

Factors associated with extreme weight loss behaviors among adolescents of Northeastern Brazil: a hierarchical approach

Comportamentos extremos para perda de peso e fatores associados em adolescentes do Nordeste brasileiro: uma abordagem hierárquica

Ana Elisa Ramos (<https://orcid.org/0000-0002-0286-6479>)¹
 Karine Brito Beck da Silva (<https://orcid.org/0000-0001-5313-5353>)¹
 Valterlinda Alves de Oliveira Queiroz (<https://orcid.org/0000-0002-9269-1595>)¹
 Edleide de Brito (<https://orcid.org/0000-0002-3316-3514>)²
 Carlos Alberto Santos da Costa (<https://orcid.org/0000-0001-8302-657X>)³
 Mônica Leila Portela de Santana (<https://orcid.org/0000-0002-2706-8238>)¹

Abstract *The objective of this article is to identify the prevalence and evaluate the factors associated with extreme weight loss behaviors among adolescents of Northeastern Brazil. Cross-sectional study with 2,439 adolescents from Sample 2 (2015) of the National School-based Health Survey. Extreme weight loss behaviors, such as self-induced vomiting, laxative use and use of medicines or formulas (outcome) and independent variables were evaluated using a self-administered electronic questionnaire. The statistical analysis was performed following a hierarchical conceptual model. The prevalence of extreme weight loss behaviors in the sample was 12.1%. Among the factors that showed significant association with the outcome, we emphasize the administration model of the private school (PR = 0.62; CI = 0.46-0.84), bullying related to body appearance and for other reasons (PR = 1.62; CI = 1.19-2.20), forced sexual intercourse (PR = 2.65; CI = 1.90-3.69), insomnia (PR = 1.84; CI = 1.43-2.37), and be perceived as fat or very fat (PR = 1.90; CI = 1.50-2.42). Moderate prevalence of extreme weight loss behaviors was identified among adolescents. Socioeconomic factors, exposure to violence, mental health, and body image were associated with the adoption of these behaviors.*

Key words *Purgative behavior, Weight loss, Induced vomiting, Laxatives, Adolescent*

Resumo *O objetivo deste artigo é identificar a prevalência e avaliar os fatores associados aos comportamentos extremos para perda de peso em adolescentes do Nordeste brasileiro. Estudo transversal com 2.439 adolescentes da Amostra 2 (2015) da Pesquisa Nacional de Saúde do Escolar. Os comportamentos extremos para perda de peso (desfecho) e as variáveis independentes foram avaliadas por meio de um questionário eletrônico autoaplicável. A análise estatística foi realizada seguindo um modelo conceitual hierárquico. A prevalência de comportamentos extremos para perda de peso na amostra foi de 12,1%. Entre os fatores que mostraram associação significativa com o desfecho, destacam-se a situação administrativa da escola privada (RP = 0,62; IC = 0,46-0,84), ser vítima bullying relacionado à aparência corporal e pelos demais motivos (RP = 1,62; IC = 1,19-2,20), ser forçado a ter relação sexual (RP = 2,65; IC = 1,90-3,69), ter insônia (RP = 1,84; IC = 1,43-2,37) e se autoperceber como gordo ou muito gordo (RP = 1,90; IC = 1,50-2,42). Prevalência moderada de comportamentos extremos para perda de peso foi identificada entre os adolescentes. Os fatores socioeconômicos, de exposição à violência, de saúde mental e da imagem corporal se associaram à adoção de tais comportamentos.*

Palavras-chave *Comportamento purgativo, Perda de peso, Vômito induzido, Laxantes, Adolescente*

¹ Escola de Nutrição, Universidade Federal da Bahia. Av. Araújo Pinho 32, Canela. 40110-150 Salvador BA Brasil. anaelisa_alegrete@hotmail.com

² Departamento de Estatística, Universidade Federal da Bahia. Salvador BA Brasil.

³ Centro de Ciências da Saúde, Universidade Federal do Recôncavo da Bahia. Santo Antônio de Jesus BA Brasil.

Introduction

Adolescence is the period of life in which intense physical, psychological, and behavioral changes occur¹. Besides dealing with the changes already expected for that phase, adolescents are faced with beauty standards and extreme appreciation of appearance, resulting in unreal internalization and consequent increase in insecurity, anxiety, and body dissatisfaction².

The search for a body pattern socially accepted can lead the adolescent to adopt extreme weight loss behaviors (EWLB), such as restrictive diet and fasting, use of food substitutes, smoking more cigarettes, use of laxatives, diuretics, and medications as well as induction of vomiting³⁻⁶.

The assessment of such behaviors varies between studies. In Brazil, Leme *et al.*⁷, in a cluster randomized controlled study, identified in adolescents three categories to classify weight control behaviors, including healthy ones (exercising, eating more fruits and vegetables, eating fewer fatty foods, eating fewer sweets), unhealthy ones (skipping meals, eating little and fast), extreme unhealthy behaviors (using diuretics and smoking) and, lastly, other weight control behaviors (medicines, meal substitutes). In subsequent studies with Brazilian adolescents, this classification was changed to a broader concept, already established, grouping all categories of unhealthy weight control behaviors. For example, Dunker & Claudino⁸ adopted the definition of New Moves Project.⁹ and Ferreira *et al.*¹⁰ applied an adaptation of the Hay scale¹¹.

The involvement of adolescents with EWLB is a serious concern with clinical relevance, because of its contribution to the etiology of eating disorders and obesity, in addition to adverse physiological effects, such as esophagitis, gastric rupture, and functional gastrointestinal disorders^{12,13}.

