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OBESITY ASSOCIATED TO HIGH BLOOD PRESSURE IN ADOLESCENCE

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ABSTRACT

Aim: To evaluate high pressure levels and risk factors of adolescents in high school of a federal institution.

Method: Transversal, analytical and descriptive study, with 96 high schools within the period of March to June of 2016 in a federal institution of the Northeast of the state of Rio Grande do Sul. The data collection was carried out using a form of sociodemographical and clinical characterization composed by: anthropometric measures, high blood pressure and health background. The analysis was done through a descriptive statistics and a non-parametric Chi-square test, using a statistical Software PASW 18.

Results: The findings of this work showed that 12,5% of adolescents presented alterations in the high blood pressure levels, prevailing in male students in the age group of 15 to 16 years old. All overweight/obese individuals presented high blood pressure.

Conclusion: The study showed that high blood pressure is related to overweight/obese adolescents. Health education actions should be developed in schools together with the family and community in order to make young people healthier and protagonists in their selfcare.

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INTRODUCTION

The Systemic High Blood Pressure (SHBP) is a chronic non-contagious disease (CNCD) characterized by the increase of high blood pressure levels (Malachias *et al.,* 2016). This pathalogy can be associated to metabolic disorders, functional and/or structural alterations of target organs worsens in the presence of otherrisk factors such as dyslipidemia, abdominal obesity, intolerance to glucoseand diabetes mellitus (Weber *et al.,* 2014). The Brazilian Society of Cardiology, High Blood Pressure and Nephrology (2010) estimates the prevalence of theSHBP between children and adolescents is of 2% to 13% in Brazil.Young people that show elevated high blood pressure levels tend to keep this health state when adults, although the existence of public health policies, the prevalence of pediatric obesity has not decreased (Baroncini *et al.,* 2017). The inadequate food allied to the lack of physical exercises and sleep elevates the level of obesity between adolescents and are prone to the CNCD, besides the cardiovascular risk that can unleash hemodynamic alterations (ESPINOSA *et al.,* 2016). The obesity in children and adolescentes representes one of the most important problems ofpublic health due to their associated metabolic and cardiovascular comorbidities (D'ADAMO *et al.,* 2015). The overweight and obesity are in the rise in the developing countries, especially in urban environments. More than 30 million of overweight children live in the developing countries and 10 million in the developed countries (WHO, 2002). In Brazil, this information does not diverge, according to the Family Budgets Research (FBR) carried out by Brazilian Institute of Geography and Statistics (BIGS), there was progressive reduction of malnutrition in children in the last decades, whereas overweight and obesity increased (BIGS, 2011). One of the low cost alternatives that should be used as tools in the investigation of risk factors for cardiovascular diseases and that doesn't involve laboratory analysisis the early identification of elevated levels of high blood pressure with emphasis in quality of life, change to healthy habits, selfcare and reduction of the development of these diseases (MOURA *et al.,* 2015). The epidemiological evaluation of the high blood pressure syndrome, especially among children and adolescents, should be developed through studies of populational basis that allow the identification of gravity and coverage of the disease, as well as the characterization of its risk factors (COSTA *et al.,* 2012). The direction of the studies towards adolescents justifies itself for avoiding cardiovascular complications and consequent damages in favorable conditions in their lives, since the development of high blood pressure in adolescence predisposes to several cardiovascular complications in adulthood. In this context, we verify the importance of scientific studies referring to this issue about early evaluation of high blood pressure in adolescents, associated to obesity. Taking into account these studies, the current study aimed atevaluating high blood pressure levels and risk factors of high school adolescents of a federal institution.

MATERIALS AND METHODS

It is a transversal, analytical and descriptive study carried out with high school adolescentes of Farroupilha Federal Institute (FFI) *Campus* Panambi, located in the northeast region of the state of Rio Grande do Sul. Participated in the study, students who fulfilled the following criteria of inclusion: have registered in the first semester/2016 in the integrated courses of high school, in the group age of 14 to 17 years old, have accepted participating voluntarily, have signed the the term of consent and are psichologically oriented. The participants who didn't bring previous authorization of parents or guardians, the Term of Free and Clarified Consent (TFCC) and didn´t sign the term of consent were excluded. The period of data collection occurred between the months of March and June of 2016. The target population of the study was composed by 254 students integrated in high school courses, 96 accepted to participate of the study and 6 were excluded for being 18 years old.This study integrates a final paper of of Nursing College entitled "Adolescents health in high school: Evaluation of high blood pressure levels".

