



Binge eating as a determinant of emotional state in overweight and obese males with cardiovascular disease

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ABSTRACT

Objectives: The present study investigates the association between depression, anxiety and binge eating at baseline with weight-change after an approximately 1-year period in a clinical sample of obese adult males with cardiovascular disease.

Methods: At the time of the first measurement, the sample consisted of 69 overweight and obese men (age range between 36 and 74); 34 patients attended a follow-up measurement 6–17 months after the first measurement, and completed selected psychological instruments.

Results: After the follow-up period, only 28.7% patients' lost weight, 29.9% patients' had the same weight, and finally 41.4% patients' gained weight. When comparing the first and the second assessments, the level of anxiety and depression is relatively stable. Men, who, at the time of the second assessment, gained weight, and were binge eating at baseline, were more depressed and anxious in comparison with the other two groups of patients.

Conclusions: It is necessary to focus primarily on binge eating symptoms as a part of weight reduction treatment as well as to treat anxiety and depression in CVD patients. Binge eating is an eating disorder per se, and therefore it is important to treat it before the person starts weight reduction procedures as part of the risk prevention treatment for CVD patients.

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1. Introduction

Cardiovascular disease (CVD) is the central cause of death not only in western, industrialized countries, but also in transitional countries such as Croatia. Traditional risk factors (e.g., smoking, hypertension, hypercholesterolemia, diabetes, and obesity) only explain about 40% of the variance of CVD [1–6]. Obesity represents a condition that has been consistently linked to cardiovascular disease mortality [3,4]. However, the development of CVD can be affected by psychological factors such as the emotional states of anxiety and depression [7]. Several researchers have found that depression is a greater risk factor for cardiovascular disease than diabetes, high cholesterol, smoking or obesity [8]. In light of the forecast that in 2020 depression will be the second most important cause of disability at the global level [9], we need to intensify the efforts to understand exactly why depression increases the risk of CVD. Obese persons seeking treatment have higher levels

of psychopathology, especially those with binge eating disorders and depression in comparison with non-treatment seeking obese persons [10,11]. However, evidence about the link between obesity and psychopathology in the general population is much less reliable, and indeed, some earlier studies suggested that obese persons have better mental health than the non-obese [12].

A German population sample which investigated depression, anxiety disorder, somatoform disorder, and substance use disorder, only found elevated rates of anxiety disorder and only among obese men [13]. In the United States, Simon et al. found significant associations between obesity and lifetime depression, bipolar disorder, and panic disorder/agoraphobia [14].

Although the link between depression and weight problems is well established, researchers cannot yet clarify whether depression, weight loss or gain, precede or follow the onset of depression. In order to explore the longitudinal relationship between depression, being overweight, and obesity, Lupino et al. [15] conducted a systematic review and meta-analysis of 15 studies. Their analysis confirms the existence of a reciprocal link between obesity and depression: obese persons had a 55% increased risk of developing depression over time, and depressed persons had a 58% increased risk of becoming obese.

Several studies have supported the assumption that elevated depressive symptoms are associated with less success at losing

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weight [16]. However, in some studies, depression severity has failed to emerge as a significant predictor of weight loss [17]. It is interesting to note that some researchers have found that baseline depressive symptoms actually led to enhanced weight loss following different obesity interventions [18]. These results suggest that psychological distress or impaired well-being may be a motivational factor for weight loss.

Binge eating is recognized as an important characteristic, which has been associated with poorer outcomes of treatment in obese patients [19], while reductions in uncontrolled binge eating during treatment have been associated with greater weight loss [17]. However, other studies have reported no association between binge eating and weight loss outcome [e.g. 20,21], and some researchers have concluded that obese binge eaters respond equally well to behavioural treatment for obesity compared to non-binge eaters [22]. Some researchers find a greater prevalence of additional psychopathology among males who binge eat [23].

