Problematic Eating Behaviors after Bariatric Surgery: A National Study with a Portuguese Sample

Comportamentos Alimentares Problemáticos após Cirurgia Bariátrica: Um Estudo com Amostra Nacional Portuguesa

ARTIGO ORIGINAL

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ABSTRACT

Introduction: Bariatric surgery is the most effective method for the treatment of morbid obesity. However, the development of eating psychopathology and the emergence of problematic eating behaviours have been reported in the literature. The aim of this cross-sectional study was to characterize the post-bariatric population in terms of the frequency of problematic eating behaviours over time and to understand the related psychological features.

Material and Methods: This sample was composed of 155 bariatric patients that responded to several self-reported instruments assessing eating psychopathology, problematic eating behaviours, anxiety, depression and stress and impulsive behaviour.

Results: Results showed that grazing, binge eating, concerns about body weight and shape, and negative urgency are significantly more frequent at 24 months after bariatric surgery (when compared to earlier postoperative assessments). Correlational analyses showed that eating psychopathology and problematic eating behaviours were significantly and positively associated with levels of anxiety, depression, stress and negative urgency. This study also reinforces the mediating role of negative urgency in the relationship between time elapsed since surgery and psychological distress, and problematic eating behaviours, accounting for a total of 32.3% and 27.2% of its variance, respectively.

Discussion: The results suggest a growing trend of problematic eating behaviours and levels of impulsivity being reported by bariatric patients over time.

Conclusion: Given the established evidence that supports its impact on weight variability, early identification of problematic eating behaviours and of patients with a tendency to act impulsively in situations of negative emotionality should be a central concern in the follow-up of the bariatric population.

Keywords: Bariatric Surgery; Feeding and Eating Disorders/psychology; Feeding Behavior; Obesity, Morbid/surgery; Snacks

RESUMO

Introdução: A cirurgia bariátrica é o método mais eficaz para o tratamento da obesidade mórbida. No entanto, o desenvolvimento de psicopatologia alimentar e o aparecimento de comportamentos alimentares problemáticos têm sido relatados na literatura. Este estudo transversal teve como objetivo a caracterização da população pós-cirurgia bariátrica em termos da frequência de comportamentos alimentares problemáticos ao longo do tempo e a compreensão das características psicológicas associadas.

Material e Métodos: A amostra foi constituída por 155 doentes sujeitos a cirurgia bariátrica que responderam a instrumentos de autorrelato destinados a avaliar psicopatologia alimentar, comportamentos alimentares problemáticos, ansiedade, depressão e *stress* e comportamento impulsivo.

Resultados: Os resultados mostram que o petisco contínuo, a ingestão alimentar compulsiva, a preocupação com o peso e com a forma e a urgência negativa são significativamente mais frequentes 24 meses após a cirurgia bariátrica (comparativamente com momentos pós-operatórios mais precoces). A psicopatologia alimentar e a presença de comportamentos alimentares problemáticos correlacionam-se significativa e positivamente com níveis de ansiedade, depressão, *stress* e urgência negativa. Este estudo reforça ainda o papel mediador da urgência negativa na relação entre tempo decorrido desde a cirurgia e *distress* psicológico, e comportamentos alimentares problemáticos, explicando 32,3% e 27,2% da variância, respectivamente.

Discussão: Os resultados apontam para uma tendência crescente de doentes a reportar comportamentos alimentares problemáticos e níveis de impulsividade ao longo do tempo.

Conclusão: Tendo em conta a evidência estabelecida do seu impacto na perda e aumento ponderal, a identificação precoce de comportamentos alimentares problemáticos e de doentes com tendência para agir impulsivamente em situações de emocionalidade negativa deve ser central no acompanhamento do doente sujeito a cirurgia bariátrica.

