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SEÇÃO: ARTIGOS

Emotional and Behavioral Components Related to Most Prevalent Eating Habits in Individuals with Obesity

Componentes emocionais e comportamentais relacionados com os hábitos alimentares mais prevalentes em indivíduos com obesidade

Componentes emocionales y conductuales relacionados con los hábitos alimentarios más prevalentes en individuos con obesidad

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Abstract: The objective of this study was to assess the prevalence of behavioral and emotional issues among individuals with obesity, as well as aspects related to their eating habits. A cross-sectional survey was conducted with adults with obesity (n=72). Participants completed the Binge Eating Scale, the International Physical Activity Questionnaire, and a 3-day food diary. Body Mass Index (BMI) and waist and neck circumferences were also measured. Quantitative variables were described using means and standard deviations, while categorical variables were presented as absolute and relative frequencies. A significant correlation was observed between participants' mean BMI and both the Emotional Eating (EE) (p=0.003) and Eating Behavior (EB) (p=0.004) domains. Additionally, EB scores showed a strong correlation with both energy consumption (r=0.858) and caloric density (r=0.739). Daily consumption of processed meat was also significantly correlated with EE (p=0.049). High scores in both domains were associated with anthropometric measurements, a high-fat/low-fiber diet, and an increased risk of Binge Eating Disorder. These findings underscore the importance of incorporating qualitative, behavioral, and multidisciplinary approaches in obesity treatment to support both healthy weight management and mental well-being.

Keywords: obesity, eating behavior, emotional eating, eating habits

Resumo: O objetivo deste estudo foi avaliar a prevalência de questões comportamentais e emocionais entre indivíduos com obesidade, bem como aspectos relacionados aos hábitos alimentares. Foi realizado um levantamento transversal com adultos com obesidade (n=72). Os participantes responderam à Escala de Compulsão Alimentar Periódica, ao Questionário Internacional de Atividade Física e registraram um diário alimentar de três dias. Também foram medidos o Índice de Massa Corporal (IMC) e as circunferências da cintura e do pescoço. As variáveis quantitativas foram descritas por médias e desvios-padrão, enquanto as variáveis categóricas foram apresentadas como frequências absolutas e relativas. Observou-se uma correlação significativa entre o IMC médio dos participantes e os domínios de Comer Emocional (EE) (p=0,003) e Comportamento Alimentar (EB) (p=0,004). Além disso, os escores de EB apresentaram forte correlação com o consumo energético (r=0,858) e a densidade calórica (r=0,739). O consumo diário de carne processada também teve uma correlação significativa com o EE (p=0,049). Escores elevados em ambos os domínios foram associados a medidas antropométricas, dieta rica em gorduras/pobre em fibras e um risco aumentado de diagnóstico de TCAP. Esses achados ressaltam a importância de incorporar abordagens qualitativas, comportamentais e multidisciplinares no tratamento da obesidade para promover tanto a gestão saudável do peso quanto o bem-estar mental.

Palavras-chave: obesidade, comportamento alimentar, comer emocional,



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hábitos alimentares

Resumen: Evaluar la prevalencia de problemas conductuales y emocionales en personas obesas, así como aspectos relacionados con los hábitos alimentarios. Estudio transversal con adultos con obesidad ($n = 72$). Se aplicó la Escala de Atracones, el Cuestionario Internacional de Actividad Física y un Diario de Alimentación de 3 días. También se midieron el Índice de Masa Corporal (IMC) y la circunferencia de la cintura y el cuello. Las variables cuantitativas se describieron como media y desviación estándar y las categóricas como frecuencias absolutas y relativas. El IMC medio de los participantes mostró una correlación importante entre los dominios de Alimentación Emocional (AC) ($p=0,003$) y Comportamiento Alimentario (CA) ($p=0,004$). Hubo una fuerte correlación entre la puntuación en CA, el consumo de energía ($r=0,858$) y la densidad calórica ($r=0,739$). Hubo una correlación significativa ($p=0,049$) entre el consumo diario de carne procesada y el dominio Alimentación Emocional. Los puntajes altos en ambos dominios mostraron una fuerte correlación entre las mediciones antropométricas, una dieta alta en grasas/baja en fibras y un mayor riesgo de diagnóstico de atracones. Los enfoques cualitativos, conductuales y multidisciplinarios en el tratamiento de la obesidad pueden ser grandes aliados para mantener un peso y un estado mental saludables.