In recent decades, there has been a worrying prevalence of EWLB among adolescents in both developed countries (6.2% to 12%)^{14,15} and those in development (9.6% to 30.7%)^{16,17}. In Brazil, a study conducted with the three surveys (2009, 2012, and 2015) of the National School-Based Health Survey (PeNSE), recorded a temporal trend of increased prevalence of EWLB among adolescents living in Brazilian capitals, with estimates of 6.4% in 2009, 9.0% in 2012 and 10.1% in 2015⁴.

The increased occurrence of EWLB in adolescence is explained by various individual (biological and psychological) and socio-cultural factors identified as potential risks for the adoption of

these behaviors. Evidence shows that body image dissatisfaction, followed by overweight/obesity, are determinants for adoption of EWLB^{6,18} and that the higher frequency of family meals is associated with lower chances of adopting these behaviors¹⁹.

In this direction, in northeastern Brazil cultural values guide the way the northeastern relates to food and weight, also, is the region that has the largest coastline and high climatic temperatures most of the year, which is associated with greater body exposure with the adoption of light clothing for boys and girls^{20,21}. Thus, it is assumed that northeastern adolescents are more vulnerable to social pressures to adapt their body image to a socially established standard, which can differentiate the way EWLB develops. Therefore, the dissolution of cultural boundaries and the resulting homogenization of values relativized this premise, emerging as one more element to justify the conduction of this study on this theme in this region.

Then, considering the complex and multifactorial nature of EWLB and the need to deepen knowledge on this topic, this study was guided by the hypothesis that socioeconomic and demographic characteristics, family, individual, and psychological behaviours are related to the development of EWLB in adolescents. Thus, the present study was developed to assess, based on PeNSE²² of 2015, the prevalence and factors associated with unhealthy behaviors in adolescents of northeastern Brazil.

Methods

This is a cross-sectional study, using data from Sample 2 of the PeNSE 2015 edition, collected from a complex sampling design²². This study followed the recommendations of the Strengthening the Reporting of Observational Studies in Epidemiology - STROBE.

The national sample consisted of students who attended from 6th to 9th grade of elementary school and from 1st to 3rd grade of high school in public and private schools located in urban and rural areas of the five geographic regions of Brazil. This study adopted the section of the Northeast region with 3,230 adolescents. Data from 791 questionnaires were excluded due to the absence of the variable maternal education, so 2,439 adolescents were included in the analysis. The design of the study sample selection is shown in Figure 1.

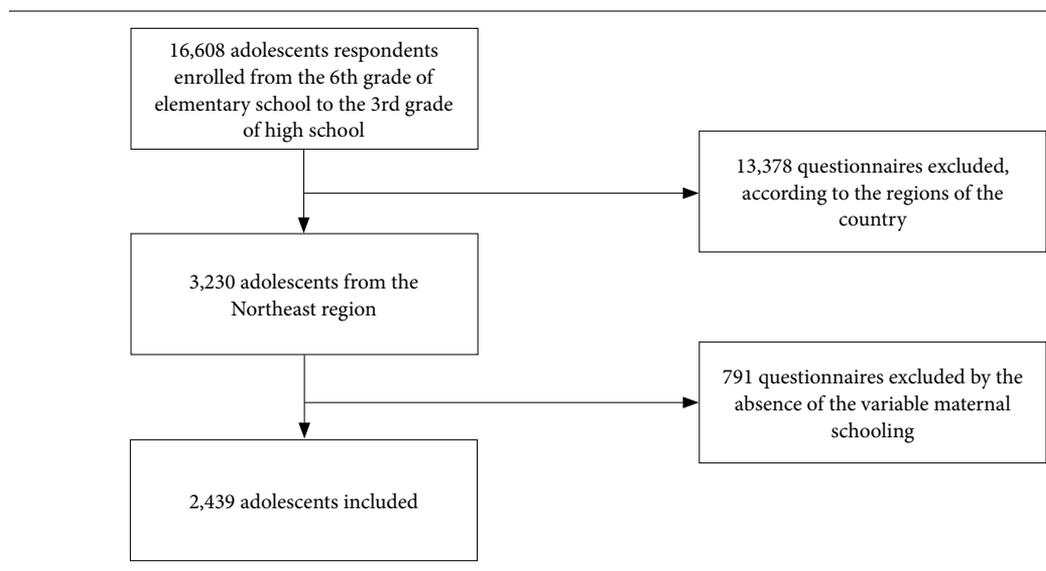


Figure 1. Study flowchart.

Source: Authors.

Data collection was performed with electronic devices (smartphones) in a self-administered electronic questionnaire. The researchers from the Brazilian Institute of Geography and Statistics (IBGE) distributed the devices to the students on the day of the interviews and introduced them to how to use them. In addition to the questionnaire, anthropometric measurements of weight and height were performed to assess the body mass index (BMI) of students. PeNSE's data is in the public domain and details about the sampling strategy and other research information can be found in the report of its third edition held in 2015²². This nationwide research was approved by the Research Ethics Committee of the Ministry of Health of Brazil, approval n° 192/2012, referring to registration n° 16,805, from CONEP/MS, from 27/3/2012.

The outcome variable, EWLB, was constructed based on two simple questions: "Did you vomit or take laxatives to lose weight or avoid gaining weight?" (yes/no) and "have you taken any medicine, formula, or other weight loss product without medical follow-up?" (yes/no)²². A negative answer classified the participant with absence (0 = reference) of EWLB, and if the answer was affirmative for at least one of the questions was considered presence (1) of these behaviors in adolescents.

The exposure variables represent categories related to socioeconomic and demographic factors, family, individual and psychological behavior, and are described in Chart 1.