In patients with myocardial infarction, clinical depression is often under diagnosed [24,25] and associated with poor medical outcome and increased mortality [26]. Some clinical studies report a prevalence of 17% to 22% for major depression during the first year after myocardial infarction, which is higher in women than in men [24,26]. Frasure-Smith et al. [26] and Schleifer et al. [27] found that two thirds of patients with major depression in the first 3 months after infarction were still depressed at their 12-month follow-up. Myocardial infarction patients with an initial minor depression often developed major depression within the first year [28], and according to the results of Lesperance et al. [24], 50% of those, depressed 1-year post- myocardial infarction, had developed major depression.

Major depression tends to take a chronic course, and comorbid anxiety disorders are common and add to the disease weight and to the impairment level [28]. Although some studies indicate that anxiety symptoms are only temporary features for most persons in the period of post-myocardial infarction [28,29], the association between myocardial infarction and anxiety has not been clearly demonstrated.

It is interesting to note that abdominal obesity and depression-anxiety show similar neuroendocrine abnormalities, which consequently induce the accumulation of fat in central depots and other risk factors that contribute to cardiovascular disease and diabetes mellitus. It is hypothesized that this pathogenic pathway may lead from frequent depressive episodes to somatic disease [30].

Depression and obesity may cause moderate to severe impairments that affect quality of life, and both of them can be difficult to treat. For this reason, all research that can help to understand the development, maintenance and treatment of these disturbances is very important. In view of the fact that depression is a potentially preventable and treatable condition, early identification of subjects with high risk for a CV disease has important clinical implications.

The present study investigates the association between depression, anxiety and binge eating at baseline (Time 1) with weight-change after an approximately 1-year period in a clinical sample of obese adult males with cardiovascular disease. In other words, we set out to assess what happened to the psychological variables in relation to weight-change during this period.

2. Methods

2.1. Subjects

At the time of the first measurement, the sample consisted of 69 overweight and obese men age ranging between 36 and 74 ($M=57.91$, $SD=7.09$), with a body mass index (BMI) ranging

from 26.37 to 42.25. The patients were admitted to the Department of Cardiology and Cardiac Rehabilitation at the Clinic for Treatment, Prevention and Rehabilitation of Cardiovascular Disease Thalassotherapy in Opatija, Croatia. They had suffered a major cardiovascular event, acute myocardial infarction or myocardial revascularisation.

Thirty-four patients attended the follow-up measurement after a period of 6–17 months and completed the selected psychological instrument. The follow-up time variability is related mostly to organizational reasons. The small groups of patients were invited every 6 months considering their availability. For this reason some patients were able to attend the follow-up study within the period of more than 6 or 12 months. The rest of the patients, as they mentioned during our telephone contact with them, did not attend the control exam either because of the long distance from their home to the hospital, financial reasons, problem with work absence and health reasons.

2.2. Measures

Depression and anxiety was assessed using the *Hospital Anxiety and Depression Scale* (HADS) [31]. The HADS is a self-report questionnaire consisting of a 14 four-point Likert-type format, assessing anxiety (HADS-A) and depression (HADS-D) over the last 2 weeks. Higher scores represent higher levels of distress. It is a widely used self-rating scale originally designed for detecting depression and anxiety in patients with cardiac disease and other medical conditions. It was designed to avoid false-positive cases among individuals with somatic illness. It contains no questions on somatic symptoms, sleep, or appetite disturbance, focusing on the psychological and cognitive symptoms relevant to the two disorders. The clinically tested classification system developed for HADS considers a score of 0–7 on a sub-scale to be within the normal range, a score of 8–10 to be “a possible case”, and a score of 11 or more to be a case of depression or anxiety [31]. A cut-off score of 8 in each subscale has been found to be the optimal level for case finding. Cronbach's alpha coefficient for the HADS-A was .86, and for the HADS-D was .63 in this sample.

Binge eating scale (BES) is a 16-item questionnaire used to assess the presence of binge eating behaviour. Gormally et al. [32] specifically developed this instrument for use with obese individuals. The questions are based on both behavioural characteristics (e.g., amount of food consumed) and the emotional, cognitive response, and guilt or shame. Each question has 3–4 possible responses assigned with a numerical value. The score range is from 0 to 46. A score less than 17 is considered non-binging, a score of 18–26 as moderate binging and a score of 27 and greater as severe binging. Cronbach's alpha coefficient for the scale in this sample is .81.