Palavras-chave: Cirurgia Bariátrica; Comportamentos Alimentar; Compulsão Alimentar/psicologia; Obesidade Mórbida/cirurgia; Petisco Contínuo

INTRODUCTION

Obesity is defined as an abnormal or excessive fat accumulation and is considered by the World Health Organisation as one of the major concerns in modern society, associated with high mortality and prevalence rates.[1]

Bariatric surgery is the most efficient treatment for morbid obesity and has an indication in patients with body mass index (BMI) ≥ 40 kg/m^2 or ≥ 35 kg/m^2 in the presence of medical comorbidities.[2] Surgery is also associated with significant psychological, physical and social improvements apart from allowing for a significant weight loss and

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improvements or resolution of related comorbidities.[3,4]

Despite the improvements, widely variable surgical long-term outcomes have been found, in terms of weight loss and its maintenance,[5] as well as regarding patient's psychological status.[6] The development of eating disorders and problematic eating behaviours (PEBs) has been frequently described in literature[7-9] and of particular concern to researchers and clinicians.

In fact, after surgery, patients are recommended to comply with a restrictive diet plan aimed at weight loss, with dietary intake monitoring. This restrictive diet plan should be maintained in the long-term by some patients, according to Conceição *et al.*,[10] in order to control body weight, through the implementation of strict eating patterns. Therefore, frequent reminders made by healthcare professionals regarding the chance of a weight gain, a declining weight loss rate or normal weight variations when a weight loss plateau is reached seem to raise significant concerns regarding weight control in a subgroup of patients, leading to the development of postoperative problematic eating behaviours among postoperative bariatric surgery patients.[10] In fact, unhealthy weight control behaviours have been described by some patients[9] and greater attention should be given to the assessment of these psychiatric disorders and their symptoms.

The presence of postoperative rather than preoperative PEBs has been described in literature as a risk factor for poorer weight loss outcomes.[8-10] Apart from eating disorders, different PEBs that do not meet the DSM-V diagnostic criteria have been identified.[11] The presence of grazing,[12] loss of control over eating (regardless of the intake) and binge eating episodes[13] or emotional eating[14] seem to be associated with lower weight loss and/or weight gain, particularly 1.5 - 2 years after surgery.[8]

This study primarily aimed at the characterisation of postoperative bariatric population in a community context, in terms of PEBs and psychological characteristics in a Portuguese group of patients, in order to understand the relationship between postoperative time, psychosocial status and PEBs.

MATERIAL AND METHODS

Sampling and procedure

This is a cross-sectional study designed for the assessment of the prevalence of postoperative problematic eating behaviours and to understand the associated psychological characteristics. Study participants were recruited online within six Facebook® social groups of bariatric patients in cooperation with the Portuguese Bariatric Patients Association (*Associação Portuguesa dos Bariátricos*) (APOBARI), where only members have access to published information. Members of the APOBARI and within these groups include patients nationwide. Patients aged 18 and over having undergone bariatric surgery and registered as members of at least one of these Facebook groups were included in the study. Pregnancy or breastfeeding have been considered as exclusion criteria.

Data collection was entirely obtained online. An invitation for the participation in the study has been posted by the research team every two weeks over a 20-week period of time between Nov 2016 and March 2017, including a link for the completion of the group of questionnaire through a Google Drive application. The study and its aims were initially described and the voluntary and anonymous participation was mentioned. An informed consent was included in the study and only one entry per person was admitted.

Instruments

Social, demographic and clinical questionnaire

This questionnaire was used for information collection regarding patient's age, marital status, education level, occupation, type of bariatric surgery, postoperative time and the use of dietary supplements.

Eating disorder-15 (ED-15)[15]

The ED-15, a 15-item questionnaire, was translated by Machado (2016) and is aimed at the assessment of symptoms of eating disorders. The attitudes associated with behavioural psychopathology are assessed by ten items and responses are assessed on a seven-point Likert scale (0 = Nothing to 6 = Always) and two subscales are provided (eating concern and body weight and shape concern). The four items aimed at the assessment of the use of compensatory strategies were used for this study.