Initially, the descriptive analysis was performed to characterize the study population using frequencies. Then, the Pearson's chi-square test was performed to compare the prevalence of EWLB according to the exposure variables. The statistical analysis was performed following a predefined conceptual model like that suggested by Victora et al.²⁵ to map the relationships proposed between the EWLB and the variables of interest. This structure is organized in blocks and distributed in three levels (Figure 2).

Poisson regression models were adjusted to identify potential factors associated with EWLB. The initial model included all Level 1 variables (Figure 2). Those statistically significant ($p < 0.05$) in this first model contributed to the adjustment of subsequent levels of analysis. The second model included all Level 2 variables and those that were significant ($p < 0.05$) in the initial model. Then, a new model was adjusted with the variables of Level 2 that were significant ($p < 0.05$), in addition to the variables selected in the initial model and all variables of Level 3. After checking the statistical significance ($p < 0.05$) for the variables of Level 3, the final model was ad-

Chart 1. Description of independent/secondary variables according to their characteristics. Brazil, 2015.

Characteristic/ variable	Description
Socioeconomic conditions	
Economic indicator	Better economic situation (reference) and Worse economic situation (indicator created from the data of ownership of household items, vehicles, number of bathrooms with shower, Internet access in the household, and the presence of a maid. The score was categorized into tertiles, according to the distribution observed in the sample studied by Levy et al. ²³)
School administration	Public (reference); Private
Maternal education	Illiterate/incomplete elementary education (reference); Complete elementary/incomplete high school; Complete high school/incomplete college; Complete college degree
Demographic Characteristics	
Sex	Male (reference); Female
Age	11-14 years (reference); 15-19 years
Race/ skin color	Non-white (black, yellow, mixed, and indigenous) (reference); White
Family context	
Have family meals with parents or guardian	Frequent (5 days) (reference); Less frequent (<5 days)
Exposure to violence	
Victim of bullying	Sporadic behavior (never, rarely, sometimes) (reference); Yes (often, always)
Forced to have sex	No (reference); Yes
Lifestyle	
Physical activity	Physically active (300 min/week) (reference); Insufficiently active (< 300 min/week)
Sedentary behavior	Non-sedentary (2 hours/day sitting) (reference); Sedentary (> 2 hours/day sitting)
Mental health	
Feeling lonely	No (never/sometimes/rarely) (reference); Yes (often/always)
Insomnia	Sporadic (never/sometimes/rarely) (reference); Yes (often/always)
Indicators of nutritional status and food practice	
Anthropometric status	Eutrophy (BMI/Age > z-score -2 and < z-score +1) (reference); Underweight (BMI/Age < z-score -2); Overweight (BMI/Age > z-score +1); Obesity (BMI/Age > z-score +2) ²⁴
Eating while watching TV	Frequent (5 days) (reference); Less frequent (< 5 days)
Breakfast omission	Frequent consumption (reference); Less frequent consumption
Body image	
Body image perception	Normal (reference); Lean (thin/very thin); Excess weight (fat/very fat)
Body satisfaction	Satisfied (satisfied/very satisfied) (reference); Indifferent; Dissatisfied (dissatisfied/very dissatisfied)
Attitude towards the weight	No attitude (reference); Trying to lose or maintain weight; Trying to gain weight

Source: Authors.

justed. Also, the variables of economic indicator and race/skin color were maintained in all steps of the analysis, although they were not statistically significant ($p < 0.05$). Statistical analyses were performed using the software R (R Version 4.1.2 – “Bird Hippie”)²⁶.

Results

Of the 2,439 adolescents, 51.6% were female, 54.4% were aged 15 to 19 years, and 70.0% belonged to the public school system (Table 1). The prevalence of EWLBS was 12.1%, with 8.5% reporting self-induced vomiting or use of laxatives and 7.1% using medicine or other products

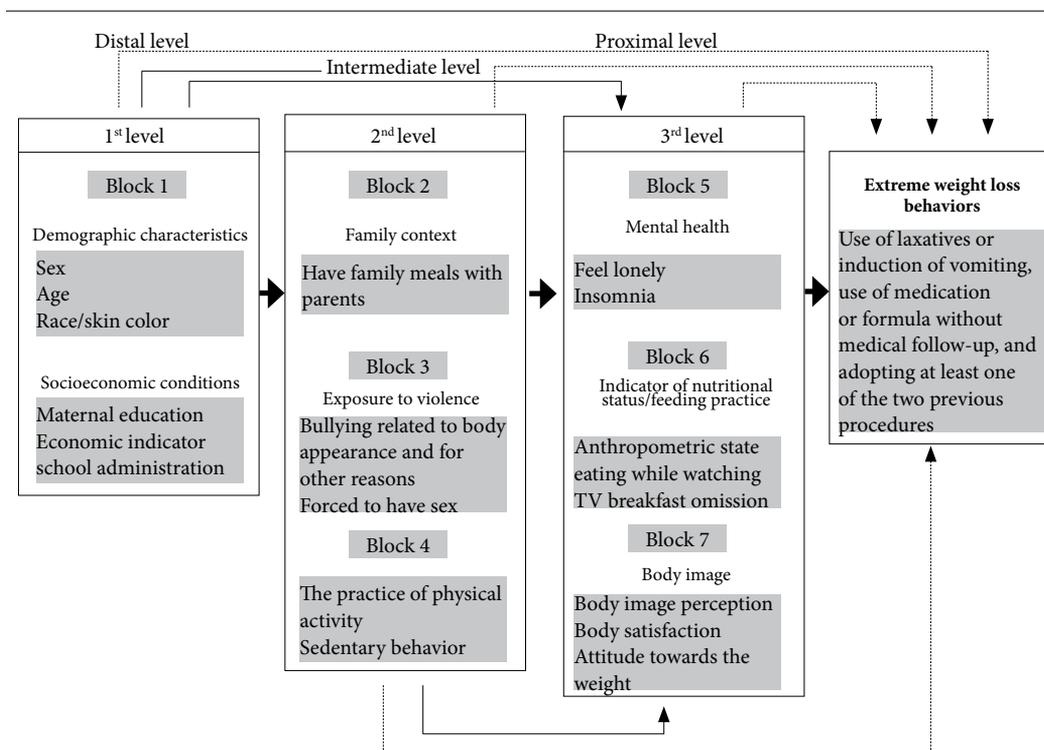


Figure 2. Hierarchical conceptual model of factors associated with EWL among adolescents from northeastern Brazil, Brazil, 2015.