Palabras clave: obesidad, comportamiento alimentario, comer emocional, hábitos alimenticios

Introduction

Obesity is a worldwide epidemic and is related to behavioral and/or cognitive factors influenced by individuals' environment and lifestyle (Bahia & Araújo, 2014). According to the World Health Organization (WHO), classification is indicated through the Body Mass Index (BMI), considering individuals with obesity those with a BMI ≥ 30 kg/m² (Executive summary, 1998)

In Brazil, the prevalence of obesity increased from 11.8% in 2006 to 20.3% in 2019 (Ministério da Saúde, 2006; Ministério da Saúde, 2019). On a global scale, estimates for the present year already pointed to overweight and obesity rates reaching levels of 89% and 85% in men and women, respectively (Finucane et al., 2011). In general, this increase in global prevalence brings several concerns and consequences, such as an increased risk for the development of chronic diseases like diabetes, certain types of cancers, and heart diseases (Wang et al., 2011). In order to optimize time and practicality, current eating habits end up showing a high consumption of ultra-processed food, rich in sugar and fat, and a

lower consumption of *in natura* food (Diez Garcia, 2003; Fernandes et al., 2007).

The main culprits for the modern obesity epidemic combine a global dietary pattern characterized by high energy density and poor micronutrients with environmental factors such as physical inactivity, lack of financial resources, and vulnerability, among others, given its multifactorial etiology. Consequently, a positive energy balance occurs, leading to weight gain (Swinburn et al., 2011). These characteristics are identified as the primary influencers on changes in weight and behavior, illustrating what the literature presents to us as an 'obesogenic' environment (Qasim et al., 2018).

The improvement in the quality of individuals' diets is related to changes in eating habits and lifestyle. However, even if individuals are interested in a balanced diet and understand its benefits, this alone is often insufficient for effective adherence to a healthier eating pattern. In addition to social, cultural, and economic factors, emotional and behavioral factors emerge as limiting factors to improving eating habits (Smith & Owen, 1992). Therefore, when investigating the eating behavior of patients with obesity, the possibilities of preventive actions for both obesity itself and its associated diseases become more expansive (Viana, 2002).

Eating behavior is closely linked to the psychological aspects of food intake and doesn't reflect a continuous and successive process, unlike the concept of eating habits (Klotz-Silva et al., 2016; Carvalho, 2012). The food choices individuals make are established in childhood, influenced by family dynamics, and further shaped by social and media environments until adulthood (Ramos, 2000).

Emotional eating serves as a quick mechanism individuals employ to avoid or suppress negative emotions using food. However, in the long term, the inability to effectively manage these emotions can perpetuate a cycle, leading to the onset of psychological disorders such as anxiety and depression (Geliebter & Aversa, 2003; Konttinen et al., 2010). Binge eating, highly

correlated with emotional eating, represents one of the consequences of using food to cope with stress and negative emotions (Konttinen et al., 2010; Haedt-Matt et al., 2014). The primary causes include a lack of awareness regarding health and disease status, physiological symptoms linked to emotions, and confusion between internal states of hunger and satiety, which may occur irrespective of nutritional status and exposure to restrictive diets (van Strien, 2018).

The diagnostic criterion for Binge Eating Disorder (BED) is the presence of recurrent binge eating episodes, characterized by uncontrolled consumption of a large amount of food in a brief period, without compensatory behaviors such as purging, excessive physical exercise, or fasting (American Psychiatric Association, 2013). For individuals with BED, difficulty in losing weight may be attributed to the high energy intake (Roehrig et al., 2009; Leite et al., 2017).

