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CARDIOVASCULAR AND BEHAVIORAL FACTORS ASSOCIATED WITH OVERWEIGHT IN YOUNG ADULTS IN SCHOOLS

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ABSTRACT

Introduction: Excessive weight is considered a risk factor for cardiovascular diseases, and it is frequently present among the causes of death. Its prevalence has increased worldwide, raising the need to investigate behaviors and factors associated with excessive weight at early ages so as to create subsidies for prevention and health education actions. To analyze excessive weight and its association with cardiovascular and behavioral factors in young adults in schools. **Methods:** Analytical, quantitative study with 1073 young adults from 52 schools. The data were collected through a previously constructed instrument, and then tabulated and analyzed through hierarchical logistic regression with the aid of a statistical software. A $p < 0.20$ was adopted for inclusion in the initial regression model, and a $p < 0.05$ for permanence in the model. **Results:** The frequency of cases of excessive weight in young adults in the schools was high, affecting more than a third of them (35.4%). In the final logistic regression model, the factors associated with overweight were: excessive weight in adolescence, blood pressure, and exposure to alcohol. **Conclusions:** Clinical and behavioral factors are associated with excessive weight, causing harm to the cardiovascular health of young adults in schools.

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INTRODUCTION

Excessive weight is considered as a risk factor for cardiovascular diseases (CVD) and is strongly represented among the causes of death. Moreover, it is related to high morbidity and, consequently and high costs for governments at the municipal, state or federal level (Magalhães *et al*., 2012; Mascena *et al*., 2017; Mazzoccante *et al*., 2013). Excessive weight rates in developed countries have been significant throughout the world. One example is the United States, where more than a third of the population is overweight (Ministério da Saúde do Brasil, 2014). Regarding the rates among Brazilian adults, a longitudinal study between the years 2006 and 2009 found an incidence of excessive weight among individuals with low or normal weight at 20 years, estimated at 40% in males and 30% in females. The persistence of obesity, in turn, was estimated to affect 65% of males and 47% of females (Conde *et al*., 2011).

Another study carried out in the northeast of Brazil with young adults in schools found that the prevalence of excessive weight reached 35.5%, where 26.4% were overweight and 9.4% were obese (Florêncio *et al*., 2016). These numbers are worrisome because, as already discussed, excessive weight is an important risk factor for many diseases, especially CVD. It is necessary to investigate behaviors and other factors associated with excessive weight at early ages, since the habits acquired during this phase may persist during aging and result in the development of CVD (Gasparotto *et al*., 2013). This research may serve as a subsidy for educational actions that nurses can develop in the care for overweight people with or without cardiovascular health changes, whose purpose is to create in the individuals/community the capacity to critically analyze their reality, decide on joint actions for solving problems and change situations, organize and implement the action, and evaluate it with a critical spirit (Santos *et al*., 2014), preserving the health, culture, pleasure of eating, life, natural resources and human dignity (Aguiar *et al*., 2012). These actions can be developed in the health institutions or even in the school, where nurses work as part of the School Health Program. Given the above, the objective of the present study was to analyze excessive weight and its association with cardiovascular and behavioral factors in young adult students.

MATERIALS AND METHODS

This is a cross-sectional, analytical, quantitative study. The study was conducted with young adults (20 to 24 years old) enrolled in state schools in Fortaleza-Ceará-Brazil. Considering that the initial number of young adult students was unknown, it was decided to define the sample size based on the calculation by simple random sampling for infinite populations. Based on the result of the calculation, we obtained an initial sample of 1067 young adult students and a final sample of 1073. It was considered the addition of six youths in the last school, since they had the profile for the study, accepted to participate in the research and could be useful in the case of possible losses after preparation of the database. Young women who were pregnant (considering other parameters to identify excessive weight) were excluded from the sample, as well as those who needed wheelchairs for locomotion, since there were no means available to perform anthropometric measurements for this group. When such cases occurred, new youths were included.