Depression, Anxiety and Stress Scale – 21 items (DASS-21)[16,17]

This is a 21-item scale, divided into three subscales (anxiety, depression and stress) and responses were given considering how statements applied to responder over the past week scored on a four-point Likert-type scale (0 = did not apply to me at all; 3 = applied to me most of the time). This scale is used to measure emotional states and the higher the score, the more negative the patient's emotional state is. The sum of the scores in the three subscales (DASS-21_Total) was used as a measure of patient's psychological distress.

UPPS-P (Urgency, Premeditation (lack of), Perseverance (lack of), Sensation Seeking, Positive Urgency) Impulsive Behaviour Scale[18]

This is a 59-item scale divided into five subscales (negative urgency, lack of premeditation, lack or perseverance, sensation seeking and positive urgency). This scale allows for the assessment of impulsivity based on the dimensions of the Five-Factor Personality Model. 'Negative urgency' was the only subscale that was administered in this study, showing the trend towards acting impulsively in the presence of negative emotional situations. This is a 12-item scale scored on a four-point Likert-type scale (1 = I fully agree; to 4 = I fully disagree).

Questionnaire for the assessment of problematic eating behaviours (*Questionário de avaliação de comportamentos alimentares problemáticos* (QACAP)

This instrument was developed by the authors for this study and is aimed at the identification of the number of days over the past week in which the following PEBs have occurred: i) skipping meals, ii) grazing ('unplanned, repetitive eating of small amounts of food through the whole day'; iii) overeating; iv) emotional eating ('I could not avoid eating due to the fact that I was feeling anxious, nervous, sad or due to other emotions'); v) loss of control over eating ('I felt that I had lost control on what I was eating'); vi) binge eating episodes ('I have been eating too large amounts of food for the circumstances').

Data analysis

Collected data were subject to statistical analysis and treatment by use of the Statistical Package for Social Sciences® (SPSS) – version 24 software (for Windows).

Descriptive and chi-square analysis were carried out in order to characterise the group of patients and to assess the presence of any problematic eating behaviour at different postoperative moments. Univariate (ANOVA) and multivariate analysis of variance (MANOVA) were used to search for differences in the psychological variables that were analysed regarding the different postoperative times. Spearman's correlations were used to test for the existing correlations between the psychological variables and the presence of problematic eating behaviours. Finally and even though this was a cross-sectional study, two mediation models were tested, allowing for the study of the percentage of variance explained by the relationship between two variables (for instance, postoperative time or psychological distress and PEBs) through the mediator effect of a third variable (for instance, negative urgency). PROCESS macro for SPSS, using 5000 bootstrap samples and a 95% confidence interval were used and *p*-value <0.05 was considered as statistically significant.

RESULTS

A group of 155 patients were included in the study [92.3 female, age range 24 - 62, mean age 40.37 (SD = 8.1); 9% of patients had completed basic education, 44.5% secondary and 46.5% high school].

Most patients (61.3%) were married or lived as a couple, 31% single and 7.7 divorced. Most patients were employed (81.3%), 16.1% unemployed and 2.6% students. Most patients underwent gastric bypass (69.7%), 26.5% gastric sleeve and 3.8% other bariatric surgery or were unaware of the surgery type. As regards postoperative time, 47 patients (30.3%) were operated no more than six months earlier [group A], 34 (21.9%) between six and 11 months [group B], 28 (18.1%) between 12 and 23 months [group C] and 46 (29.7%) over 24 months earlier [group D]. The fact that most of the patients were on dietary supplements (60.6%) is worth mentioning.