The Binge Eating Scale (BES) comprises a questionnaire that assesses the presence of Binge Eating Disorder (BED) across different severity levels. It is divided into two sections: one focused on eating behavior and another on emotional eating (Freitas et al., 2001; Escrivá-Martínez et al., 2019). Questions in the BES related to eating behavior examine individuals' actions during eating, such as eating speed or the quantity of food consumed (Klotz-Silva et al., 2016).

On the other hand, issues related to emotional eating are directly linked to individuals' emotions, which precede or justify the act of eating, such as stress, anxiety, sadness, and the fear of not being able to stop eating (van Strien, 2018). In the realm of nutritional care, merely assessing an individual's food consumption and its alignment with dietary guidelines is insufficient to address the emotional dimensions inherent in eating behavior (Toral & Slater, 2007). This is especially pertinent in the population with obesity, which faces significant prejudice and social stigma (Wharton et al., 2020). Understanding the characteristics and influencing factors of eating behavior is essential so that scientific and theoretical knowledge in nutrition can be applied to individuals' eating practices,

facilitating feasible changes and addressing the root causes of weight gain underlying a patient's clinical condition (Wharton et al., 2020).

Therefore, the primary objective of this study is to assess eating behavior and emotional eating among patients with obesity and their correlation with eating habits, anthropometric measurements, and levels of physical activity. The aim is to aid these patients in obesity treatment and subsequent weight loss, while also reducing the incidence of new cases and associated comorbidities.

Methods

This cross-sectional study was conducted at a Metabolic Nutrition Clinic within a general hospital in southern Brazil. It is a component of a larger study titled "Relationship between adherence to dietary treatment and binge-eating disorder in patients with obesity". Ethical approval for the study was obtained from the hospital and the ethics committees of the Federal University of Health Sciences in Porto Alegre before commencement. All participants provided informed consent prior to their involvement in the study. The study instruments were administered individually during sessions held at the Metabolic Nutrition Clinic, with each session lasting approximately 30 minutes per participant.

Participants and procedure

This survey included individuals with obesity (BMI \geq 30 kg/m²), aged 18 years or older, of all genders, who consented to participate by signing a consent form. Patient selection was non-probabilistic and unintentional for convenience. The study was conducted from March 2018 to November 2019. Patients with a) cognitive, neurological, or psychiatric conditions hindering questionnaire completion, and b) wheelchair users or individuals unable to stand for anthropometric measurements were excluded.

Sample size calculation was conducted using the G*Power version 3.1.9.2 software, based on Burgess et al.'s (2014) study. Considering a significance level of 5% and a power of 90%, the

largest sample size was determined based on correlations between emotional issues such as coping with behavioral issues like dependence ($r=0.37$) and binge eating ($r=0.47$), resulting in an estimated sample size of 69 participants.

Instruments and measures

A questionnaire collecting sociodemographic and anthropometric data was administered. Information including age, gender, education, marital status, and comorbidities was gathered through interviews and medical records accessible at the hospital.

Weight (kg) and height (cm) were measured using a properly calibrated anthropometric scale with an attached stadiometer, with patients wearing light clothing. Participants were positioned with their heads up, looking at a fixed point at eye level, and barefoot, ensuring they were parallel to the stadiometer. BMI was subsequently calculated.

Waist circumference (WC) and neck circumference (NC) were measured with participants standing using an inelastic measuring tape. WC was measured at the midpoint between the last rib and the iliac crest, with the measurement taken when the participant exhaled. The measuring tape was positioned at the midpoint of the neck to measure NC (World Health Organization, 2000; Ben-Noun et al., 2001).

