ORIGINAL ARTICLE

Family History of Hypertension: Impact on Blood Pressure, Anthropometric Measurements and Physical Activity Level in Schoolchildren

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Abstract

Background: A family history of arterial hypertension (AH), combined with environmental risk factors, is directly related to the development of AH.

Objective: To evaluate the frequency of AH, anthropometric indicators and level of physical activity and their association with a family history (FH) of AH in school children.

Methods: Cross-sectional study with 118 students, aged between 11 and 17 years, of both sexes. Waist circumference (WC), weight, height, level of physical activity and FH of HA were collected. Body mass index z score (BMI-z) and waist-to-height ratio (WHtR) were calculated. Binary logistic regression model was used to verify the chance risk, with significance $p < 0.05$.

Results: Of the 118 parents who answered the questionnaire, 34.7% had a positive FH of AH. Girls with a positive FH had higher means of WC (p= 0,004), BMI (p=0,020), and systolic blood pressure (SBP) (p=0,006) than boys, and a higher risk of being overweight (OR=4,48; 95%CI:1,55–12,94), and having elevated WHtR (OR=5.98; 95%CI:1.66–21.47) and SBP (OR=3,07; 95%CI:1,03–9,13) than girls without a FH, but they practice more vigorours moderate physical activity (MVPA) (p=0,039). On the other hand, no differences in these parameters were observed between boys with and without a FM of AH.

Conclusions: Overweight and a FH of hypertension were associated with an increased risk for AH in girls. This was not observed among boys, perhaps due to more active lifestyle.

Keywords: Heredity/genetics; Hypertension/genetics; Blood Pressure; Anthropometry; Physical Activity; Obesity; Schoolchildren.

Introduction

The prevalence of arterial hypertension (AH) has increased worldwide, and considering that it has a multifactorial cause and a low control rate, it has been regarded as a public health problem.[1] The appearance of AH depends on the interaction of environmental and genetic factors.[2] In this respect, predictive risk models can be used to identify those with higher and lower probability of developing early AH and are essential for the prevention of complications in adult life.[3,4]

Primary prevention has been recommended for individuals with a family history of AH, and consequently, with an increased risk of developing AH. Children of hypertensive parents, compared with children of normotensive parents, tend to have higher blood pressure to levels compatible with prehypertension.[5] For this reason, individuals should be screened for

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family history of AH, since children of hypertensive parents (both mother and father) have higher odds of becoming hypertensive as compared with children of one hypertensive parent.[6, 7]

The influence of lifestyle on the health of different populations has been extensively discussed and indicated that risk behaviors in adolescence can lead to numerous diseases, including hypertension. [8, 9] An environmental aspect, related to HA in this age group, that has reached major proportions is sedentary lifestyle which, combined with a high-calory diet, may result in obesity, metabolic disorders, and low cardiorespiratory fitness, which are contributing factors to cardiovascular disease.[10,11]

Therefore, the importance of an early identification of an increased risk for hypertension has been highlighted by several studies in which anthropometric assessments were performed.[12,13] However, these studies did not assess the impact of a family history of AH on blood pressure levels, which would involve the assessment of both genetic and environmental factors.

The assessment of physical activity levels through reliable procedures and instruments can be essential for the surveillance and evaluation of the effectiveness of intervention actions aimed at protective effects on blood pressure levels.[14] Therefore, the aim of the present study was to identify blood pressure levels and the prevalence of AH associated with family history, and their relationship with anthropometric indicators of obesity and physical activity level in schoolchildren.

Methods

This is a cross-sectional study with a sample of 118 students (11 to 17 years old), selected by convenience, from private elementary and high schools in the city of São José do Pinhais, Paraná, in southern Brazil. After the consent of the educational institutions, visits were made to the classrooms for presentation of the research objectives to the students and invitation for participation. Data collection was performed by trained employees, under responsibility of one of the investigators.

The proportional stratified sampling procedure was used, so that schools with a larger population contributed more to the sample. The study excluded pregnant girls, individuals with limitations that prevented them from participating in a procedure, and those who did not sign the informed consent form. This study was approved by the Research Ethics Committee of the Pontifícia Universidade Católica do Paraná, PUC – PR (approval

number 2198319). Sample power was calculated afterwards using the GPower v3.1 program. The t-test statistic was used for analysis of the presence of the family history of hypertension. An effect size of 0.50 was assigned (α 0.05). Based on these parameters and the final sample size (118 schoolchildren), we observed a sample power of 0.82 in the study.

Age at peak height velocity (PHV) was used as an indicator of somatic maturity.[15] Anthropometric measurements were collected at school, following the procedures recommended by the *Anthropometric Standardization Reference Manual*.[16] Body mass (BM) [kg] was evaluated using a Seca Aura 807 digital flat platform scale, with 100 g accuracy and capacity of 150 kg, with the participant wearing light clothing, standing barefoot, feet together on the center of the platform. For height measurement students were instructed to stand barefoot with their feet together, arms along their body, and head positioned in the Frankfurt Plane (looking forward), with their heels, buttocks and shoulders were in contact with the vertical backboard of a portable stadiometer (AVANUTRI).