Body mass index (BMI) was calculated as weight (kg) divided by height squared (m^2), and obesity was defined as $BMI \geq 30 \text{ kg}/m^2$.

2.3. Procedure

At the time of hospitalization at the Clinic, all participants completed the HADS and the BES as previously described. The weight-loss treatment consisted of decreased caloric intake combined with recommendation for physical exercise, which all patients received. The patients were contacted again after 6–17 months with the aim of monitoring the weight changes and their psychological status. During the follow-up, the patients again completed the HADS.

2.4. Statistical analysis

All analyses were conducted using SPSS version 15. For correlation analyses involving psychological measures, BMI,

Table 1
The mean values of all measures in relation to the weight change.

	Weight change			^a F _{2,66} ^b F _{2,31}
	Decrease (N = 18)	Same (N = 20)	Increase (N = 31)	
Anxiety – baseline ^a	4.78	4.85	5.13	.06
Anxiety – Time 2 ^b	4.17	5.50	7.00	.89
Depression – baseline ^a	4.15	4.45	4.50	.10
Depression – Time 2 ^b	3.50	4.93	5.75	.91
Binge eating – baseline ^a	7.72	8.53	8.83	.20

weight-change and age, we used Pearson correlation coefficients. A one-way analysis of variance was used to test the differences among three groups of patients regarding weight-change (decrease, same, increase body weight) in anxiety, depression and binge-eating scores. To define the differences in number of patients with high and low anxiety and depression scores between the first and second measurements we used a proportion test. Finally, to evaluate if BMI, age, binge eating, and weight change could predict anxiety and depression at the baseline and the follow-up, standard regression analysis was used.

3. Results

After the follow-up period of 6–17 months only 28.7% of patients have lost weight (from 2 to 11.30 kg), 29.9% of patients' weight remained the same (plus or minus 2 kg), and finally 41.4% patients have gained weight (from 2 to 14 kg). The results of the analysis of variance showed that there were no differences in anxiety, depression (at baseline and follow-up) and binge eating (at baseline) among those three groups of patients (Table 1).

Regarding the level of anxiety and depression 76.4% patients did not express anxiety symptoms despite their hospitalization because of serious cardiovascular problems. Just 11.8% of patients showed the signs of possible anxiety, and 11.8% had anxiety symptoms. In terms of depressive symptoms, 82.7% patients were not depressed, 14.5% had possible depression, and only 2.7% patients were depressed. The binge eating scale results showed that 91.6% of patients did not have binge eating symptoms, 7.5% showed moderate bingeing and 0.9% severe bingeing.

Although the number of patients with anxiety and depressive symptoms was not so prominent, it was interesting to evaluate possible changes in anxiety and depression between the first and the second time of measurement. We conducted a proportion analysis, where the results are shown in Figs. 1 and 2.

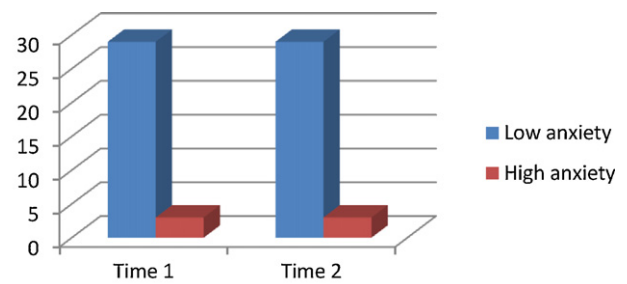
The proportion test showed that there were no differences in the level of anxiety and depression between the first and the second measurements. This means that the level of anxiety and depression is relatively stable when comparing the first and second assessments. Those patients who initially expressed a low level of anxiety

Table 2
Correlation among all measured variables for overall sample.