To evaluate the behavioral and emotional aspects related to patients' diets, the Binge Eating Scale (BES) was utilized in its translated and validated version (Freitas et al., 2001). This scale comprises 16 questions divided into two sections: Eating Behavior (EB) and Emotional Eating (EE) (Escrivá-Martínez et al., 2019). The level of physi-

cal activity was assessed using the International Physical Activity Questionnaire (IPAQ) (Matsudo et al., 2001). Food consumption analysis was conducted through a three-day food diary, which included two weekdays and one weekend day. The arithmetic mean of Total Energy Intake (TEI) from the patients' diets was calculated, along with the macronutrient composition.

Data analysis

Quantitative variables were described as mean and standard deviation and categorical variables as absolute and relative frequencies. To compare the scores between groups, the Mann-Whitney test was used due to the asymmetry of scores (K-S test for normality) and Spearman's correlation coefficient was used to assess the correlations of scores within quantitative variables. Estimates of 95% CI were obtained through a bootstrapping procedure (1000 re-samplings; 95% CI BCa), which is generally used to correct deviations from the normality of the sample distribution. The effect of each domain on the diagnosis of BED was measured by Relative Risk with 95% CI, obtained via Poisson regression analysis with robust variance adjustment. The level of significance adopted was 5% ($p<0.05$) and the analyzes were performed using the SPSS version 25 program.

Results

The sample comprised 72 participants, with 74.6% being women ($n=53$), and a mean age of 53.31 years ($SD\pm 12.87$). Half of the participants reported having consulted a nutritionist, while the prevalence of those who had undertaken any type of diet alone was 38.8%. Additional characteristics of the sample are presented in Table 1.

Table 1 – Sample characteristics

Variables	n=72
Age (years) – Mean \pm SD	53.31 \pm 12.87
Sex – n (%)	
Masculine	19 (26.4)
Feminine	53 (73.6)

Marital status – n (%)	
Single	14 (19,4)
Married/Stable Union	47 (65,3)
Divorced	7 (9,7)
Widower	4 (5,6)
Scholarship – n (%)	
Complete Elementary School	35 (48,6)
Complete High School	28 (38,8)
University Education	9 (12,5)
Occupation – n (%)	
Formal Income	23 (21,9)
Retirement/Sick pay	31 (43,1)
No Formal Income	18 (25,0)
Have you ever consulted a nutritionist? – n (%)	
Yes	36 (50)
No	36 (50)
Have you ever dieted by yourself? – n (%)	
Yes	28 (38,8)
No	44 (61,1)
BMI (kg/m²) – Mean ± SD	
	37,09 ± 5,30
Circumferences – Mean ± SD	
Waist (cm)	113,07 ± 11,01
Neck (cm)	40,93 ± 3,51
Physical Activity Level* – n (%)	
Low	24 (33,3)
Moderate	36 (50)
High	12 (16,7)
Nutrient Consumption – Mean ± SD	
TEI (kcal)	1480,34 ± 424,70
Carbohydrates (%TEI)	42,78 ± 6,32
Proteins (%TEI)	19,80 ± 3,47
Fat (%TEI)	37,58 ± 4,75
Fiber (g)	16,51 ± 6,46
Cholesterol (mg)	245,69 ± 111,53
Saturated Fat (%VET)	13,82 ± 4,41

BMI, Body Mass Index; SD, Standard Deviation; TEI, Total Energy Intake.

* Physical Activity Level was determined according to International Physical Activity Questionnaire (IPAQ).

Tables 2 and 3 present the scores obtained from the Emotional Eating (EE) and Eating Behavior (EB) domains of the Binge Eating Scale (BES), along with food consumption, anthropometric data,

and physical activity levels of the participants. In terms of anthropometric data and physical activity level (Table 2), BMI demonstrated a significant and positive correlation in both domains ($p=0.003$ in EE, $p=0.004$ in EB), indicating that higher BMI

values were associated with higher scores in both domains. While there was a strong correlation between EB domain scores and energy consumption as well as caloric density ($p=0.858$ and 0.739 , respectively), these correlations were not

statistically significant. Additionally, no significant correlations were observed between waist circumference (WC), neck circumference (NC), and IPAQ classification with scores in either domain.