Based on the sample, a previous draw of 30% of the total educational institutions was performed, resulting in a total of 52. The percentage was established after the realization that the number of viable schools for visitation in the period of one week would be of two institutions, considering the need for time for contact school managers, as well as for raising awareness towards the study. Subsequently, we counted the weeks of classes from October 2013 to October 2014, considering holidays, bi-monthly tests, and the soccer world cup. In all, there were 26 weeks and consequently 52 schools visited and participating in the study, or 30% of the total number of schools. Once the percentage was defined, the institutions were drawn, and the students in the studied age group were selected for convenience. A questionnaire was used to collect sociodemographic information, anthropometric measurements and capillary blood collection to evaluate glycemia and total cholesterol levels. The questionnaire contains items related to socioeconomic characteristics; history of weight gain; exposure to risk factors; history of disease; history of obesogenic drug use. The other items followed the objective verification of blood pressure (mmHg), weight (kg), height (meters), waist circumference or abdominal fat accumulation (cm), hip circumference (cm) and waist/hip ratio (WHR). A physical examination of the skin was also performed. The collected data were used to prepare the database in a specific software. The endpoint of the study was excessive weight, being indicated by BMI $\geq$ 25 kg/m^2. For the analysis of the data, we initially calculated the statistical descriptive measures: simple frequency and percentage for the outcome variable. Afterwards, bivariate and multivariate analytical statistics were used in the cross-over of the various variables, using appropriate statistical tests for each type of variable. The *Pearson's* chi-square test was used in the bivariate analysis. The level of statistical significance of 5% was considered in all tests. The *odds ratio* (OR) with a 95% confidence interval was calculated to estimate the strength of association of possible markers of excessive weight. In the multivariate analysis, the statistical procedure for adjusting the potential confounding effects was hierarchical logistic regression. The regression followed the sequence: 1) variables located in the hierarchical level of lower power of determination of the SE (socioeconomic); 2) variables located at the intermediate hierarchical level (clinical); 3) variables located at the hierarchical level closest to the effect (behavioral).

For inclusion in the initial regression model, as a way of checking for confounding variables in each block, we adopted a p-value < 0.20 obtained in the bivariate analysis and for its permanence in the final model we adopted a p-value < 0.05. In addition, the *backward* method of data inclusion in all phases of the regression was adopted. The data were processed and analyzed in the *International Business Machines Statistics Package Social Science* version 18.0 (IBM SPSS 18.0). This project was submitted through the Brazil Platform to the Research Ethics Committee of the State University of Ceará and it was approved under protocol 263,271/2013, the research followed all the ethical principles in all phases of the study, according to the recommended by Resolution 466/2012 (Ministério da Saúde do Brasil).

RESULTS

It was observed that more than half (58.9%) of the young adults had normal weight, almost one third (26.2%) overweight, and 9.1% presented obesity. However, when the classes considered in the group of excessive weight were added, 35.4% of the young people were already with excessive weight. Regarding the bivariate analysis of socioeconomic characteristics, the following groups had a statistically significant association with overweight/obesity (p < 0.05): age, sex, marital status and children, where there was a greater proportion of excessive weight among the youths from 23 to 24 years, women, among those who had a partner and who had children. To be included in the adjustment phase of the logistic regression model, the variables would need to be associated with p < 0.20. Only in this case they would remain in the multivariate analysis (Table 1). In the bivariate analysis of the clinical factors, the following variables presented statistically significant association with overweight/obesity (p < 0.05): family history of obesity, waist circumference, total cholesterol, systolic and diastolic blood pressure, weight in childhood and adolescence, family history of obesity and use of obesogenic drugs. All these variables were selected for inclusion in the hierarchical logistic regression, since they had p-value less than 0.005 (Table 2).

Table 1. Bivariate analysis of socioeconomic characteristics associated with excessive weight in young adults, Fortaleza, Ceará-Brazil, 2020

Variables	Excessive weight		p*	GROSS OR (95% CI)
	Yes (%)	No (%)		
Age				
20-22 years	33.9	66.1	0.005	0.64 (0.47-0.87)
23-24 years	44.3	55.7		1.00
Sex				
Male	31.9	68.1		0.71 (0.55-0.92)
Female	39.5	60.5	0.010	1.00
Children?				
Yes	49.3	50.7		2.00 (1.50-2.74)
No	32.4	67.6	0.000	1.00
Marital status				
With partner	45.9	54.1		1.70 (1.26-2.30)
Without partner	33.2	66.8	0.000	1.00
How many people live?				
Up to 4 people	37.1	62.9		1.16 (0.88-1.51)
More than 4 people	33.7	66.3	0.273	1.00
With whom do you live?				
Alone	39.1	60.9		1.15 (0.49-2.68)
Family/Companion	35.8	64.2	0.743	1.00
Race				
White	38.8	61.2		1.137 (0.69-0.72)
Non-white	35.8	64.2	0.482	1.00
Occupation				
Study	37.0	63.0		1.07 (0.82-1.40)
Study/Work/Internship	35.3	64.7	0.590	1.00
Income				
More than 2 salaries	35.9	64.1		1.07 (0.82-1.40)
Up to 2 salaries	36.5	63.5	0.870	1.00

* p: significance level of Pearson's chi-square test. OR: *odds ratio*; CI: confidence interval.