The percentage of participants in each group having described at least one PEB over the previous week is shown in Table 1. According to the results, statistically significant differences were found between the groups regarding all the PEBs except 'skipping meals' regarding which only a marginally significant difference has been found. Nevertheless, a relevant percentage (60% - 66%) of patients describing a skipping meals behaviour have been found in group A and D. Grazing has been described by a high percentage of patients (> 82%) in group A. The highest percentage of patients (> 50%) describing overeating, emotional eating, loss of control over eating and binge eating episodes has been found in group D. Non significant differences were found between the different groups as regards compensatory strategies assessed by the ED-15 questionnaire.

Scores in psychological dimensions assessed by the remaining self-reported questionnaires for each postoperative moment are shown in Table 2: body weight and shape concern and eating concern (ED-15); anxiety, depression and stress (DASS-21) and negative urgency (UPPS-P).

Table 1 – Percentage and mean time (in days) over the previous week or month, in which patients have described dysfunctional eating patterns throughout the postoperative times, as assessed by the QACAP and ED-15 questionnaires

	0 – 5 months n (%)	6 – 11 months n (%)	12 – 23 months n (%)	≥ 24 months n (%)	Total n (%)	$\chi^2(3)$
QACAP - Grazing	21 (44.7)	28 (82.4)	24 (85.7)	41 (89.1)	114 (73.5)	**29.36***
QACAP - Skipping meals	31 (66.0)	13 (38.2)	13 (46.4)	28 (60.9)	85 (54.8)	7.61§
QACAP - Overeating	16 (34.0)	21 (61.8)	14 (50.0)	34 (73.9)	85 (54.8)	**15.89***
QACAP - Emotional eating	14 (29.8)	17 (50.0)	14 (50.0)	33 (71.7)	78 (50.3)	**16.37***
QACAP - Loss of control over eating	13 (27.7)	17 (50.0)	12 (42.9)	30 (65.2)	72 (46.5)	**13.50***
QACAP – Binge eating episodes	8 (17.0)	5 (14.7)	8 (28.6)	24 (52.2)	45 (29.0)	**18.64***
ED-15 - Vomiting	8 (17.0)	1 (2.9)	3 (10.7)	6 (13.0)	18 (11.6)	3.94
ED-15 - Use of laxatives	5 (10.6)	n.o.	2 (7.1)	5 (10.9)	12 (7.7)	4.05
ED-15 - Restrictive diet	31 (66.0)	20 (58.8)	13 (46.4)	28 (60.9)	92 (59.4)	2.84
ED-15 - Excessive physical activity	16 (34.0)	13 (38.2)	16 (57.1)	18 (39.1)	63 (40.6)	4.13

ED-15: Eating disorder-15; QACAP: Questionário de avaliação de comportamentos alimentares problemáticos; MD: missing data; * $p < 0.01$; § $p < 0.1$

At first, the highest values in the different self-reported measures were found in group D. However, only moderate differences were shown by the results, not always reaching a statistical significance.

As regards the scores obtained with the ED-15 questionnaire, no statistically significant univariate differences were found in 'eating concerns' subscale, according to the different postoperative times. However, statistically significant multivariate differences were found in 'body weight and shape concerns' subscale and post-hoc LSD tests have suggested that patients in group A and D had shown significantly higher scores regarding body shape concerns when compared to the remaining groups.

No statistically significant univariate differences were found in subscales of anxiety, depression and stress, according to postoperative time, considering the subscales of the DASS-21.

Finally, statistically significant differences regarding negative urgency were found between the different groups. Patients in group A showed lower negative urgency than patients in the remaining groups, according to LSD post-hoc test.

Even though few significant differences between the groups were found regarding psychological variables, these were found in behavioural variables that were assessed by the QACAP scale. Correlations between the variables in the study were analysed in order to understand which variables were associated with PEBs (Table 3). 'Problematic eating behaviours (PEBs)' variable, corresponding to the sum of the variables assessing grazing, overeating, emotional eating, loss of control over eating and binge eating episodes, was considered for this analysis. Therefore, PEB variable showed the number of days over the previous week that were described by patients with at least one of the PEBs that were assessed. Spearman tests have shown that the longer the postoperative time, the highest the negative urgency levels were and the more frequent the PEBs. In addition, the presence of PEBs was significantly and positively correlated with higher levels of anxiety, depression and stress and negative urgency. Finally, the presence of psychopathology related to eating disorders (assessed by the ED-15 scale) and particularly to body weight and shape concerns, is also significantly and positively correlated with higher levels of anxiety, depression and stress. Particularly strong correlations (> 0.4) were found between postoperative time and PEBs, between these and negative urgency and negative urgency and stress.