Source: Authors.

to lose or maintain weight. Other characteristics of the sample and prevalence of EWL are described in Table 1.

The results of the simple Poisson model indicated that among the factors of the distal level, being female (PR: 0.60; CI: 0.46-0.79) and aged 15 to 19 years (PR: 0.56; CI: 0.41-0.77) were negatively associated with EWL. There was also a negative association between mothers having completed high school or college and adolescents studying in private schools (Table 2).

Among the factors of the intermediate level, the prevalence of EWL is about 2.09 (CI: 1.56-2.82) times higher in adolescents who suffered bullying related to body appearance and for other reasons compared to their peers who did not suffer psychological violence. More expressive and positively significant estimates were also observed when assessing the sexual abuse suffered (PR: 3.08; CI: 2.22-4.26) by the adolescent and the outcome of interest. There was no significant association between the other variables at this level and the occurrence of EWL (Table 2).

Regarding the proximal level, the results showed that feeling lonely (PR: 1.58; CI: 1.22-2.03), having insomnia (PR: 1.91; CI: 1.48-2.46), being obese (PR: 1.81; CI: 1.32-2.46), self-perception of excess weight (PR: 1.53) and body image dissatisfaction (PR: 1.44; CI: 1.12-1.84) were significantly and positively associated with EWL. The other variables in this level were not associated with the outcome of interest (Table 2).

In the final model, after adjustment, it was observed that female (PR = 0.65; CI = 0.52-0.81), aged 15 to 19 years (PR = 0.56; CI = 0.45-0.70), private school (PR = 0.62; CI = 0.46-0.84), while representative of the distal level decreased the prevalence of adoption of EWL. Regarding the intermediate level, it was found that experiencing violence as being a victim of bullying related to body appearance and for other reasons (PR = 1.62; CI = 1.19-2.20) and being forced to have sexual intercourse (PR = 2.65; CI = 1.90-3.69) showed positive and significant associations with the occurrence of EWL. Regarding the factors of the proximal level, having insomnia (PR =

Table 1. Percentage distribution of the characteristics of the sample and prevalence of EWLB among adolescents from northeastern Brazil. Brazil, 2015.

Variables	Total (2.439) n (%)	No EWLB (2.143) n (%)	EWLB (296) n (%)	p-value
Demographic characteristics				
Sex				0,001
Male	1.180 (48,4)	1011 (85,7)	169 (14,3)	
Female	1.259 (51,6)	1132 (89,9)	127 (10,1)	
Age				< 0,001
11 to 14 years	1.112 (45,6)	942 (84,7)	170 (15,3)	
15 to 19 years	1.327 (54,4)	1201 (90,5)	126 (9,5)	
Race/skin color				0,309
Non-white	1.735 (71,1)	1517 (87,4)	218 (12,6)	
White	704 (28,9)	626 (88,9)	78 (11,1)	
Socioeconomic conditions				
Maternal education				< 0,001
Illiterate/Incomplete elementary education	795 (32,6)	668 (84,0)	127 (16,0)	
Complete elementary/Incomplete high school	374 (15,3)	325 (86,9)	49 (13,1)	
Complete high school/Incomplete college	746 (30,6)	673 (90,2)	73 (9,8)	
Complete college degree	524 (21,5)	477 (91,0)	47 (9,0)	
Economic indicator				< 0,001
3 rd tertile (class B)	792 (32,5)	712 (89,9)	80 (10,1)	
1 st tertile + 2 nd tertile (class D + C)	1.647 (67,5)	1431 (86,9)	216 (13,1)	
School administration				< 0,001
Public	1.709 (70,1)	1471 (86,1)	238 (13,9)	
Private	730 (29,9)	672 (92,1)	58 (7,9)	
Family context				
Have family meals with parents				0,607
Frequent (> 5 days)	1.645 (67,5)	1449 (88,1)	196 (11,9)	
Less frequent	791 (32,5)	691 (87,4)	100 (12,6)	
Exposure to violence				
Bullying related to body appearance and for other reasons				< 0,001
Never/Rarely/Sometimes	2.264 (93,1)	2008 (88,7)	256 (11,3)	
Often/Always	170 (6,9)	130 (76,5)	40 (23,5)	
Forced to have sex				< 0,001
Not abused	2.357 (96,8)	2090 (88,7)	267 (11,3)	
Abused	79 (3,2)	50 (63,3)	29 (36,7)	

continua

1.84; CI = 1.43-2.37) and self-perception of excess weight (PR = 1.90; CI = 1.50-2.42) increased almost twice the prevalence of the outcome of interest (Table 2).

