



Eating Behavior of type 2 Diabetic and/or Hypertensive Patients

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Abstract

Background: Obesity, diabetes mellitus and systemic arterial hypertension constitute the main chronic non-communicable diseases associated with inadequate nutrition. The main challenge to control these diseases are lifestyle changes, adherence to dietary and pharmacological treatment. To help patients achieve lifestyle changes, an important step is to identify behavioral profiles. The aims of this study were to characterize the eating behavior of patients with diabetes and hypertension, and to compare its domain scores between genders, body mass index and age groups.

Methods: This cross-sectional study assessed the characteristics of eating behavior domains of diabetic and hypertensive patients in the Diabetes and Hypertension Center of the Federal University of Pelotas, using the Three-Factor Eating Questionnaire. In addition, it compared the behavioral patterns between sex, age groups and nutritional status.

Results: A total of 97 volunteer patients were included and the majority was elderly (60.82%), women (61.86%), and the mean age was 62 ± 11.15 years old. Overweight was present in 88.66% of the total sample, and obesity in 65.79% of the adults. Cognitive Restraint was the highest score domain in this sample. Women scored higher in the Emotional Eating domain ($p < 0.003$) than men. Adults presented significantly higher scores in the Emotional Eating ($p < 0.001$) and Binge Eating ($p < 0.010$) domains when compared to the elderly. An association between overweight and Emotional Eating ($p = 0.003$) and Binge Eating ($p = 0.028$) was found in the total sample. Overweight adults had a higher score for the Emotional Eating domain ($p = 0.014$) and obese adults had a higher score for the Emotional Eating domain ($p = 0.036$) and Binge Eating domain ($p = 0.041$).

Conclusion: In conclusion, Cognitive Restraint was the domain with the highest score in this sample. Furthermore, an association between overweight, Emotional Eating and Binge Eating scores was found. Women scored higher in the Emotional Eating domain than men, and adults presented significantly higher scores for the Emotional Eating and Binge Eating domains than the elderly.

Keywords: Behavioral Nutrition; Psychometrics; Diabetes Mellitus; Hypertension; Obesity

Introduction

Eating behavior has been widely investigated as an important factor that can influence how we eat, how we choose our food, and how much weight we gain. The World Health Organization (WHO) has estimated more than 1.9 billion adults were overweight and 650 million were obese. Overall, 39.0% of the world's adult population were overweight, while the prevalence of obesity worldwide practically tripled between 1975 and 2016 [1]. More than half of Brazilians adults are overweight, while obesity affects 22.0% of men and 22.2% of women [2], and this has become a major challenge for professionals and the health system [3]. Obesity is influenced by physiological, psychological, cognitive, social and behavioral factors, including eating [4]. Therefore, understanding and identifying these mechanisms are extremely important for guiding clinical conduct. Also, obese patients are part of a risk group for other chronic non-communicable diseases (NCD), such as type 2 diabetes mellitus (T2DM), systemic arterial hypertension (SAH), cardiovascular diseases (CVD), and certain types of cancer [5,6].

Obesity, T2DM, and SAH constitute the main NCD associated with inadequate nutrition and carry a great economic burden for the Brazilian healthcare system, called *Sistema Único de Saúde* (SUS) [Brazilian Unified Health System][5]. Furthermore, the main causes of cardiometabolic death in Brazil are poor diet, high blood pressure and high body mass index (BMI) [7]. The key points to control NCD are lifestyle changes and adherence to dietary and pharmacological treatment. In order to achieve these goals, an important step is to identify the behavioral profile of these patients [8].

Eating behavior can be classified in three domains: Emotional Eating (EE), Cognitive Restriction (CR), and Binge Eating (BE). Briefly, EE is described as disinhibition, in which the diet of individuals is influenced by their emotional state; CR is characterized as the cognitive and self-imposed limitation of food ingestion to control weight; and BE is compulsive overeating, with or without the presence of hunger [9,10].

To characterize eating behavior, some tools have been developed. One of the most well-known and currently used is the *Three-Factor Eating Questionnaire* (TFEQ). It was originally proposed by Stunkard and Messick (1985), consisting of 51 items, and was subsequently reviewed in a new version with 21 items [11]. The Brazilian Portuguese version was translated and validated by Natacci and Júnior (2011).