Table 2. Bivariate analysis of socioeconomic characteristics associated with excessive weight in young adults, Fortaleza, Ceará-Brazil, 2020

Variables	Excessive weight		p*	GROSS OR (95% CI)
	Yes (%)	No (%)		
Were you breatsfed?				
Yes	36.8	63.2	0.910	1.02 (0.64-1.64)
No	36.1	63.9		1.00
Health Problems				
Yes	38.1	61.9		1.36 (0.85-1.51)
No	35.1	64.9	0.388	1.00
Family history of obesity				
Yes	45.7	54.3		2.22 (1.68-2.93)
No	27..5	72.5	0.000	1.00
Blood sugar determination				
Greater than or equal to 140	38.4	61.6		1.12 (0.69-1.83)
Lower than 140	35.6	64.4	0.636	1.00
Total cholesterol				
Borderline/High	60.7	39.3		2.93 (1.68-5.10)
Normal	34.5	65.5	0.000	1.00
Use of Obesogenic Drug				
Yes	44.4	55.6		1.52 (1.07-2.15)
No	34.4	65.6	0.017	1.00
Excessive weight in childhood				
Excessive weight	57.3	42.7		2.56 (1.69-3.87)
Low Weight/Normal Weight	34.4	65.6	0.000	1.00
Excessive weight in Adolescence				
Excessive weight	66.7	33.3		4.35 (2.96-6.40)
Low Weight/Normal Weight	31.5	68.5	0.000	1.00
Systolic Blood Pressure				
Borderline	58.0	42.0	0.000	2.67 (1.68-4.24)
Excellent/Normal	34.0	66.0		1.00
Diastolic Blood Pressure				
Borderline	68.3	31.7		4.07 (2.08-7.96)
Excellent/Normal	34.6	65.4	0.000	1.00

* p: significance level of Pearson's chi-square test. OR: *odds ratio*; CI: confidence interval.

In the bivariate analysis of behavioral factors, only exposure to alcohol had a statistically significant association with overweight/obesity. However, the variables use of oil, olive oil and salt were also selected for the multivariate analysis (Table 3). Table 4 shows the variables that remained in the final analysis model. At this stage, it was detected that the socioeconomic variables did not maintain a statistically significant association and were therefore removed from the model. Thus, the influence of variables of the two final blocks (medial and proximal) was observed, being the excessive weight in adolescence, blood pressure and alcohol exposure the variables that showed association with excessive weight in young adult students.

DISCUSSION

When the issue of prevalence of overweight/obesity is analyzed, there is a clear difference in the percentage values found in the regions where studies were carried out that approached excessive weight in young adults.

Table 3. Bivariate analysis of behavioral characteristics associated with excessive weight in young adults, Fortaleza, Ceará-Brazil, 2020