The data was collected through the use of a sociodemographical and clinical variables: sex, age, race religion, anthropometric data, measures of High Blood Pressure (HBP), health background, carrier of chronic diseases, family history, physical activity, smoking and alcoholic drinks ingestion. The measuring of HBP was done at the health office in the school environment, according to the reccomendations of the VI Brazilian Guidelines of High Blood Pressure through theauscultatory method, using duly calibrated aneroid sphygmomanometer and bicuspid stethoscope both BIC. To choose the appropriate cuff, the circumference of the arm of each participant was considered. The procedure of the HBP's verification was done with the student in the sitting position, after five minutes of resting, uncrossed legs, bladder emptied and back resting, with the arm in the heart´s height, supported with the palm facing upwards, slightly bent and free of clothing. The verification of the HBP was done in two arms, in which it was considered the arm that presented the most elevated value and then three measures were taken, with an interval of a minute each. The real pressure was established by the average of the two last measures (BRAZILIAN SOCIETY OF CARDIOLOGY /BRAZILIAN SOCIETY OF HIGH BLOOD PRESSURE /BRAZILIAN SOCIETY OF NEPHROLOGY/ VI BRAZILIAN GUIDELINES OF HIGH BLOOD PRESSURE, 2010).

The classification of HBP was done taking into account age, gender and height percentile and according to the V Brazilian High Blood Pressure Guidelines, following. *The Fourth Repot on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents*, for children from 01 to 17 years old, from both genders. The HBP was classified in normotensive: High Systolic Blood Pressure (HSBP) and/or Diastolic High Blood Pressure (DHBP) below the percentile 90; bordering (or pre-high blood pressure): percentile between 90 and 95: values equal to or higher than 120/80 mmHg, even inferior to the percentile 90, the student was considered on this condition. The percentile equal to or superior to 95 were classified with Systolic High Blood Pressure 1: percentilebetween 95 to 99 with values of blood pressure added of 5 mmHg; High Blood Pressure 2: percentileabove 99with high blood pressure values added of 5 mmHg (BRAZILIAN SOCIETY OF CARDIOLOGY/BRAZILIAN SOCIETY OF HIGH BLOOD PRESSURE /BRAZILIAN SOCIETY OF NEPHROLOGY. V BRAZILIAN GUIDELINES OF HIGH BLOOD PRESSURE, 2006).

The anthropometric measure was determined in order to classify the prevalence of overweight and obesity. The body weight (Kg) was taken with the adolescent barefoot, wearing light clothes in a mechanic balance of brand (Bião), with capacity of 2-150 Kg and accuracy of 100g.

Table 1. Descriptive statistics of the hig blood pressures levels according to the high school student´s gender at IFFAR – Panambi/RS. March to June of 2016

			High Blood Pressure Levels			Total
			Normotense	Bordering	High Blood Pressure 1	
Sex	Male	N	20	5	2	27
		% sex	74,10%	18,50%	7,40%	100,00%
		% high blood pressure	23,80%	55,60%	66,70%	28,10%
	Female	N	64	4	1	69
		% sex	92,80%	5,80%	1,40%	100,00%
		% high blood pressure	76,20%	44,40%	33,30%	71,90%
Total		N	84	9	3	96
		% total	87,50%	9,40%	3,10%	100,00%

The height was verified by the stadiometer coupled to the balance with the adolescent barefoot, upright position, against the flat vertical surface, hanging arms with hands flat on thigh, united heels and toes apart (GIUGLIANO, MELO, 2004). The Body Mass Index (BMI) was calculated through the division of the body weight by the squared height, for the evaluation of the nutritional state of adolescents was calculated by the age and months through the birth date and attendance date (BRASIL, 2014). The collected data was compiled in a data file using the *software Microsoft Excel* 2013. At first,descriptive statistical analysis of the sociodemographic profile of students were done, anthropometric measures, health bakground ans high blood pressure levels in order to obtain knowledge of the main results that describe the respondents characteristics. After that, the test chi-square non-parametric was used in order to verify the association between the high blood pressure levels and the other variables analysed in the study. It was calculated the coefficient of linear correlation that according to Blair e Taylor (2013) refer to a measure that indicates the level of intensity in which the correlation between the variables occurs, being either positive or negative, varying from -1 to 1, considering that the values closer to 1 indicate a stronger correlation between the variables. For all statistic tests, the level of significance of 5% was considered and the *software* used was the PASW 18. The ethical aspects that guide researchs with human beings, according to the Resolution 466/12 (BRASIL, 2012a) were respected. The research was approved by the Ethic Commitee in Research of the Regional University of the Northeast of the state of Rio Grande do Sul – UNIJUÍ, CAAE: 50784615.6.00005350. The participants handed in the consent term and the TFCC signed by their representatives, in two copies, one was kept by the interviewed and the other with the researcher.