Some studies have shown the association of the domains of eating behavior with the traditional risk factors for chronic diseases [12,13]. Other studies reported associations among the domains of eating behavior with gender[14], age range [14,15] and BMI [12,13,15]. Moreover, a recent survey showed the relation between

mood disorders and eating behavior with chronic comorbidities in T2DM and SAH in Mexican patients [15]. Also, studies have found an association between T2DM, SAH and obesity with higher scores of eating behavior domains [12]. Moreover, increased body weight was associated with TFEQ scores and the risk of developing diabetes [16]. The aims of this study were to characterize the eating behavior of patients with T2DM and SAH, and to compare its domains between genders, BMI and age range.

Material and Methods

Study design and population

This is a cross-sectional study carried out from February 2019 to March 2020. All patients undergoing nutritional treatment at the Public Nutrition Outpatient Clinic of the Diabetes and Hypertension Center who were aged over 18 years old, did not have any cognitive disorders that would have prevented them from answering the questionnaire, were invited to take part in the present study. The participants were included after reading and signing the consent form. During this period 293 patients were assisted at the nutrition service, of which 97 agreed to participate, fit the inclusion criteria, and were included.

Ethical statement

This research was approved by the Research Ethics Committee of the Faculty of Medicine of the Federal University of Pelotas (no. 4.145.604). All participants in this study were volunteers and the questionnaire was applied face to face after verbal and written approval by signing the consent form.

Measures

Trained interviewers administered the Three Factor Eating Questionnaire - R21 (TFEQ-R21) to the participants during nutritional assistance. In summary, this scale includes 6 items for Cognitive Restriction (CR), 6 items for Emotional Eating (EE) and 9 items for Binge Eating (BE). The questionnaire can be accessed in its original publication [9]. The scores for each domain were calculated and presented on a scale from 0 to 100 points, as previously described in the literature [9,17]. Higher scores indicate tendency to the respective eating behavior.

Clinical data

Sociodemographic and anthropometric data (age, gender, weight, height, and BMI) were collected from nutritional anamnesis reports of the service. The weight was obtained using a Welmy digital scale (200 Kg capacity and minimum accuracy of 50g). Height was measured with an aluminum stadiometer attached to the scale with a minimum accuracy of 0.1 cm. The individual was in a standing position with his/her head in the Frankfurt plan. BMI

was classified according to age range as eutrophic, overweight or obesity, for adults under 60 years old [18]. or elderly aged 60 years old or more [19].

Data analysis

Data were analyzed in the GraphPad Prism® software version 5.03 and were expressed in percentages, mean and standard deviation, or median and interquartile range, depending on their nature. The sample was divided by sex, age groups and BMI for the analyses. The Shapiro-Wilk normality test was performed. The comparison between medians of each group was performed with the Mann-Whitney U test and to compare between medians of domains, the Kruskal-Wallis test was performed, considering a level of 5% significance.

Results

A total of 97 volunteer patients were included and the majority was elderly (60.82%), women (61.86%), the mean age was 62 ± 11.15 years old. Overweight was present in 88.66% of the total sample, and obesity in 65.79% of the adults. BMI mean was 33.20 ± 7.07 Kg/m² (Table 1). Cognitive Restraint was the domain with the highest score in this sample of diabetic and hypertensive patients (p < 0.0001). It is important to point out that there is no cutoff point for each domain, so we cannot describe the prevalence of behaviors, only compare the domain means between each group.

Variables	n* (%)
Sex	
Women	60 (61.9)
Men	37 (38.1)
Age Groups	
Adults	38 (39.2)
Elderly	59 (60.8)
Chronic Diseases	
T2DM and SAH	67 (69.0)
T2DM	15 (15.5)
SAH	15 (15.5)
Body Mass Index (Kg/M ²)	
Eutrophic	11 (11.3)
Overweight	86 (88.7)
Adult's Body Mass Index ^a	
Eutrophic	3 (7.9)
Overweight	10 (26.3)
Obese	25 (65.8)

Elderly's Body Mass Index ^b	
Eutrophic	8 (13.6)
Overweight	51 (86.4)
Eating Behavior domains	
Emotional Eating (EE)	17 (0 - 39.0)
Cognitive Restraint (CR)	50 (33.0 - 72.0)
Binge Eating (BE)	22 (7.0 - 37.0)

Table 1: Demographic, anthropometric characteristics and domains of eating behavior of patients from the Nutrition Outpatient Clinic of the Diabetes and Hypertension Center. Pelotas/RS, Brazil, 2020. (N = 97).