Table 2 – Anthropometric measurements and IPAQ classification

	n	EE			EB		
		r	95% CI	P-value	r	95% CI	P-value
BMI	72	0,347	0,136; 0,525	0,003	0,334	0,079; 0,549	0,004
WC	70*	0,211	-0,027; 0,455	0,079	0,209	-0,017; 0,455	0,082
NC	72	-0,050	-0,309; 0,233	0,678	0,084	-0,167; 0,362	0,482
Kcal	58*	-0,082	-0,351; 0,209	0,541	0,024	-0,268; 0,340	0,858
Kcal/kg	58*	-0,104	-0,355; 0,176	0,437	0,045	-0,233; 0,331	0,739
PAL**	72	0,118	-0,124; 0,344	0,323	0,211	-0,021; 0,419	0,075

BMI, Body Mass Index; EB, Eating Behavior; EE, Emotional eating; Kcal, Energy consumption; Kcal/kg; caloric density; NC, Neck Circumference; PAL, Physical Activity Level; WC, Waist Circumference.

*Analysis was performed on N=70 and N=58 due to loss of sample segment.

** PAL was determined according to International Physical Activity Questionnaire (IPAQ).

Spearman coefficient correlation with 95%CI bias-corrected and accelerated bootstrap method (1000 re-samples).

In the Eating Behavior (EB) domain, a significant difference was observed between hypertensive and non-hypertensive individuals (4.5 ± 4.6 and 6.0 ± 3.4 , respectively, $p=0.036$). Similarly, differences were noted in the Emotional Eating (EE) domain between patients with and without dyslipidemia (6.1 ± 5.6 and 9.5 ± 6.9 , respectively, $p=0.046$), as well as in the EB domain (7.2 ± 5.0

and 4.0 ± 3.7 ; respectively, $p=0.014$). Table 3 presents food consumption and the distribution of macronutrient consumption, showing a weak and inverse correlation with EE and EB scores, except for alcohol consumption, where a direct and moderate correlation was found, respectively ($r=0.65$ in EE, $r=0.53$ in EB).

Table 3 – Food consumption and distribution of macronutrients

Consumption	n	EE			EB		
		r	95% CI	p-value	r	95% CI	P-value
Alcoholic beverages/month	72	0,065	-0,145; 0,273	0,59	0,053	-0,169; 0,259	0,657
Fruits/week	72	-0,112	-0,354; 0,146	0,351	-0,191	-0,409; 0,051	0,107
Vegetables/week	72	-0,113	-0,371; 0,142	0,344	-0,124	-0,373; 0,112	0,300
Margarine/week	71*	-0,158	0,105; -0,389	0,188	-0,147	-0,366; 0,091	0,221
Margarine/day	70*	-0,213	-0,450; 0,042	0,077	-0,137	-0,385; 0,118	0,258
Butter/week	72	-0,115	-0,350; 0,176	0,334	-0,178	-0,392; 0,098	0,135
Butter/day	72	-0,127	-0,364; 0,170	0,289	-0,184	-0,399; 0,097	0,121
Processed meat/day	71*	0,235	-0,009; 0,476	0,049	0,179	-0,076; 0,436	0,135
Fries/day	71*	0,026	-0,218; 0,259	,830	0,132	-0,118; 0,367	0,274
CHO%	58*	0,069	-0,227; 0,332	0,609	0,035	-0,259; 0,295	0,792

PTN %	58*	-0,235	-0,476; 0,087	0,076	-0,253	-0,528; 0,082	0,055
LIP %	58*	0,090	-0,172; 0,333	0,503	0,164	-0,087; 0,414	0,219
Fiber (g)	58*	0,049	-0,231; 0,332	0,715	-0,095	-0,364; 0,192	0,478
Cholesterol (mg)	58*	-0,083	-0,376; 0,201	0,537	-0,104	-0,371; 0,185	0,438
Saturated fat (%)	58*	-0,051	-0,344; 0,225	0,705	0,131	-0,159; 0,389	0,328

EB, Eating Behavior; EE, Emotional eating.