Discussion

This study evaluated the prevalence and factors associated with the adoption of EWLB among adolescents from northeastern Brazil. The estimated prevalence of EWLB among adolescents (12.14%) in this study was higher than that ob-

served throughout Brazil in the three PeNSE surveys, 6.4% in 2009, 9.0% in 2012, and 10.1% in 2015⁴ or among Spanish (3.26%) and North American adolescents (5.03%)²⁷, but it was lower than the estimates for adolescents from southeastern Brazil (31.9%)²⁸. The variability of the prevalence found may have been influenced by the sociocultural aspects inherent to each location and methodological differences adopted by the studies to assess the outcome. These results of the estimated prevalence of EWLB related to body and weight should raise concerns, especially in adolescence, considered an important start-

Table 1. Percentage distribution of the characteristics of the sample and prevalence of EWLB among adolescents from northeastern Brazil. Brazil, 2015.

Variables	Total (2.439) n (%)	No EWLB (2.143) n (%)	EWLB (296) n (%)	p-value
Lifestyle				
Physical activity				0,383
Physically active	464 (19,1)	402 (86,7)	62 (13,3)	
Insufficiently active	1.968 (80,9)	1734 (88,2)	234 (11,8)	
Sedentary behavior				0,082
Non-sedentary	892 (36,6)	770 (86,3)	122 (13,7)	
Sedentary	1.542 (63,4)	1368 (88,7)	174 (11,3)	
Mental health				
Feeling lonely				0,001
Never/Sometimes/Rarely	2.058 (84,6)	1828 (88,8)	230 (11,2)	
Often/Always	375 (15,4)	310 (82,4)	65 (17,6)	
Insomnia				< 0,001
Never/Sometimes/Rarely	2.133 (87,7)	1899 (89,0)	234 (11,0)	
Often/Always	300 (12,3)	238 (79,3)	62 (20,7)	
Indicator of nutritional status/food practice				
Anthropometric status				
Underweight/Eutrophy	1.878 (77,0)	1678 (89,4)	200 (10,6)	< 0,001
Overweight	371 (15,2)	312 (84,1)	59 (15,9)	
Obesity	190 (7,8)	153 (80,5)	37 (19,5)	
Eating while watching TV				0,015
Frequent consumption	1.124 (46,1)	968 (86,1)	156 (13,9)	
Less frequent consumption	1.315 (53,9)	1175 (89,4)	140 (10,6)	
Breakfast omission				0,299
Frequent consumption	1.687 (69,2)	1490 (88,3)	197 (11,7)	
Less frequent consumption	752 (30,8)	653 (86,8)	99 (13,2)	
Body Image				
Body image perception				< 0,001
Normal	1.736 (53,9)	1606 (92,5)	130 (7,5)	
Lean	894 (27,7)	818 (91,5)	76 (8,5)	
Excess weight	594 (18,4)	504 (84,9)	90 (15,1)	
Body satisfaction				0,019
Satisfied	1.691 (69,5)	1505 (89,0)	186 (11,0)	
Indifferent	265 (10,9)	231 (87,2)	34 (12,8)	
Dissatisfied	477 (19,6)	401 (84,1)	76 (15,9)	
Attitude towards the weight				0,064
No attitude	880 (36,1)	778 (88,4)	102 (11,6)	
Trying to lose or maintain weight	1.050 (43,1)	906 (86,2)	144 (13,8)	
Trying to gain weight	505 (20,8)	456 (90,3)	49 (9,7)	

Data presented as n (%). EWLB prevalence 12,1%.

Source: Authors.

ing point for the development of eating disorders, which can result in numerous consequences for physical and mental health.

Among the variables explored in the final model, the results indicated that studying in private school, being a victim of bullying related to body appearance and for other reasons, being forced to have sexual intercourse, having insomnia, and self-perception of excess weight were

associated with EWLB among the adolescents assessed.

Considering the final model adjusted by the economic indicator, self-reported race/skin color, and all the variables of the model, this study showed that the school administration (private) reduced the prevalence of EWLB. Similar results^{28,29} was presented, in which the presence of these behaviors was higher among adolescents

Table 2. Crude prevalence ratios and final hierarchical model of factors associated with EWLB among adolescents of northeastern Brazil. Brazil, 2015.

Variables	PRcrude ¹ (95% CI)	p-value	PRadjusted ² (95% CI)	p-value
Demographic characteristics				
Sex				
Male	Ref -	-	Ref -	-
Female	0,71 (0,57-0,88)	0,002	0,65 (0,52-0,81)	< 0,001
Age				
11 to 14 years	Ref -	-	Ref -	-
15 to 19 years	0,62 (0,50-0,77)	< 0,001	0,56 (0,45-0,70)	< 0,001
Race/skin color				
Non-white	Ref -	-		
White	0,88 (0,68-1,12)	0,303		
Socioeconomic conditions				
Maternal education				
Illiterate/ Incomplete elementary education	Ref -	-		
Complete elementary/Incomplete high school	0,81 (0,58-1,11)	0,197		
Complete high school/Incomplete college	0,60 (0,45-0,79)	< 0,001		
Complete college degree	0,55 (0,40-0,77)	< 0,001		
Economic indicator				
3 rd tertile (class B)	Ref -	-		
1 st tertile + 2 nd tertile (class D + C)	0,68 (0,32-1,42)	0,328		
School administration				
Public	Ref -	-	Ref -	-
Private	0,56 (0,42-0,74)	< 0,001	0,62 (0,46-0,84)	0,002
Family context				
Have family meals with parents				
Frequent (> 5 days)	Ref -	-		
Less frequent	1,06 (0,85-1,34)	0,55		
Exposure to violence				
Bullying related to body appearance and for other reasons				
Never/Rarely/Sometimes	Ref -	-	Ref -	-
Often/Always	2,09 (1,56-2,81)	< 0,001	1,62 (1,19-2,20)	0,003
Forced to have sex				
Not abused	Ref -	-	Ref -	-
Abused	3,07 (2,22-4,25)	< 0,001	2,65 (1,90-3,69)	< 0,001

continua

enrolled in public schools. These results may be related to the socioeconomic conditions of these students, which is a hypothesis to be tested in future studies, since studying in public school is a proxy for worse economic conditions and previously it was supposed that these behaviors were more frequent in higher income populations. However, it has often been observed that people from lower social classes are more vulnerable to pressures to adapt to a socially established body standard³⁰.