Variables	Excessive weight		p*	GROSS OR (95% CI)
	Yes (%)	No (%)		
Smokes currently				
Yes	43.4	56.6	0.233	1.40 (0.80-2.45)
No	35,3	64,7		1,00
Alcohol Exposure				
Rarely/never	32,9	67,1	0,003	0,66 (0,50-0,87)
Regular/Occasional use	42,4	57,6		1,00
Level of Physical Activity				
Active	35,8	64,2	0,960	1,00 (0,72-1,40)
Inactive	35,7	64,3		1,00
Use of Oil				
Yes	34.7	65.3	0.194	0.83 (0.63-1.07)
No	38.9	61.1		1.00
Use of Olive Oil				
Yes	44,0	56,0	0,061	1,46 (0,98-2,18)
No	34,9	65,1		1,00
Margarine Light				
Yes	45,2	54,8	0,274	1,49 (0,72-3,05)
No	35,6	64,4		1,00
Common Butter				
Yes	36,9	63,1	0,653	1,06 (0,80-1,40)
No	35,5	64,5		1,00
Lard				
Yes	47,6	52,4	0,257	1,64 (0,69-3,90)
No	35.6	64.4		1.00
Butter				
Yes	38,0	62,0	0,425	1,12 (0,84-1,51)
No	35,2	64,8		1,00
Liquid milk?				
Yes	38,3	61,7	0,527	1,12(0,77-1,64)
No	35,5	64,5		1,00
Pasteurized milk?				
Yes	37,7	62,3	0,666	1,09 (0,73-1,63)
No	35,7	64,3		1,00
Whole milk?				
Yes	36,6	63,4	0,593	1,07 (0,83-1,08)
No	35,0	65,0		1,00
Semi-skimmed Milk?				
Yes	30,2	69,8	0,430	0,76 (0,39-1,48)
No	36,1	63,9		1,00
Skim milk?				
Yes	35,6	64,4	0,958	0,98(0,64-1,51)
No	35,9	64,1		1,00
I do not drink milk				
Yes	37,0	63,0	0,765	1,05 (0,73-1,51)
No	35,7	64,3		1,00
Use of salt				
Never/When not salty	34,7	65,3	0,139	0,76 (0,54-1,09)
Always	40,9	59,1		1,00
Balanced diet				
Yes	34,3	65,7	0,598	0,91 (0,66-1,26)
No	36,3	63,7		1,00
Participation in conference/lecture				
Yes	40,4	59,6	0,108	1,28 (0,95-1,73)
No	34,6	65,4		1,00

* p: significance level of Pearson's chi-square test. OR: *odds ratio*; CI: confidence interval.

In Brazilian studies, more precisely in Ceará, the prevalence of overweight/obesity changed according to the region analyzed (Florêncio *et al*., 2016 and Gomes *et al*., 2012). The current study surpassed such marks, making it clear that in the area closest to the capital, the result was superior. Extrapolating the Brazilian borders and observing an international study, it was verified that the Philippines presented a number of young adults with excessive weight about 4-fold smaller (8.7%) than the one found in Fortaleza (Dahly *et al*., 2013). Moreover, the Brazilian epidemiological situation is more serious than in the Bahamas, for example, where just over a third of the adults (32%) presented the disease (Brathwaite *et al*., 2011). This fact calls attention to a difference of habits, customs and social issues in the different regions, where the process of urbanization and globalization may be influencing the prevalence of excessive weight in a contextual way. Bringing this reflection to the school leads to a greater concern in dealing with actions that minimize or eliminate the processes that trigger this health problem. In the attempt to search for factors associated with excessive weight, the clinical aspects of the population of these young adults are relevant, and the history of weight gain is verified as an important factor

associated with the outcome. Youngsters with excessive weight already had this nutritional status in adolescence, a fact evidenced in the bivariate analysis in two other studies with the same population of young students (Florêncio *et al*., 2016 and Santiago *et al*., 2015). Nevertheless, the final model of such studies did not show such history as a significant factor. In this sense, it is observed that the young participants of the current research presented an additional factor, not previously evidenced, being under risk of excessive weight in the transition from childhood or adolescence to adulthood.

1.02 - 2.55) was observed for students with a negative perception of stress, positive alcohol consumption and physically inactive. Complementing these results, it is observed that there is an excessive exposure of young people to publicity and advertisement may make alcoholic beverages attractive. This is related to a greater expectation of future consumption, and with higher frequency and earlier onset of consumption, mainly among adolescents and young adults (Faria *et al*., 2011). In the bivariate analysis, which refers to alcohol use (OR = 0.66, [0.50-0.87], p = 0.003), the study demonstrated

Table 4. Final model of the hierarchical logistic regression of the predictors of overweight in young adult students. Fortaleza-Ceará, Brazil, 2020

			95% Confidence Interval for Exp b		
Variables	B (EP)	p	Lower	Exp b	Higher
Stage 1					
Constant	-4.846 (0.549)	0.000		0.008	
Children	0.373 (0.195)	0.056	0.991	1.452	2.127
Weight in the adolescence	1.194 (0.234)	0.000	2.088	3.302	5.221
Systolic blood pressure	0.935 (0.293)	0.001	1.433	2.548	4.529
Diastolic blood pressure	0.921 (0.428)	0.031	1.086	2.511	5.808
Alcohol Exposure	-0.372(0.164)	0.024	0.500	0.690	0.952
Stage 2					
Constant	-4.546 (0.521)	0.000		0.011	
Nutritional status in adolescence	1.181 (0.233)	0.000	2.063	3.258	5.144
Systolic blood pressure	0.897 (0.288)	0.002	1.393	2.453	4.317
Diastolic blood pressure	0.864 (0.414)	0.037	1.054	2.372	5.336
Alcohol Exposure	-0.336 (0.163)	0.040	0.519	0.714	0.984

SE, standard error; Note: Final model - 0.25 (Cox & Snell), 0.34 (Nagelkerke). X^2 of the model = 279.96, p = 0.000.