*Analysis was performed on N=70 and N=58 due to loss of sample segment

Spearman coefficient correlation with 95%CI bias-corrected and accelerated bootstrap method (1000 re-samples)

A significant direct correlation ($p=0.049$) was found between daily consumption of processed meat and Emotional Eating (EE). Additionally, there was a tendency towards significance ($p=0.077$) in the correlation between daily consumption of margarine and EE. However, there was a sample loss in macronutrient intake data ($n=58$), and the correlation between protein intake among participants who scored higher in the Eating Behavior (EB) domain was close to statistical significance ($p=0.055$).

Finally, a multivariate analysis using Poisson regression was conducted to compare the effect of EE and EB on the diagnosis of Binge Eating Disorder (BED). With a 95% Confidence Interval (CI), for two participants with the same EB domain value, each point increase in the EE domain raised the risk of BED diagnosis by 11.6%.

Discussion

The main findings of the present study revealed that age and BMI of individuals increased proportionally to Binge Eating Scale (BES) scores in both the Emotional Eating (EE) and Eating Behavior (EB) domains. Additionally, an increase in the EE domain score was observed in individuals who had previously been on diets without nutritional follow-up. Regarding food consumption, a noteworthy finding was the elevated consumption of processed meat and margarine correlating with higher EE domain scores, indicating a higher consumption of these foods in individuals with emotional eating tendencies.

The characteristics of the sample indicate that the majority of individuals reporting psychological or emotional issues related to their diet were

female, aged over fifty years old, married, had completed high school, and were either retired or engaged in informal employment. These findings suggest that these demographic groups are more vulnerable to binge eating and are more likely to engage in weight control behaviors, such as restrictive diets. This susceptibility may be attributed to hormonal and emotional factors, as well as the prolonged periods spent at home, which provide greater availability and access to food, irrespective of its nutritional quality (Chapuis-de-Andrade et al., 2017; Torres et al., 2020).

It was observed that the mean BMI of participants was 37.09 kg/m^2 , showing a significant and directly proportional correlation with both the Emotional Eating (EE) and Eating Behavior (EB) domains ($p=0.003$ and $r=0.347$, $p=0.004$ and $r=0.334$, respectively). Previous studies have identified a higher prevalence of Binge Eating Disorder (BED) and isolated episodes of binge eating in individuals with higher BMI values, along with the presence of symptoms such as anxiety, depression, and excessive concern with body image (Matos et al., 2002). This underscores the notion that higher BMI values are associated with higher Binge Eating Scale (BES) scores and, consequently, an increased risk of BED diagnosis.

Regarding the anthropometric assessment conducted, the mean WC of 113.07 cm and NC of 40.93 cm were higher than the cutoff points recommended to mitigate the risk of cardiovascular diseases (27,28). In the case of WC, there was a tendency towards significance in the EE group ($p=0.079$), a finding supported by previous studies that have identified positive associations between eating in response to negative emotions

and the increase in WC over time (Konttinen, 2019).

In terms of food consumption, the average intake of lipids (37.58% of Total Energy Intake, TEI), saturated fat (13.82% of TEI), and cholesterol (245.69mg) exceeds the recommendations set by the Dietary Reference Intakes (DRIs) (Padovani et al., 2006). Conversely, fiber consumption falls below the recommended levels. Additionally, the strong correlation between EB domain and energy consumption, as well as caloric density ($r=0.858$ and 0.739 , respectively), underscores the significant impact of factors addressed in this domain on the food consumption patterns of individuals.