Considering one of the major aims of this study, which was understanding the presence of PEBs through time in this group of patients, two mediation models were tested, the first one with the aim at understanding whether the presence of PEBs in the long term, which has been described in literature as being associated with poorer weight loss outcomes, would be explained by a trend towards impulsive actions in the presence of situations with negative emotionality (negative urgency). Results have confirmed our hypothesis, as they have shown that negative urgency has helped us explaining the relationship between postoperative time and the presence of PEBs.

The mediation analysis has shown that negative urgency has a mediator role in the relationship between time from surgery and PEBs, F (2152) = 36.28, $p < 0.001$ and this model has explained for 32.3% of the total variance of PEBs. A significant indirect effect, $b = 0.026$, BCa CI [0.005; 0.050] and a significant direct effect ($b = 0.061$, $p = 0.001$) have also been found (Fig. 1).

The results of this mediation model have suggested that the longer the postoperative time, the higher the trend towards the development of PEBs, due in part to a higher trend to act impulsively in the presence of negative emotional states [when the mediator variable is introduced – negative urgency – the strength of the relationship between the independent (postoperative time) and the dependent variable (PEBs) is reduced (C = 0.086, $p < 0.001$; C' = 0.061, $p = 0.001$)]. In addition, the indirect path (the effect of mediation) explained for around 30% of the total effect (ratio of indirect into the total effect = 29.6%).

Considering the significant correlation (Table 2) also found between negative urgency and psychological distress and considering the current literature in which an association between psychological distress and PEBs with poorer weight loss outcomes has been described,[8,19] we have

Table 2 – Differences in subscales of the ED-15, DASS-21 and UPPS questionnaires according to postoperative times

	0 - 5 months (n = 47) Mean (SD)	6 - 11 months (n = 34) Mean (SD)	12 - 23 months (n = 28) Mean (SD)	≥ 24 months (n = 46) Mean (SD)	F (3.15)
ED-15_total	2.97 (1.39)	2.26 (1.20)	2.39 (1.08)	2.76 (1.43)	2.37
Eating concern	3.24 (1.45)	2.72 (1.15)	2.92 (1.40)	2.95 (1.47)	0.97
Concern with body weight and shape	2.70 (1.83)	1.81 (1.60)	1.87 (1.44)	2.57 (1.78)	**2.79***
DASS-21_total	10.96 (9.71)	11.62 (11.16)	11.57 (9.39)	14.17 (10.90)	0.85
Anxiety	3.23 (2.88)	2.82 (2.72)	3.25 (3.33)	4.02 (3.34)	1.09
Depression	2.72 (3.89)	3.09 (4.80)	2.82 (3.47)	4.17 (4.64)	1.07
Stress	5.00 (4.26)	5.71 (4.92)	5.50 (3.84)	5.98 (4.09)	0.43
UPPS- Neg Urg	23.45 (8.36)	27.29 (7.84)	28.11 (8.18)	28.96 (9.20)	**3.70****

ED-15: Eating disorder-15; DASS-21: Depression, Anxiety and Stress scale; UPPS_Neg_Urg: Subscale of negative urgency; * $p < 0.05$; ** $p < 0.01$