The results also show that adolescents who experienced appearance-related bullying were more likely to adopt EWLB and this is in line with previous findings among youngsters^{31,32}.

Mostly, adolescents who have been victims of appearance-related bullying, feel more uncomfortable with teasing, which contributes to body dissatisfaction and EWLB. This result is particularly relevant, and this situation should be monitored, as other studies have also shown an association between bullying and problems related to emotional distress, such as loneliness, anxiety, insomnia, sadness, depression, post-traumatic stress disorder, and suicidal thoughts³³, showing the extent of this problem and its serious immediate and long-term health consequences.

Furthermore, the results reveal significant associations between experiences of sexual abuse and the outcome of interest. There are numerous

Table 2. Crude prevalence ratios and final hierarchical model of factors associated with EWLB among adolescents of northeastern Brazil. Brazil, 2015.

Variables	PRcrude ¹ (95% CI)	p-value	PRadjusted ² (95% CI)	p-value
Lifestyle				
Physical activity				
Physically active	Ref -	-		
Insufficiently active	0,89 (0,68-1,15)	0,38		
Sedentary behavior				
Non-sedentary	Ref -	-		
Sedentary	0,82 (0,66-1,02)	0,08		
Mental health				
Feeling lonely				
Never/Sometimes/Rarely	Ref -	-		
Often/Always	1,57 (1,22-2,03)	0,001	Ref -	-
Insomnia			1,84 (1,43-2,37)	< 0,001
Never/Sometimes/Rarely	Ref -	-		
Often/Always	1,91 (1,48-2,46)	< 0,001		
Indicator of nutritional status/food practice				
Anthropometric status				
Underweight/Eutrophy	Ref -	-		
Overweight	1,44 (1,11-1,89)	0,008		
Obesity	1,81 (1,32-2,46)	< 0,001		
Eating while watching TV				
Frequent consumption	Ref -	-		
Less frequent consumption	0,79 (0,63-0,98)	0,034		
Breakfast omission				
Frequent consumption	Ref -	-		
Less frequent consumption	1,15 (0,92-1,45)	0,209		
Body image				
Body image perception				
Normal	Ref -	-	Ref -	-
Lean	1,11 (0,86-1,44)	0,413		
Excess weight	1,95 (1,53-2,49)	< 0,001	1,90 (1,50-2,42)	< 0,001
Body satisfaction				
Satisfied	Ref -	-		
Indifferent	1,16 (0,83-1,63)	0,368		
Dissatisfied	1,44 (1,12-1,84)	0,004		
Attitude towards the weight				
No attitude	Ref -	-		
Trying to lose or maintain weight	1,19 (0,93-1,51)	0,150		
Trying to gain weight	0,84 (0,61-1,16)	0,306		

¹ Simple Poisson model. ² Adjusted multiple models. PR = prevalence ratio; 95%CI = 95% confidence interval. * Final model adjusted by the variables economic indicator and race/skin color and all statistically significant variables, Akaike - AIC (1654,69).

Source: Authors.

psychological consequences of sexual abuse suffered by adolescents, including the development of eating disorders. This mechanism is related to body dissatisfaction, which acts as a mediator throughout the process since the victims of this violence have a sense of discomfort and dissatisfaction with their self-image seeking body changes through inadequate eating behavior³⁴⁻³⁶. Early interventions are essential so that a specific

diagnostic proposal is built to better serve populations at risk and minimize the damaging effects of this violence.

Regarding the psychosocial indicators, having insomnia increased the prevalence of the outcome of interest, aligning with the result presented in other studies, in which adolescents with sleep duration of at least 8 hours per day act as a protective factor against EWLB for both sexes³⁷. It

is believed that this association can be explained by dissatisfaction with body image, because poor sleep quality, in addition to causing hormonal changes, increases physical inactivity and the time available for food intake mainly of high energy density foods and low nutritional value, and even prolonged exposure to television, which may lead adolescents to present distorted body image, thus favoring the adoption of EWLB³⁸.

Consistent with previous studies^{5,6,7,18,39} self-perception of excess weight was significantly associated with adolescent involvement with EWLB. In contemporary society, adolescents with a greater possibility of involvement in strategies for weight loss probably have a high level of body image dissatisfaction, such as stress with appearance. The hypothesis that body image perception may have a greater impact on EWLB that favors weight loss is reinforced by considering, for example, that normal-weight adolescents who overestimate their nutritional status are more likely to adhere to fasting practices, self-induced vomiting, or use of laxatives and over-the-counter drugs when compared with those with normal weight and self-assessment in accordance with their real weight²⁸.

This study, for analysis of PeNSE data, is a pioneer in Brazil in evaluating the factors associated with EWLB with a hierarchical approach and a large region of the country. The results suggest potential implications for public health, yet this study has some limitations that should be considered for the interpretation of the results. First, as PeNSE is cross-sectional research, there is the possibility of causality bias because the relationship between outcome and exposure variables was estimated in a single moment. The temporal sequence of events was not considered, and the cause and effect could not be identified. Second, the sample

studied was from a single Brazilian region and, therefore, is not representative of all adolescents in the country. However, the sample size was adequate (with adequate power and effect size) for the analyses and attested conclusions. Third, PeNSE²² presents: the use of self-report for the research of extreme weight loss behaviors with the possibility of underreporting, because the adolescent can be inhibited, not reporting accurately, and may be subject to classification errors.