The relationship between caloric value and eating/emotional behavior certainly seems to have significant implications when it comes to understanding obesity and dietary patterns. The stronger association between caloric value and eating/emotional behavior may indicate that the caloric content of foods plays a more direct role in emotion-related eating patterns than BMI itself. Regarding the potential confounding factor, there could be several elements to consider. One of them could be the very nature of emotional eating behavior, which often involves food choices based on emotional reactions such as stress, sadness, or happiness, rather than simply the consumption of high-calorie foods. Additionally, psychological, socioeconomic, and cultural factors can influence both eating behavior and BMI, and these factors can interact in complex ways.

This population's diet was characterized as hyperlipidic, likely due to high consumption of ultra-processed foods and fried preparations, coupled with low intake of fruits and vegetables. This dietary pattern impedes the weight loss process due to the poor nutritional quality of the diet. Although there were reports of regular consumption of fresh foods such as fruits, meat, and rice, they were not the preferred choices during binge episodes. Instead, hyperpalatable foods rich in fats and carbohydrates were favored, as they help alleviate negative emotions such as sadness and stress. In this study, correlations were observed between the EE domain and daily

consumption of processed meat ($p=0.049$, $r=0.235$) and margarine ($p=0.077$, $r=-0.213$).

In pursuit of weight loss, the treatment approach provided to individuals with obesity should extend beyond simply prescribing diet and physical exercise. It should encompass all the "4M" factors involved in this process, as outlined in the Canadian Guideline for Clinical Practice on Obesity in Adults: mental, metabolic, mechanical, and milieu considerations (Wharton et al., 2020).

Prescriptive and conservative treatment methods, which often involve restrictive diets, typically recommend the elimination of certain foods or food groups deemed high in calories and low in nutritional value. These diets often categorize foods as either allowed or prohibited, without considering relevant substitutions based on the individual's preferences and reality. This approach can have detrimental effects on individuals' mental health, as restrictive practices can trigger binge eating episodes, particularly in those prone to emotional eating (Torres et al., 2020), and may lead to dysfunctional behaviors related to eating habits.

Furthermore, despite the sample comprising individuals with obesity who are more likely to engage in restrictive dieting, as indicated in the DSM-V, only a small proportion of these individuals reported practicing restrictive diets independently (only 38.9%) (American Psychiatric Association, 2013). This highlights the potential mismatch between the prevalence of obesity and the adoption of restrictive dietary practices within this population.

In the studied population, it was observed that the risk of a diagnosis BED increases by 11.6% for each question scored in the EE domain of the BES. Therefore, the more an individual engages in emotional eating behaviors, the higher the risk of developing BED.

To effectively address uncontrolled eating and related dysfunctions in individuals' diets and lifestyles, qualitative, behavioral, and multidisciplinary approaches to obesity treatment should be prioritized. These approaches should not only focus on energy balance, physical activity,

and dietary intake but also consider the broader issues influencing weight loss, including social and cultural dynamics, mental health, stress management, sleep quality, and individuals' behavioral and emotional aspects, particularly those predisposing to future disorders (Leite et al., 2017; Wharton et al., 2020; Clifford et al., 2015). Several strategies already exist that encompass and utilize behavioral aspects to facilitate the development of healthier habits. These include mindful eating, the transtheoretical model of change, cognitive-behavioral therapy, and motivational interviewing, among others. All of these approaches are applicable to the population with obesity and can effectively address the aforementioned issues.

According to the current "Stigma of Obesity" document, individuals with obesity are often stigmatized and stereotyped as lazy, gluttonous, lacking willpower, resigned to their physical condition, or negligent with their health and appearance. Unfortunately, these negative perceptions are sometimes held by health professionals as well. Moreover, individuals with obesity may experience feelings of not belonging in social situations, leading to suffering, personal devaluation, low self-esteem, and heightened negative emotions. This can perpetuate a vicious cycle related to food and further exacerbate the challenges of managing obesity (Rubino et al., 2020).

Obesity is a highly complex disease that cannot be solely attributed to internal controllable factors or individual choices, and it cannot be resolved simply by eating less and exercising more. Instead, it is influenced by a multitude of factors.