However, a cross-sectional study carried out in India showed that excessive weight was present in 37.5% of university students aged between 17 and 20 years, that is, in adolescence (Pengpid and Peltzer, 2014). With regard to blood pressure, altered blood pressure levels were associated with excessive weight in the young adults of this study. In a similar context, Cristóvão, Sato and Fujimori performed a cross-sectional study using multiple logistic regression to investigate the variables associated with overweight and obesity and observed that in the fitted analysis, hypertension was one of the variables that remained as statistically associated ($p < 0.05$) with overweight (Cristóvão *et al*., 2011). Lino, Muniz and Siqueira (2011) detected in the bivariate analysis that men who reported having arterial hypertension had a prevalence ratio of 1.44-fold [1.19; 1.74] greater than those who were overweight and obese, and for women this ratio was 1.72 [1.54; 1.92]. After applying the Poisson regression, the self-reported hypertension in both sexes remained significant. In addition to the clinical aspects already mentioned, it was also observed that alcohol consumption has become common among adult and young groups, being common its use in collective environments. It was not different in the present study: more than a third of the young people (32.3%) had been exposed to alcohol. Similarly, high percentages of alcohol intake were also detected in the study by Gomes *et al*. (2012): 76.1% of young adults consumed alcoholic beverages, with an initial mean age of 15.58 (± 2.70) years. In the study by Reséndiz, Aguilera and Rocher (2010), 55% of men and 35% of women had been exposed to alcoholism. Petribú *et al*. (2011) also add that, after adjustment for the confounding variables, the variables of perception of stress, alcohol consumption and physical activity remained associated with overweight. A prevalence ratio (PR) of 1.80 (95% CI 1.07-3.11), 1.91 (95% CI 1.08-2.64) and 1.60 (95% CI

that non-use is a protective factor for young adults, leading to a decrease in cardiovascular risk related to excessive weight. The study by Faria, Gandolffi and Moura (2014) showed that alcohol consumption is a major risk factor among youngsters, with greater use among male students. In previous studies, the pressure of academic activities, the need to be part of peer groups, and the affordable unit price of alcoholic beverages are some causes related to alcohol consumption among students. As described, several cardiovascular and behavioral clinical factors are present in a more expressive way in the group of young people with excessive weight. This finding deserves attention of health professionals, especially nurses, because they are inserted in several contexts where these students live and develop. It is therefore important that nurses identify predisposing factors that interfere with the outcome, through epidemiological analyses, so as to be used in clinical and critical reasoning to direct their practices, whether they are aimed at health promotion, disease prevention or even associated morbidities. It is important to point that the cross-sectional nature of this study limits longitudinal inferences, being restricted to the conclusions described here.

Conclusion

Excessive weight is associated with clinical cardiovascular factors (history of excessive weight in adolescence, change in pressure levels) and behavioral factors (alcohol use). This finding provides evidence of the negative effect of overweight in the cardiovascular health of the young adult students, which in the long term can lead to CVD. In view of this, there is a need for actions to promote health and prevent diseases on the part of health professionals in conjunction with education professionals, in the school, which is a space where these

young people spend most of their time. Nurses have a fundamental role in this aspect; they may act as a link between these two sectors and articulator of care. Health professionals should seek to reach this population and, for doing so, they can use access strategies developed by national and/or international programs. One of the relevant strategies in Brazil is the Health in School Program (HSP), launched in 2008 by the Ministry of Health, and has the aim to strengthen health prevention among Brazilian students and help to build a healthy culture in schools. This program is structured in four blocks, the first of which deals with the evaluation of health conditions and involves nutritional status, early incidence of chronicity such as hypertension and diabetes and other health conditions. Therefore, this program makes it possible for health professionals to contact young adults in schools and provide guidance on excessive weight and its associated factors with the goal of promoting effective care to this population, with a reduction of excessive weight and prevention of the associated complications.

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