RESULTS

In what concerns the sociodemographical profile of the 96 students who participated of the study, it was verified that 69 (71,9%)were female, in relation to age 49 (51%) were 15 years old and 29 (30,2%) were 16 years old. Concerning the race 82 (85,4%) were white and in relation to religion 51 (53,1%) were evangelic, followed by 37 (38,5%) Catholic. Table 1 presents the percentile of high blood pressure levels according to the student´s gender. The Table 2 presents high blood pressure levels related to the BMI of high school adolescents at IFFAR – Panambi/RS. It was verified that all students classified as obese in this study presented elevated HBP. The Table 3 presents the results of the chi-square test that shows the association of the variables studied with the high blood pressure levels of students. Still, in relation to the Table 3 we verified that there was a relevant association among the high blood pressure levels, sex and BMI ($p<0,05$).

On the other hand, there was no relevant association ($p>0,05$) among high blood pressure levels and chronic diseases carriers. The Table 4 presents the descriptive statistics of variables refering to Height (m), Body Weight (Kg) and BMI (Kg/m²). The greatest standard deviation was found in 16 year old female student´s height, that means greater absolute variabilityo in relation to the average.

Table 2. High Blood Pressure levels related to the BMI of high school adolescents students at IFFAR – Panambi/RS. March to June of 2016

BMI	HBP	Gender	
		Male	Female
Normal	Normotense	18	63
	Bordering	3	4
	High Blood Pressure stage 1	-	1
Overweight	Normotense	2	1
	Bordering	1	-
	High Blood Pressure stage 1	-	-
Obeso	Normotense	-	-
	Bordering	1	-
	High Blood Pressure stage 1	2	-

Source: study data.

Table 3. Chi-square test fo high blood pressure associated to the variable of high school adolescents at IFFAR – Panambi/RS. March to June of 2016

Variables	p-value
Gender	0,042*
Masculine	
Feminine	
BMI	0,001*
Normal	
Overweight	
Obese	
Chronic Disease Carrier	0,46
Yes	
No	

*p-value<0,05; Source: study data

Table 5 shows students carriers of chronic n diseases according to gender and age. The study showed that, among the participants of the research, six (6,25%) female were chronic diseases carriers and four (4,16%) were male. Table 6 shows the family history of chronic disease carriers. The table makes evidente that most of the family members have some kins of chronic disease. Around half of the students (n=47; 49%) have family members suffering from hihg blood pressure, in sequence Diabetes Mellitus (DM) (n=38; 39,6%), malignant neoplasm (37; 38,5%) and other disease like cardiopathy (n=22, 22,9%), Cerebrovascular (n=20, 20,8%), Kidney failure (n=7, 7,3%), Hepatopathies (n=3, 3,1%) e DPOC (n=2, 2,1%). Besides that,when questioned about other diseases that family members could present the diseases presented in the same table come about.

Table 4. Descriptive statistics of variables: Height, Weight and BMI of high school students at IFFAR – Panambi/RS. March to June of 2016

Age	Stature (m)		Body weightl (Kg)		BMI (Kg/m2)	
	Feminine	Masculine	Feminine	Masculine	Feminine	Masculine
14 years old	1,58 ± 0,04	1,55 ± 0,00	47,65 ± 5,44	58 ± 0,00	15,06 ± 1,31	18,87 ± 0,00
15 years old	1,62 ± 0,07	1,61 ± 0,01	57,38 ± 15,67	53,75 ± 8,84	17,59 ± 4,17	16,63 ± 2,66
16 years old	1,64 ± 0,09	1,64 ± 0,06	65,13 ± 19,61	59,17 ± 10,40	19,64 ± 5,21	10,01 ± 2,94
17 years old	1,58 ± 0,01	1,56 ± 0,00	52,80 ± 7,73	53,00 ± 0,00	16,67 ± 2,50	16,98 ± 0,00

Values expressed in average ± standard deviation. BMI: body mass index; Fonte: dados do estudo.