	1	2	3	4	5	6	7	8
1. Body mass index – baseline	–	–.15	.15	–.15	–.18	.01	–.11	–.11
2. Age		–	–.13	–.09	.08	–.02	.11	.22
3. Binge eating – baseline			–	.35**	.18	.09	.44*	.44*
4. Anxiety – baseline				–	.51**	.05	.75**	.73**
5. Depression – baseline					–	–.02	.38*	.48**
6. Weight change (Time 1 – Time 2)						–	.23	.22
7. Anxiety – Time 2							–	.88**
8. Depression – Time 2								–

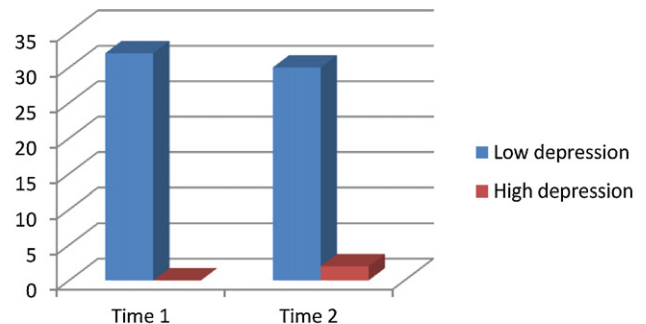
* $p < .05$.

** $p < .01$.



Note. Low anxiety = score less than 11; high anxiety = more than 11

Fig. 1. Differences in number of patients with high and low anxiety scores between the first and second measurements.



Note. Low depression = score less than 11; high depression = more than 11

Fig. 2. Differences in number of patients with high and low depression scores between the first and second measurements.

and depression showed the same pattern in these negative affects the second time and vice versa.

Table 2 shows correlations among variables used in the first and the second assessment time.

A correlation matrix (Table 2) computed on the results of the overall sample reveals significant positive relationships among anxiety at baseline with depression at baseline, as well as with anxiety and depression measured at Time 2. We find the same situation in relation to depression at baseline. It is important to note that higher scores for binge eating were associated with higher scores for anxiety at baseline, as well as with anxiety and depression at Time 2.

In order to explore the amount of explained variance in depression at baseline and at Time 2, two standards of multiple regressions were performed. Participants' body mass index, age, binge eating, and change in weight between Time 1 and Time 2 were entered in regression analysis as predictors. The results presented in Table 3 show that the mentioned predictors could reliably predict depression. In the first regression analysis, binge eating was an important predictor of depression at baseline explaining 7% of variance: men with cardiovascular disease who reported binge eating were more

Table 3
Standard regression analysis: predicting depression from BMI, age, binge eating, and weight change.

Predictor	Depression – baseline		Depression – Time 2	
	β	R^2	β	R^2
		.07 ^a		.39 ^{**}
BMI	-.17		-.21	
Age	.10		.18	
Binge eating	.21 [*]		.55 ^{**}	
Weight change (Time 1 – Time 2) ¹	–		.42 [*]	
	$F_{3,102} = 2.63^a$		$F_{4,27} = 4.24^{**}$	

¹ Weight change – entered in regression only for depression at Time 2.

^a $p < .06$.

^{*} $p < .05$.

^{**} $p < .01$.

depressed at the time of the first assessment. In the second analysis, important predictors of depression at Time 2 were binge eating and weight change. All variables together accounted for 39% of total variance. Men, who, at the time of the second assessment, gained weight, and were binge eating at baseline, were more depressed.

The results presented in Table 4 show that the mentioned predictors could predict anxiety at the first and the second time of assessment. All variables together accounted for 16% of total variance, and 36% of anxiety variance at the second measurement time. Binge eating at the baseline was an important predictor of anxiety, as well as at Time 2, together with weight change. Men, who binge at baseline and gained weight at the time of the second assessment, were more anxious.

4. Discussion

In the present research, we decided to explore some psychological characteristics (anxieties, depression, binge eating) of overweight and obese CVD patients and their change or persistence over time.

One could be concerned about the result that 40% of patients gained weight, 30% maintained their weight and only one third of patients lost weight. During the time of hospitalization, group psychological counselling, aimed to help patients reduce their weight, was offered. Despite the fact that each patient had the possibility to attend group counselling, only 7% of patients accepted it. What is the possible reason for this?