Despite the limitations of this study, it can be concluded that among the adolescents assessed there is a worrying prevalence of EWLB, and that studying in private school, being a victim of bullying related to body appearance and for other reasons, being forced to have sexual intercourse, having insomnia and self-perception of weight excess are important factors associated with these disorderly behaviors. The impact of these results on public and mental health involves the fact that early identification of EWLB can help prevent more serious health problems that burden the public health system.

In this perspective, these results, as well as all others from PeNSE, should be widely disseminated to subsidize actions to be implemented, expanded, and/ or reformulated. In addition, these findings can help to inform policies and programs for the prevention of EWLB and protection of young people, to monitor the magnitude and temporal trends of these factors, as well as to evaluate the actions addressed to this population group. The EWLB affects the physical and mental health of adolescents and therefore requires an integrated approach to coping with this problem that involves educators, health professionals, parents, and the community in general. These initiatives should focus on health promotion and protection, comprehensiveness, and intersectorality.

Collaborations

AE Ramos participated in the design of the project, carried out the analysis and interpretation of the data and wrote the final text of the article; KBB Silva participated in the design of the project, wrote the article and critically reviewed the intellectual content. VAO Queiroz and E Brito carried out the data analysis and critically reviewed the intellectual content. CAS Costa wrote the article and critically reviewed the intellectual content. MLP Santana participated in the design of the project, interpretation of the data, wrote the article and critically reviewed the intellectual content.

Acknowledgment

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) - Funding Code 001. The authors thank the Fundação de Amparo à Pesquisa do Estado da Bahia (FAPESB) for awarding the scholarship to the graduate student (Ph.D.) and for supporting this research.

References

1. World Health Organization (WHO). *Coming of age: adolescent health*. Geneva: WHO; 2019.
2. Vitolo MR, Bortolini GA, Horta RL. Prevalência de compulsão alimentar entre universitárias de diferentes áreas de estudo. *Rev Psiquiatr RS* 2005; 28(1):20-26.
3. Neumark-Sztainer D, Wall M, Story M, Standish AR. Dieting and unhealthy weight control behaviors during adolescence: associations with 10-year changes in body mass index. *J Adolesc Health* 2012; 50(1):80-86.
4. Ferreira CS, Andrade FB. Tendência de atitudes extremas em relação ao peso em adolescentes e sua relação com suporte familiar e imagem corporal. *Cien Saude Colet* 2020; 25(5):1599-1606.
5. Vale D, Dantas RF, Amorim GKD, Lyra CO, Oliveira AGRC. Determinantes sociais de comportamentos alimentares desordenados entre adolescentes brasileiros. *Rev Debat Psiquiat* 2021; 11:1-22.
6. Santana ML, Assis AM, Silva RC, Raich RM, Machado ME, Pinto EJ, Moraes LT, Ribeiro HC. Risk factors for adopting extreme weight-control behaviors among public school adolescents in Salvador, Brazil: a case-control study. *J Am Coll Nutr* 2016; 35(2):113-117.
7. Leme AC, Philippi ST, Thompson D, Nicklas T, Baranowski T. "Healthy habits, healthy girls – Brazil": an obesity prevention program with added focus on eating disorders. *Eat Weight Disord* 2019; 24:107-119.
8. Dunker KL, Claudino AM. Validity and reliability of the Brazilian version of the weight control behaviors scale. *J Pediatr* 2017; 189:143-148.
9. Neumark-Sztainer DR, Friend SE, Flattum CF, Hannan PJ, Story MT, Bauer KW, Feldman SB, Petrich CA. New moves – preventing weight – related problems in adolescent girls: a group-randomized study. *Am J Prev Med* 2010; 39(5):421-432.
10. Ferreira JES, Veiga GV. Confiabilidade (teste-reteste) de um questionário simplificado para avaliar comportamentos de risco para transtornos alimentares em adolescentes. *Rev Bras Epidemiol* 2008; 11(3):393-401.
11. Hay P H. The epidemiology of eating disorder behaviors: an Australian community-based survey. *J Eat Disord* 1998; 23(4):371-382.
12. Golden NH, Schneider M, Wood C, Committee on Nutrition, Committee on Adolescence, Section on Obesity. Preventing obesity and eating disorders in adolescents. *Pediatrics* 2016; 138(3):e20161649.
13. Herzog W, Deter HC, Fiehn W, Petzold E. Medical findings and predictors of long-term physical outcome in anorexia nervosa: a prospective, 12-year follow-up study. *Psychol Med* 1997; 27(2):269-279.
14. Kim Y, Austin SB, Subramanian SV, Thomas JJ, Eddy KT, Franko DL, Rodgers RF, Kawachi I. Risk factors for disordered weight control behaviors among Korean adolescents: multilevel analysis of the Korea Youth Risk Behavior Survey. *Int J Eat Disord* 2018; 51(2):124-138.
15. Gordon AR, Austin SB, Schultz J, Guss CE, Calzo JP, Wang ML. Gender expression, peer victimization, and disordered weight-control behaviors among U.S. high school students. *J Adolesc Health* 2021; 68(6):1148-1154.