Table 5. Students carriers of chronic diseases according to gender and high school age at IFFAR – Panambi/RS. March to June of 2016

Chronic diseases carriers Age	Feminine - n (%)		Masculine – n (%)	
	Yes	No	Yes	No
14 years old	-	5 (100)	-	1 (100)
15 years old	3 (9,37)	29 (90,62)	4 (23,53)	13 (76,47)
16 years old	3 (13,04)	20 (86,96)	-	6 (100)
17 years old	-	9 (100)	-	3 (100)
Total	6 (8,69)	63 (91,30)	4 (14,81)	23 (85,18)

Source: research data.

Table 6. Chronic Diseases and other family members diseases of high school students at IFFAR – Panambi/RS. March to June of 2016

		Frequência	%
Chronic diseases	Diabetes Mellitus	38	39,6
	Cerebrovascular	20	20,8
	DPOC	2	2,1
	High Blood Pressure	47	49
	Malignant Neoplasm	37	38,5
	Cardiopathies	22	22,9
	Liver diseases	3	3,1
	Kidney Failure	7	7,3
Other chronic diseases	Intolerance to gluten and to lactose	1	8,33
	Asthma	1	8,33
	Bronchitis	1	8,33
	Colesterol	4	33,33
	Dementias/Parkison	1	8,33
	Depression	2	16,67
	Thyroid	1	8,33
	Myopia	1	8,33

Source: research data

DISCUSSION

Ninety six students from integrated high school participated in this study. Concerning the sociodemographic characterization, we identified that the studied population presented greater adhesion of female in the age group of 15 to 16 years old. According to this, 59, 7% of participants belonging to the female sex, Moura *et al.* (2015) study evaluated the prevalence of high blood pressure and its relation with the excesse of weight, physical activity and capilar blood glucose of 211 adolescents of two public schools, of the Northeast Region of Brazil. Concerning the race of the interviewed people, the white colored prevailed diverging from other studies found in literature. Magalhães *et al.* (2015) in a survey with 6.077 adolescents of public schools from the state of Pernambuco identified the prevalence of a previous measure of the high blood pressure and associated factors, in which 74,2% of participants were not white colored. Corroborating Kroth e Maia (2015) who in investigation estimated the prevalence of pre-high blood pressure, high blood pressure and other factors of cardiovascular risks in 160 adolescents of three schools in the city of Salvador, Bahia in which 97,5% of participants were black and brown colored. The prevalence of elevated HBP among adolescents who participate of this study was of 12,5%, this index fits into the Brazilian Society Guidelines of Cardiology, High Blood Pressure and Nephrology (2010) that estimates HBP in children and adolescents from 2% to 13% in this population. On the other hand, in Kroth and Maia (2015) survey, they verified that 24,4%of the group presented elevated HBP, surpassing the expectation previously cited. The first Brazilian investigation with national representativity that estimated the prevalence of HBP in 73.399 students was the Study of Cardiovascular Risks in Adolescents (SCRA), in which the male presented greater prevalence (BLOCH *et al.,* 2016). In this study, it was identified that 25, 92% of male adolescents presented greater prevalence of elevated HBP.A research with 1.867 students, in the district of Santa Cruz do Sul in the state of Rio Grande do Sul (RS), identified associated factors and prevalence of overweight and high blood pressure levels among students, as well as that the elevated HBP had greater prevalence among boys, with a diagnosis of SHBP (TORNQUIST *et al.,* 2015). A study of Corrêa Neto *et al.* (2014) with 850 adolescents of district public schools in Rio de Janeiro that investigated the relations of the systemic high blood pressure with obesity and levels of physical exercise, presented superior indexes in the same gender, with 59% of SHBP. The association between the high blood pressure levels and the BMI was relevant (p-value<0,05) in this study. We highlight the fact that the greatest index of altered HBP was found in male students that presented BMI classified as overweight or obese. Corroborates the investigation of Tornquist *et al.* (2015) that shows that male students with elevated BMI, presented prevalence of increase of HBP, being higher among obese than overweight students. The result of ERICA confirms that 1/5 of prevalence in SHBP in school adolescents is related to obesity, what represents around 200 thousand Brazilian adolescents who would not have high blood pressure if they were not obese(BLOCH *et al.,* 2016). Obesity is a chronic disease that involves social, behavioral, environmental, cultural, psychological, metabolic, and genetic factors. It is characterized by the gain of body fats in consequence of the excessive consumption of calories and or physical inactivity (ABESO, 2016). The Brazilian Guidelines of Obesity (2016), point out that overweight in childhood is a risk factor predictor of obesity in adulthood. Children obesity starts each day earlier and the consequences are worrisome because of the associated morbities as, for example, dyslipidemias, a DM type 2 and a SHBP (BRASIL, 2012b). In a more specific way, we highlight the importance of the early diagnosis in the cases of overweight/obesity, as they demonstrate the positive association to health risk factors.