It seems that they did not seriously consider the necessity to reduce their body weight, or maybe they believe that will be able

Table 4
Standard regression analysis: predicting anxiety from BMI, age, binge eating, and weight change.

Predictor	Anxiety – baseline		Anxiety – Time 2	
	β	R^2	β	R^2
		.16 ^{**}		.36 [*]
BMI	-.18 ^a		-.26	
Age	-.08		.07	
Binge eating	.36 ^{**}		.54 ^{**}	
Weight change (Time 1 – Time 2) ¹	–		.42 [*]	
	$F_{3,102} = 6.21^{**}$		$F_{4,27} = 3.85^*$	

¹ Weight change – entered in regression only for anxiety at Time 2.

^a $p < .06$.

^{*} $p < .05$.

^{**} $p < .01$.

to do this alone. The fact is that approximately 1 year later, for the majority of patients, their body weight remained the same or became higher, and continues to represent a risk factor for their CVD.

Considering the number of patients that obtained the results above the established cut-off for depression and anxiety, we can see that the majority of them were in the normal range (80%), so they were not depressed and anxious. Furthermore, the level of anxiety and depression remain relatively stable over time (Figs. 1 and 2). This fact might explain why our patients were not concerned with the weight they gained. The majority of patients maintained or increased their weight (70%) despite their CVD. It is well known that obesity and over-weight increase the risk for cardiovascular diseases especially if the person is anxious and/or depressed.

In our sample, the weight change was not correlated with anxiety and depression at the baseline and at the follow-up. However, the existence of a significant positive correlation between binge eating and negative emotionality (anxiety and depression) is very interesting. As can be seen in Table 2, at Time 1, binge eating was significantly correlated with anxiety, but not with depression. Afterwards (6th to 17th months), the results of initial binge eating correlated significantly with anxiety and depression. It is possible that binge eating is an important factor that maintains the increased body weight as well as negative affectivity over time. Consequently, we were interested to investigate the possible role of binge eating and weight change in predicting negative affect. The results of regression analyses showed that significant predictors for anxiety and depression at baseline were binge eating and weight change at follow-up. Those variables possibly act as an underlying psychological mechanism, which prevents patients acquiring the healthy behavioural patterns necessary for reducing weight.

Individuals, who pass through intense emotions as sadness, anger, and anxiety, try to cope with them by using bingeing, and consequently they immediately experience pleasure and forget real life problems [33]. It is possible that for our overweight and obese patients with CVD, anxiety and depression represent the risk factors that might contribute to maintenance of their weight problem through binge eating.

Other authors obtained similar results. Emotional eating is an important determinant of bingeing [34–36]. It is highly prevalent among obese persons that are seeking treatment but also reliably differentiates non-treatment-seeking obese persons from the non-obese [37]. Anxiety is one of the negative emotions that triggers emotional eating, and there is experimental support for anxiety increasing food consumption among obese persons.

According to our results, it is necessary to focus primarily on binge eating symptoms as a part of weight reduction programs, as well as to treat anxiety and depression. Binge eating is an eating disorder per se and therefore it is important to treat it before the person starts weight reduction treatment. The hypothesis is that, if we confront the binge eating behaviour, we could significantly reduce anxiety and depression that accompany this behaviour in patients. As we mentioned before, this is very important, because anxiety and depression following the increased weight, might represent serious risk factors for the development and maintenance of CVD.

There are several limitations of our study. The correlational study design does not allow us to conclude about the causal relationship between psychosocial variables and weight gain/loss. The results obtained are relevant only for men that most often developed CVD. The relationship that we found between depression, anxiety, and body weight may be different among females. Further, the role of psychological functioning in maintenance or change of body weight over time may be different for males and females.

Contributors

Alessandra Pokrajac-Bulian is the first and author who contributed in theoretical and methodological part. Mladenka Tkalčić contributed in results and discussion part. Neala Ambrosi-Randić contributed in introduction and discussion part. All three authors equally contribute to the manuscript.

Competing interests

We declare that we do not have any competing interests.

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Ethical approval

This research was approved by the Ethical Committee of the Faculty of Humanities and Social Sciences, University of Rijeka. All participants signed an informed consent.

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