* Total number of individuals

^aBody Mass Index (BMI) was classified according to analysis for adults (WHO, 2000).

^bBody Mass Index (BMI) was classified according to analysis for the elderly (Lipschitz, 1994).

Significant differences between gender and age groups were observed in the behavioral domains. Women presented higher scores than men in the EE domain (p < 0.001). Adults had significantly higher scores in the EE domain (p < 0.001) and in the BE domain (p < 0.010) when compared to the elderly (Table 2).

Variables	Emotional Eating (EE)	Cognitive Restraint (CR)	Binge Eating (BE)
	Median (P25 - P75)	Median (P25 - P75)	Median (P25 - P75)
Sex			
Women (n = 60)	22.0 (6.0 - 54.5)	56.0 (33.0 - 72.0)	20.5 (7.0 - 41.0)
Men (n = 37)	11.0 (0 - 28.0)	39.0 (30.5 - 72.0)	22.0 (9.0 - 33.0)
p-value ^c	0.003**	0.375	0.973
Age Groups			
Adults (n = 38)	33.0 (9.75 - 57.2)	50.0 (33.0 - 62.5)	31.5 (11.0 - 48.0)
Elderly (n = 59)	11.0 (0 - 28.0)	56.0 (28.0 - 78.0)	19.0 (7.0 - 33.0)
p-value ^c	<0.001**	0.481	<0.010*

Table 2: Demographic characteristics for each eating behavior domain of patients from the Nutrition Outpatient Clinic of the Diabetes and Hypertension Center. Pelotas/RS, Brazil, 2020 (N = 97).

^c Comparison among medians was performed with the Mann-Whitney U test.

* Statistical significance (P < 0.05).

When considering the whole sample, an association between BMI and EE score was found ($p = 0.003$), and an association between BMI and BE score ($p = 0.028$). In addition, overweight adults scored higher for EE when compared to eutrophic adults ($p = 0.014$), and

obese adults scored higher for EE ($p = 0.036$) and BE ($p = 0.041$) than eutrophic adults. No other behavioral domain was associated with BMI (Table 3).

Variables	Emotional Eating (EE)	Cognitive Restraint (CR)	Binge Eating (BE)
	Median (P25 - P75)	Median (P25 - P75)	Median (P25 - P75)
Total sample Body Mass Index ^{ab}			
Eutrophic (n = 11)	0 (0 - 11.0)	33.0 (28.0 - 44.0)	4.0 (0 - 33.0)
Overweight (n = 86)	17.0 (6.0 - 39.0)	56.0 (33.0 - 72.0)	22.0 (11.0 - 38.0)
<i>p</i> -value ^c	0.003**	0.083	0.028*
Adult's Body Mass Index ^a			
Eutrophic (n = 3)	0 (0 - 6.0)	28.0 (22.0 - 39.0)	4.0 (0 - 15.0)
Overweight (n = 10)	41.5 (11.0 - 65.2)	55.5 (41.25 - 73.5)	42.0 (14.0 - 55.75)
<i>p</i> -value ^c	0.014*	0.076	0.075
Obese (n = 25)	39.0 (14.0 - 80.5)	44.0 (33.0 - 64.0)	37.0 (17.0 - 50.0)
<i>p</i> -value ^{cd}	0.036*	0.086	0.041*
Elderly's Body Mass Index ^b			
Eutrophic (n = 8)	3.0 (0 - 11.0)	33.0 (28.0 - 77.75)	9.5 (1.0 - 33.0)
Overweight (n = 51)	11.0 (0 - 28.0)	56.0 (33.0 - 78.0)	19.0 (7.0 - 30.0)
<i>p</i> -value ^c	0.106	0.399	0.381

Table 3: Eating behavior domains according to anthropometric characteristics and age range of patients from the Nutrition Outpatient Clinic of the Diabetes and Hypertension Center. Pelotas/RS, Brazil, 2020 (N = 97).

^a Body Mass Index (BMI) was classified according to analysis for adults (WHO, 2000).

^b Body Mass Index (BMI) was classified according to analysis for the elderly (Lipschitz, 1994).

^c Comparison among medians was evaluated by Mann-Whitney U test.

^d When comparing eutrophic with obese.

* Statistical significance ($P < 0.05$).

