significantly reducing patients' BMI. Patients with DEP, BED and DEP+BED presented BMI a similar reduction regarding the group without DEP and/or BED. Although it has been reported that the presence of mental disorders in patients with obesity may negatively impact weight loss, this usually happens due to the low motivation to treatment adherence (Hoffmann et al., 2022). In this sense, an inpatient intervention presents as a good treatment option to ensure adherence (Rios et al., 2025).

The comprehensive intrahospital treatment for patients with obesity was also efficient in reducing and all other anthropometric parameters evaluated in the 4 research groups. Waist circumference, in particular, is associated with increased cardiovascular risk at any given BMI (Chartrand et al., 2022) and is also more sensitive to lifestyle changes than BMI itself (Ross et al.,

 doi:10.20944/preprints202509.1079.v1

2020). The positive result of the intervention in WC highlights its potential to preserve the cardiovascular health of patients with obesity.

The comprehensive intrahospital treatment for patients with obesity was also effective in reducing all other anthropometric parameters evaluated across the four research groups. Waist circumference (WC), in particular, is associated with increased cardiovascular risk, regardless of BMI (Chartrand et al., 2022), and is more responsive to lifestyle modifications than BMI itself (Ross et al., 2020). Moreover, increased WC has been linked to a higher likelihood of experiencing major depressive symptoms or moderate-to-severe levels of depression in overweight and obese adults, further underscoring its clinical relevance (Zhao et al., 2011). The positive impact of the intervention on WC highlights its potential not only to preserve cardiovascular health but also to mitigate risks related to mental health in individuals with obesity.

Despite these findings, this study has some limitations. First, patients were not followed after discharge, so data on the maintenance of the newly acquired healthy habits is unknown. Secondly, the diagnoses of depression and binge eating disorder were established during a single admission assessment. As a result, the prevalence of these conditions may have been underestimated, given that some cases may only have been identified in subsequent evaluations conducted after admission. Third, data on body composition was not available. As in any weight management control program for obese patients, some lean mass must have been lost (Stefanakis et al., 2024). However, to minimize this side effect, patients performed daily sessions of supervised resistance exercises as part of the treatment, besides following a diet program cautiously planned to provide them with the suitable amount of protein intake.

5. Conclusions

In conclusion, patients with DEP, BED with DEP+BED presented equally significant reductions in BMI and WC when compared to the CG, and the reduction in body weight was directly associated with the length of the inpatient intervention.

Author Contributions: Conceptualization, M.C.A.M.O. and N.C.O.; methodology, N.C.O.; validation, X.X., Y.Y. and Z.Z.; formal analysis, N.C.O.; investigation, C.M.M.N.; F.M.C.T.; C.C.C.M. an C.G.P..; resources, S.O.B.; data curation, M.C.A.M.O.; writing - original draft preparation, M.C.A.M.O and N.C.O.; writing- review and editing, N.S.P.; F.F.B. and J.L.S.S.; visualization, S.O.B.; supervision, M.C.A.M.O.; project administration, S.O.B. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics Committee of Bahia State University (protocol code 65578822.1.0000.0057, approved in Apr 10th 2025) for studies involving humans.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data is available upon request.

Acknowledgments: Authors acknowledge the Hospital of Obesity for the support in data collection and publication of this manuscript.

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

F	Females
NS	Non-significant statistical difference
DG	Depression group
DEP	Depression

 doi:10.20944/preprints202509.1079.v1

BG	Binge-eating disorder group
BED	Binge-eating disorder
DBG	Depression + Binge eating disorder group
CG	Control group (without depression or binge-eating disorder)
BMI	Body mass index
WC	Waist circumference
HC	Hip circumference
CC	Calf circumference

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