Table 3 – Correlations (Spearman's correlation coefficient) between variables

	Postoperative time (months)	PEBs	ED-15 Concern with weight and shape	ED-15 Food concern	ED-15 Total	DASS-21 Anxiety	DASS-21 Depression	DASS-21 Stress	DASS-21 Total	UPPS- Neg Urg
1 -	-									
2 -	**0.401****	-								
3 -	-0.046	0.125	-							
4 -	-0.062	0.023	**0.413****	-						
5 -	-0.039	0.096	**0.861****	**0.801****	-					
6 -	0.052	0.219**	0.380**	0.054	2.53**	-				
7 -	0.151	0.297**	0.323**	-0.004	0.174*	**0.640****	-			
8 -	0.091	0.342**	0.269**	0.046	0.172*	**0.657****	**0.652****	-		
9 -	0.105	0.331**	0.352**	0.046	0.221**	**0.844****	**0.824****	**0.931****	-	
10 -	0.238**	**0.484****	0.061	-0.189*	-0.069	0.268**	0.277**	**0.444****	0.387**	-

PEBs: problematic eating behaviours; ED-15: Eating disorder-15 questionnaire; DASS-21: Depression, Anxiety and Stress Scale; UPPS_ Neg_Urg: Subscale of negative urgency; correlation values > 0.4 are shown in bold; * $p < 0.05$; ** $p < 0.01$

considered the hypothesis that an impulsive tendency to act in the presence of situations with negative emotionality would be a mediator of the relationship between psychological distress and PEBs. The results of the second mediation model have shown that the relationship between psychological distress (DASS-21_Total) and PEBs is entirely mediated by negative urgency (impulsive behaviour in the presence of situations with negative emotionality), F (2 152) = 28.32, $p < 0.001$ and this model explained for 27.15% of total variance of PEBs. A significant indirect effect, $b = 0.133$, BCa CI [0.079; 0.207] and a non-significant direct effect (c') ($b = 0.048$, $p = 0.333$) have also been found - (Fig. 2).

The results of this model of mediation have suggested that poorer psychological distress is associated with higher frequency of PEBs as it is associated with higher levels of negative urgency (when the mediator variable is introduced into the model – negative urgency – the significance of the relationship between psychological distress and PEBs is removed (C = 0.181; $p < 0.001$; C' = 0.048, $p = 0.333$). In addition, the indirect path (the effect of mediation) explained for around 74% of the total effect (ratio of the indirect effect into the total effect = 73.5%).

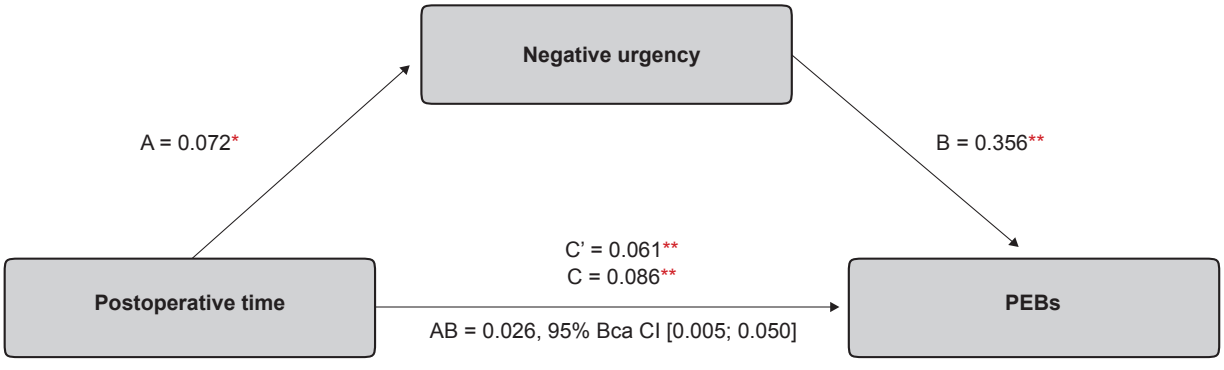

Figure 1 – Coefficients of the mediation model: the mediator effect of negative urgency in the relationship between postoperative time and the frequency of problematic eating behaviours (PEBs).
* $p \leq 0.05$. ** $p \leq 0.001$

DISCUSSION

This study aimed at the characterisation of bariatric postoperative patients as regards problematic eating behaviours and associated psychopathology. Knowledge on eating disorders in these patients has a major significance due to its association with poorer outcomes and higher psychological distress. In addition, this study was also focused on the relationship between postoperative time, psychological status and eating behaviour.