Discussion

This study characterized the eating behavior of patients with T2DM and SAH undergoing treatment in a public nutritional clinic. CR was the domain with the highest score in this sample. Women presented higher EE scores than men; in addition, adults scored higher for EE and BE than the elderly. The main result was the association between BMI and eating behaviors - EE and BE domains - in adults. Most of this sample was elderly and women and presented overweight or obesity. It is well established that eating behaviors can interfere in the control of T2DM and SAH [12,15] and can be influenced by depression and anxiety symptoms [20,21].

Previous studies demonstrated a positive association between high scores in eating behavior domains and risk for T2DM, hypertension and obesity [12,15]. However, the association between sociodemographic factors and eating behavior patterns remains unclear. A previous study with Mexican adult patients with NCD (n = 61), such as T2DM and SAH, did not find any association of eat-

ing behaviors between genders [15]. In addition, a study in Korea with 82 adults with obesity and healthy weight [13] also presented no association between eating behavior and gender. On the other hand, a cross-sectional study conducted among Lebanese university students (n = 400) [14] and a cohort study with American university students (n = 241) [22], both with young adults, showed differences in eating behavior between genders, in which women scored higher than men in the EE domain, which was also observed in our sample.

Adults scored higher in the EE and in the BE domains when compared to the elderly, corroborating a previous study conducted with T2DM patients [15]. Overall, eating behavior domains, such as EE and BE, also were positively correlated with perceived stress in young adults [23]. Furthermore, studies with T2DM adult patients from Brazil [24] and Denmark [25] have already demonstrated a high prevalence of emotional disorders, such as perceived stress and depressive symptoms.

In addition, the present study also found a positive association between EE and BE with overweight patients, which was significantly more expressive in adults. In a Finnish cohort study with 5,024 adults and elderly adults, it was possible to observe that adults with higher EE scores may be particularly vulnerable to weight gain [26]. Higher scores in the EE and BE domains were related to obesity, central obesity, T2DM and hypertension in a sample of US Latinos (n = 578) [12], and to high BMI in Dutch T2DM patients (n = 120) [27]. The EE domain has been associated to a diet rich in sweets and salty foods, as well as to greater intake of energy-dense foods [17] with or without depressive symptoms [28], which also is related to obesity. Our research group has already identified that the present sample of diabetic and hypertensive patients demonstrated higher risk of CVD and low quality of their diet [29,30]. Also, brain cognitive dysfunction has been linked to patterns of eating behaviors and obesity [13].

Moreover, several studies have found the same relationship among the EE and BE domains, gender and BMI in young adults [13,14,21] in Australian women [31] adult and elderly [32], and, more specifically, in individuals that presented risk factors for CVD [12] and for developing diabetes [16]. The association between obesity and EE, CR and BE domains in a sample of patients with NCD - such as diabetic, hypertensive and obese patients - is already well described in the literature [12,1,3,15,16,27]. Moreover, a longitudinal study conducted in Singapore (n = 140) found that high scores of EE and BE were contributors to obesity in diabetic patients [33].

The CR score in our sample can be explained by the fact that the patients are diabetic and hypertensive, which can lead to greater concern about their diet or perhaps because at some point in their life they received guidance on healthy eating by some healthcare professional. Moreover, in a sample of North American adults (n = 522), individuals with high scores of CR domain tended to be more sensitive to health perceptions [34]. Therefore, it is necessary to incorporate strategies for changing eating behavior in order to reduce the prevalence of obesity, as well as T2DM, by focusing on factors of perception of eating and sense of control [35,36]. Further, weight management programs should be conducted by a multidisciplinary team [16] taking into account all psycho-environmental aspects.

As a limitation, the researchers recognize that the sample under study is relatively small, and that it would be useful to investigate the diagnosis of depression and anxiety among patients. Even so, it was possible to characterize and find associations between groups in this sample of diabetic and hypertensive patients. It is noteworthy that these results deal with a population with a specific health condition and should not be extrapolated to the general population.

Conclusion

The present study demonstrated that Cognitive Restriction was the eating behavior domain with the highest score in this sample of diabetic and hypertensive patients. Furthermore, an association between overweight, EE and BE scores were found. When the sample was stratified by gender and age groups, women presented higher scores in the EE domains than men, and adults presented significantly higher EE and BE scores when compared to the elderly. Additional studies are necessary to examine eating behaviors, especially in chronic patients, taking into consideration psycho-environmental aspects.

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Conflict of Interest

No conflict of interest.

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