Eating for reward is one behavioral aspect that can significantly contribute to the development and maintenance of obesity. Individuals with a greater propensity to seek out food for its rewarding qualities, such as those high in fat and sugar, are at higher risk of overconsumption of these foods, which can lead to weight gain and obesity (Stice et al., 2008). Additionally, the style of internal regulation of eating plays a crucial role in body weight regulation. Individuals with adequate internal regulation are better able to

respond to internal cues of hunger and satiety to guide their eating patterns, which can aid in maintaining a healthy weight. On the other hand, those who are more susceptible to eating in response to external stimuli, such as food availability or visual cues, typically lack proper functioning of external regulation, which can contribute to overeating and, eventually, the development of obesity (Lowe & Butryn, 2007).

Another point deserving attention is interoceptive awareness in eating, which refers to the ability to perceive and interpret internal signals of the body related to food intake, such as hunger, satiety, desire to eat, and digestive sensations. It is a specific part of interoceptive awareness that is directly related to regulating eating behavior and how we relate to food. Interoceptive awareness in eating is influenced by a variety of factors, including genetic, environmental, behavioral, and psychological factors. Practices that promote interoceptive awareness, such as mindful eating, paying attention to hunger and satiety cues, and cultivating a mindful connection with food, can help improve eating behavior regulation and promote healthier and more balanced food choices (Khalsa & Lapidus, 2016).

Individuals with high interoceptive awareness in eating are better able to recognize and respond to hunger and satiety signals accurately and sensitively. They have a clearer understanding of the body's actual needs and are less likely to eat impulsively or in response to external stimuli such as emotions, stress, or food availability. On the other hand, those with low interoceptive awareness in eating may struggle to recognize these internal hunger and satiety signals. This can lead to dysregulated eating patterns, such as overeating or underestimating the body's actual needs, potentially contributing to issues like weight gain, obesity, and eating disorders (Herbert & Pollatos, 2012).

Therefore, prioritizing treatments that promote a positive body image, as well as autonomous motivation, self-efficacy, self-regulation, and flexibility in food choices, can not only facilitate weight loss and its long-term maintenance but also

address emotional issues related to food. This holistic approach acknowledges the complexity of obesity and aims to empower individuals in their journey towards better health (Wharton et al., 2020; Clifford et al., 2015; Rubino et al., 2020; Teixeira et al., 2015).

Finally, we believe that more studies should be conducted to enable the follow-up of individuals with obesity who undergo behavioral strategies. Future clinical studies are essential to further explore the effectiveness of these strategies in qualitative treatment approaches and to consolidate their utilization among health professionals. Continued research in this area will contribute to the development of more comprehensive and effective approaches for managing obesity and improving the overall well-being of affected individuals.

Limitations

It's indeed important to recognize the potential discomfort and biases that dietary survey methods, like food diaries, may introduce, especially among individuals with obesity. The flat-slope syndrome, where individuals underestimate their food intake, can occur due to various factors, including the awareness that their consumption will be scrutinized and potentially criticized. This can lead to feelings of guilt associated with food choices and may result in the omission of information. Similarly, the IPAQ can also be prone to biases, particularly in self-reporting physical activity levels. The questionnaire relies on individuals' perceptions of effort, which can vary greatly among different individuals. What one person considers a light activity might be perceived as more demanding by another, leading to inaccuracies in the reported physical activity levels. Recognizing these potential biases is crucial for interpreting the data accurately and understanding the limitations of the study findings. It highlights the importance of employing multiple assessment methods and considering other sources of information to corroborate findings and ensure a more comprehensive understanding of individuals' behaviors and habits.

Author contributions

FMB and RFM contributed to the conception of the study. GMLS, RFM and FMB contributed to the acquisition, analysis, and interpretation of data. GMLS and FMB drafted the manuscript. All authors critically revised the manuscript, provided their final approval, and agreed to be accountable for all aspects of the work ensuring its integrity and accuracy.

Declaration of interest

The authors declare that they have no conflict of interest.

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