A worrying percentage of patients having undergone bariatric surgery and describing problematic eating behaviours has been found in this study considering that the presence of PEBs has been associated with poorer outcomes in terms of weight loss. Around 54% of the patients have described skipping meals; 73.5% grazing; 54.8% overeating; 50.3% emotional ingestion; 46.5% compulsive eating and 29.0% binge eating episodes, at least once over the previous month. A higher percentage of patients in group D have described different PEBs, in line with literature, in which PEBs tend to present beyond two years after surgery.[20] Higher prevalence has been found in our study, when compared to literature,[21] which may be explained by the assessment strategy that was used in the study (self-report) and by the frequency that was considered for the presence of a behaviour (at least once over the previous week). Nevertheless, the patient's perception on his/her eating behaviour should become the central strategy for the early detection of these behaviours. In addition, as the frequency of these behaviours tends to increase with time, its early detection becomes crucial in a time when there is still no impact on surgery-related weight outcomes.[8]

As regards the items in the ED-15 questionnaire for the assessment of compensatory strategies such as vomiting, the use of laxatives/diuretics, excessive exercise and eating restriction aimed at body weight and shape control, the distinction between the use of these behaviours within a psychopathological context or within bariatric surgery has been described as challenging to healthcare professionals.[9] These behaviours are usually described by patients with eating disorders as maladaptive strategies for weight control. However, the presence of vomiting as a reaction to food intolerance is a usual presentation in postoperative period, as well as the use of laxatives/diuretics for regular bowel movements. In addition, physical activity and restrictive and intense eating control are recommended by healthcare professionals to patients submitted to bariatric surgery. Therefore and considering that our results were obtained by self-report, these may have been biased by the lack of knowledge of the clinical meaning of these behaviours. Considering that the development of eating disorders has been increasingly described in literature,[9] healthcare professionals should therefore receive training aimed at a correct assessment of these behaviours.

Even though no significant differences were found regarding most of the psychological variables that were assessed (except negative urgency), differences between groups regarding body weight and shape concerns have been suggested by multivariate results (although not in post-hoc tests) and are worth mentioning, with higher scores found in patients in group A and D (Table 3). This results may reflect the significant weight change that patients submitted to bariatric surgery present over the initial six postoperative months which may decline two years after surgery due to the presence of excess skin.[22] An increasing prevalence of anxiety, depression and stress has been described in literature,[6] particularly beyond two years after surgery. In our study, even though higher scores have been found in group D patients, non-significant differences have been found. Finally, statistically significant differences were found as regards negative urgency, according to postoperative times. Post-hoc tests have shown that patients in group A presented lower levels of negative urgency when compared to patients in group D (mean difference = 5.51; 95% CI -10.20 – -0.82). Negative urgency was significantly correlated with the presence of PEBs (Table 3). Therefore, even though no significant differences regarding psychological distress (anxiety, depression and stress) seem to occur according with postoperative time, patients with longer postoperative time tend to present more impulsive strategies to cope with emotionally negative situations which, in turn, explained for the higher prevalence of PEBs over time. In addition, we have considered that the correlation between depression and PEBs was also better explained by negative urgency. Negative urgency was suggested as a