The Brazilian Association for the Study of Obesity and the Metabolic Syndrome (BASOMS, 2016) considers that the atherosclerotic disease starts in childhood and adolescence. The risk of metabolic syndrome in adulthood is greater among individuals tha presente obseity in childhood (ABESO, 2016). The risk factors are more prevalente as greater the level of obesity, the risks of high blood pressure and e hypertriglyceridemia seem to be greater in younger children, and the risks of hypercholesterolemia and hyperinsulinemia are greater in adolescents. The alteration of high blood pressure levels in male adolescents has as a factor the accumulation of intra-abdominal fat, which would lead to na increase of the sympathetic activity, increased sodium reabsorption, of peripheral vascular resistance and, consequently the changing of HBP (BLOCH *et al.,* 2016). Some studies meet results of this research, demosntrating an increase of indexes of overweight/obesity in male children and adolescents. In this interval, a research with 250 adolescents was carried out in the city of Leiria/Portugal, which revealed a prevalence of overweight and obesity in male gender. (BRITO *et al.,* 2014). Cordeiro *et al.* (2016) investigated 477 students of the public system findings met the study in screen, as it verified a greater index of overweight and obesity for females. When analysing the demographical data of this research, concerning stature we observed greater and equal average in students of 16 years old, from both genders. Concerning body weight, we found the greatest average (65,13 kg), as well as greater variability in female students of 16 years old. That fact repeats itself when analysing the BMI, in which it was possible to observe greater average (19,64 Kg/m^2) and greater standard deviation (5,21 Kg/m^2). These results diverge of a study carried out in the district of Vitoria with 447 students of the public school system, in which the interaction betweenstature and gender is demonstrated and the boys presented higher values than girls from 14 years old on. While in the age group of 9 years old, there was a statistical difference in the BMI of girls in relation to the boys' BMI. (CORDEIRO *et al.,* 2016).
This study made evident that 49%of the interviewees have family background with CDNC. In the first place, we highlight the HBPS and in second place the DM, in consonance with the Brazilian Guidelines of Obesity (2016), the presence of cardiovascular events or the risk factors in closer realtives predicts greater risk and the family background should be investigated. Rezende *et al.* (2015) present a study with 109 children of public elementary schools of João Pessoa/Paraíba in which 66% of interviewees reported having people with SHBP in their family and 40% of them have family members with other cardiovascular diseases. These resultas are similar to the ones obtained in this study. The implications of nursing assistance in the promotion and prevention of the CDNC could be faced through the implementation of ludic and methodological educational actions in school, in order to give orientations about primary prevention and food quality, physical exercises, leisure, sleep and culture. In this way, the intention of building awareness in the students about selfcare in health since childhood (TOSSIN *et al.,* 2016). The results of this research allied to the arguments of the authors, prove that obesity is associated to high blood pressure in adolescence. These results show that intervention measures should be started, from childhood and adolescence through the movement of health promotion in the school environment stimulating healthy life habits through food habits andphysical activity, in order to decrease the incidence of CDNC in adulthood.

Conclusion

Findings of the current study, showed that 12,5% of adolescents presented alterations in high blood pressure levels, prevailing male students of the age group from 15 to 16 years old. The association between high blood pressure levels and overweight/obesity had a greater index in males and we highlight the fact that all adolescents classified as obese presented altered high blood pressure. Educational actions in health field should be developed in schools and are essential for a whole education of children and adolescents. In this sense, the intervention of health professionals in actions to build bonds and confidence with adolescents extending it to their family members in terms of behavior changes is extremely important. We highlight the importance of this research for the accomplishment of the early and effective diagnosis monitoring of the cases, as the nurse as a member of the health staff is responsible for the detection and control of the HBP in childhood and adolescence.This professional is also a constant educator, as through its orientations this target public together with its family, school and community, can acquire healthy life habits and contribute for the non-evolution of diseases. Therefore, it is valid to highlight the importance and need of campaigns and educational measures with interventions in the school environment, to turn young people healthier and protagonist in their health selfcare.The study meets the aim developed in the research and contributes significantly for the qualification of health and education professionals being useful as a subsidy for new researchs.

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