16. Hidalgo-Rasmussen CA, Martín AH, Rasmussen-Cruz B, Montaña-Espinoza R. Calidad de vida, según percepción y comportamientos de control del peso por género, en estudiantes universitarios adolescentes en México. *Cad Saude Publica* 2011; 27(1):67-77.
17. Tuffa TA, Gebreyesus SH, Endris BS, Getnet Y, Abebe DS. Unhealthy weight control behaviors among Ethiopian female adolescents. *Int J Eat Disord* 2020; 53(4):525-532.
18. Castro IRR, Levy RB, Cardoso LO, Passos MD, Sardinha LMV, Tavares LF, Dutra SP, Martins A. Imagem corporal, estado nutricional e comportamento com relação ao peso entre adolescentes brasileiros. *Cien Saude Colet* 2010; 15(Supl. 2):3099-3108.
19. Loth K, Wall M, Choi CW, Bucchianeri M, Quick V, Larson N, Neumark-Sztainer D. Family meals and disordered eating in adolescents: are the benefits the same for everyone? *Int J Eat Disord* 2015; 48(1):100-110.
20. Iriart JAB, Chaves JC, Orleans RG. Culto ao corpo e uso de anabolizantes entre praticantes de musculação. *Cad Saude Publica* 2009; 25(4):773-782.
21. Alves TCHS, Santana MLP, Silva RCR, Pinto EJ, Assis AMO. Fatores associados a sintomas de transtornos alimentares entre escolares da rede pública da cidade do Salvador, Bahia. *J Bras Psiquiatr* 2012; 61(2):55-63.
22. Instituto Brasileiro de Geografia e Estatística (IBGE). *Pesquisa Nacional de Saúde do Escolar 2015*. Rio de Janeiro: IBGE; 2016.
23. Levy RB, Castro IRR, Cardoso LO, Tavares LF, Sardinha LMV, Gomes FS, Costa AWN. Consumo e comportamento alimentar entre adolescentes brasileiros: Pesquisa Nacional de Saúde do Escolar (PeNSE), 2009. *Cien Saude Colet* 2010; 15(Supl. 2):3085-3097.
24. Onis M, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-aged children and adolescents. *Bull World Health Organ* 2007; 85(9):660-667.
25. Victora CG, Huttly SR, Fuchs SC, Olinto MT. The role of conceptual frameworks in epidemiological analysis: A hierarchical approach. *Int J Epidemiol* 1997; 26(1):224-227.
26. R Core Team. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria; 2021.
27. López-Guimerà G, Neumark-Sztainer D, Hannan P, Fauquet J, Loth K, Sánchez-Carracedo D. Unhealthy weight-control behaviours, dieting and weight status: a cross-cultural comparison between North American and Spanish adolescents. *Eur Eat Disord Rev* 2013; 21(4):276-283.
28. Silva SU, Barufaldi LA, Andrade SSCA, Santos MAS, Claro RM. Estado nutricional, imagem corporal e associação com comportamentos extremos para controle de peso em adolescentes brasileiros, Pesquisa Nacional de Saúde do Escolar de 2015. *Rev Bras Epidemiol* 2018; 21(Supl. 1):e180011.
29. Austin SB, Richmond TK, Spadano-Gasbarro J, Greaney ML, Blood EA, Walls C, Wang ML, Mezgebu S, Osganian SK, Peterson KE. The contribution of school environmental factors to individual and school variation in disordered weight control behaviors in a statewide sample of middle schools. *Eat Disord* 2013; 21(2):91-108.
30. Stephen EM, Rose JS, Kenney L, Rosselli-Navarra F, Weissman RS. Prevalence and correlates of unhealthy weight control behaviors: findings from the national longitudinal study of adolescent health. *J Eat Disord* 2014; 2:16.
31. Lampard AM, MacLehose RF, Eisenberg ME, Neumark-Sztainer D, Davison KK. Weight-related teasing in the school environment: Associations with psychosocial health and weight control practices among adolescent boys and girls. *J Youth Adolesc* 2014; 43(10):1770-1780.
32. Menzel JE, Schaefer LM, Burke NL, Mayhew LL, Brannick MT, Thompson JK. Appearance-related teasing, body dissatisfaction, and disordered eating: a meta-analysis. *Body Image* 2010; 7(4):261-270.
33. Henry KL, Lovegrove PJ, Steger MF, Chen PY, Cigularov KP, Tomazic RG. The potential role of meaning in life in the relationship between bullying victimization and suicidal ideation. *J Youth Adolesc* 2013; 43(2):221-232.
34. Ackard DM, Neumark-Sztainer D. Multiple sexual victimizations among adolescent boys and girls: prevalence and associations with eating behaviors and psychological health. *J Child Sex Abus* 2003; 12(1):17-37.
35. Paraventi F, Claudino AM, Morgan CM, Mari JJ. Estudo de caso controle para avaliar o impacto do abuso sexual infantil nos transtornos alimentares. *Arch Clin* 2011; 38(6):222-226.
36. Rocha DB, Andrade AC, Silva CAB. Vidas atravessadas pelo abuso sexual e pelo transtorno alimentar. *Inv Quali Saude* 2018; 2:727-736.
37. Weng CB, Sheu JJ, Chen HS. Factors associated with unhealthy weight control behaviors among a representative sample of U.S. high school students. *J Sch Nurs* 2022; 38(6):533-546.
38. Lima FEB, Coco MA, Santos DR, Lima SBS, Lima WF. Relação entre imagem corporal, consumo alimentar e sono em adolescentes. *Rev Assoc Med RS*; 65(3):01022105.
39. Leal GVDS, Philippi ST, Alvarenga MDS. Unhealthy weight control behaviors, disordered eating, and body image dissatisfaction in adolescents from São Paulo, Brazil. *Braz J Psychiatry* 2020; 42(3):264-270.

Article submitted 29/09/2022

Approved 25/01/2023

Final version submitted 27/01/2023

Chief editors: Romeu Gomes, Antônio Augusto Moura da Silva