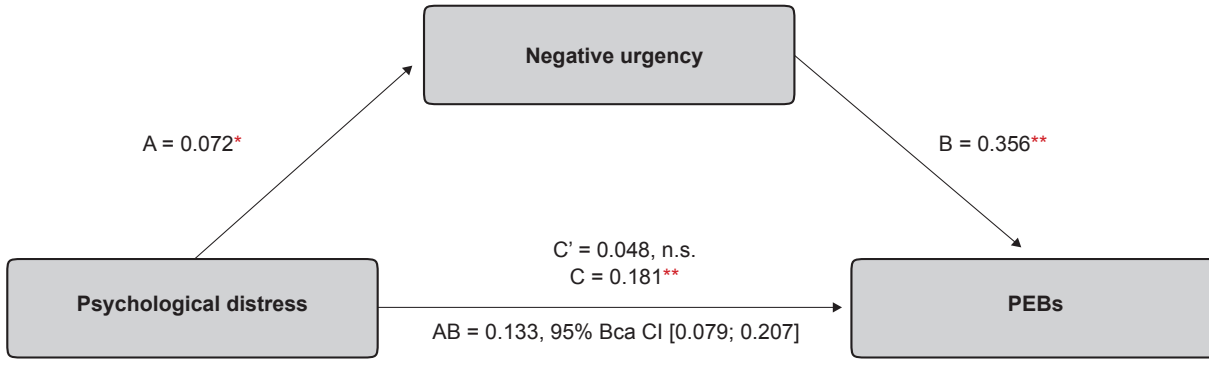

Figure 2 – Coefficients of the model of mediation: the mediator effect of negative urgency in the relationship between psychological distress and the frequency of problematic eating behaviours (PEBs).
* $p \leq 0.05$. ** $p \leq 0.001$

significant mediator of the relationship between postoperative time and PEBs and psychological distress and PEBs by the mediation models that were tested. These results have counteracted those published by Schag *et al.*,[23] in which an indirect result of impulsivity on weight loss is supported, possibly mediated by depressive symptoms and dysfunctional eating behaviour. Nevertheless, in our study, the models that were tested with the variable of psychological distress in the role of a mediator (non-presented data) were not significant. Further studies should include the analysis of the role of negative urgency in weight loss outcomes, as well as the mechanisms through which this relationship is operated.

The small sample size (155 participants), considering that patients were divided into four different groups, the asymmetry in gender ratio and the fact that assessment of PEBs was obtained by self-report were the limitations of this study, which tend to overestimate the presence of these behaviours. Nevertheless, the fact that patients have been selected online and outside the hospital has allowed for the identification of patient's subjective experience without the bias of the influence that any healthcare professional would represent in terms of treatment. In addition, patients submitted to different types of surgery have been included in the study. Unfortunately, few patients having been submitted to other than gastric bypass have been included, a limitation for testing any differences between different groups. Further studies should analyse whether or not these relationships or the frequency of the different PEBs remain unchanged in patients having been submitted to different surgical procedures.

CONCLUSION

The high prevalence of problematic eating behaviours (PEBs) found in patients submitted to bariatric surgery, as well as the role of the tendency to act impulsively in the presence of emotional situations explaining for the presence of PEBs are worth mentioning. Patients with longer postoperative times or describing higher scores of psychological distress tend to act more impulsively in the presence of emotional situations, which is more frequently associated with PEBs. The importance of a careful and systematic assessment through time not only of the presence of PEBs as also focused on the way that patients deal with negative emotions is shown by our data. Considering the evidence that was established by the impact of PEBs in weight loss and gain,[20-21,24] the early identification of PEBs and the development of training skills on emotional management, particularly in the long term after surgery, seem relevant strategies for better compliance with the necessary behaviour change in order to maintain weight loss in the long term.

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HUMAN AND ANIMAL PROTECTION

The authors declare that the followed procedures were according to regulations established by the Ethics and Clinical Research Committee and according to the Helsinki Declaration of the World Medical Association.

DATA CONFIDENTIALITY

The authors declare that they have followed the protocols of their work centre on the publication of patient data.

CONFLICTS OF INTEREST

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