The body mass index (BMI) was calculated for evaluation of nutritional status, by dividing body mass (kg) by the square of height (m²). In addition, the BMI z-score (BMI-z) was calculated according to the *Growth reference data for 5-19 years* [17] using the WHO Anthro Plus® software, version 1.0.4. Participants with BMI-z between ≥ -2 and < +1 were classified as overweight, between ≥ 1 and < 2 as obese, and those with BMI-z ≥+2 according to age group and gender were classified as normal weight.

Waist circumference (WC) was measured using a flexible and inelastic measuring tape at the nearest 0.1 cm, at the midpoint between the last costal arch and the iliac crest. The classification of WC was made following the cut- offs proposed by Fernández et. al. (2004):[18] WC values ≤ p10: low WC, WC values ≥ p10 and < p75: adequate WC, WC values ≥75 and < p90: high WC, and WC values ≥ p90: very high WC. Central obesity was defined as WC > p75 for age and sex. The waist-to-height ratio (WHtR) was calculated as waist circumference (cm)/height (cm) and classified according to the reference values for age and gender.[19]

Blood pressure (BP) was classified according the percentiles for age, sex and height proposed by the 7th Brazilian Guidelines on Arterial Hypertension[3] and the *Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents* for

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schoolchildren aged from 1 to 17 years old, of both sexes.[20] Blood pressure was measured by nurses that voluntarily participated in the investigation, in an isolated classroom, in a silent environment. The student was asked not to speak during the measurement, to rest for at least five minutes in a calm environment, not to exercise 60 to 90 minutes before the measurement, not to drink alcoholic beverages, coffee, or food and not to smoke on the same day. At the time of measurement, the students kept their legs uncrossed, feet flat on the floor, back against the chair and relaxed. BP measurements were taken from the right arm, with the palm facing upwards and the elbow slightly flexed;[3] the cuff was placed at the level of the heart.

Thus, the students were classified based on BP measurements as normotensive individuals: systolic blood pressure (SBP) and/or diastolic blood pressure (DBP) below the 90th percentile; borderline (or pre-hypertension): percentile between 90 and 95; and hypertensive: percentile equal to or greater than 95. When BP values were equal to or greater than 120/80 mmHg, even if less than the 90th percentile, the student was considered to be hypertensive.[3]

The family history of AH was obtained through a questionnaire sent to the adolescents' parents or guardians to identify whether the biological father and biological mother were hypertensive. Participants were then classified into two categories: with "positive family history" (PFH) and "negative family history" (NFH) of hypertension.

The level of physical activity was assessed according to the *World Health Organization*, which recommends that schoolchildren aged 5 to 17 years should perform a minimum of 60 minutes of moderate-vigorous physical activities daily,[21] with a weekly volume of 420 minutes of moderate to vigorous activities.

Statistical analysis

Statistical analysis was performed using the software *Statistical Package for the Social Sciences*, version 24. Continuous variables were presented as mean ± standard deviation or median (range interquartile range), while categorical variables were presented as frequency and percentage. The interquartile range was calculated by subtracting quartile 3 (75%) from quartile 1 (25%). Analyses of categorical variables were performed using the chi-square test. Normality of continuous variables was tested using the Shapiro-Wilk test. The unpaired Student's t-test was used for parametric variables, and the Mann-Whitney test for non-parametric variables.

Odds ratio analysis of PFH and NFH was performed for the anthropometric variables and (MVPA) through binary logistic regression, adjusted for PHV. A significance level of p<0.05 was considered for all analyses.

Results

A total of 336 volunteer schoolchildren of both sexes, aged 11 to 17 years old (mean age 14.6 ± 1.6 years), 173 girls (mean age 14.7 ± 1.6) and 163 boys (mean age 14.4 ± 1.6) were selected by convenience. After applying the questionnaire on the family history of AH, 118 students (mean age 14.6 ± 1.5 years) remained in the study, 75 girls (mean age 14.9 ± 1.4 years) and 43 boys (mean age 14.1±1.5).

Table 1 presents the general characteristics of the sample according to family history (PFH or NFH). Girls with PFH of AH had lower PHV, higher weight, height, WC, BMI, BMI-z, SBP and physical activity level than girls with NFH.

Table 2 presents the proportion of individuals with PFH and NFH by sex. Greater proportions of girls with central obesity, overweight, high WHtR and pre-hypertension were observed among those with PFH than NHF. These differences were not observed among boys.

Table 3 shows the distribution of individuals by anthropometric variables, BP, and physical activity level by sex and family history of AH. There was a higher frequency of hypertension in individuals with central obesity, overweight and high WHtR than those with adequate values. Likewise, hypertensive subjects with central obesity, overweight and high WHtR had higher frequency of elevated SBP, but not DBP.

According to the risk analysis (Table 4), it was found that for the total sample, individuals with a PFH of AH were 2.24 times more likely to be overweight and 2.57 times more likely to have increased WHtR. Girls with PFH had a 4.48-fold higher risk of being overweight, 5.98-fold higher risk of having increased WHtR, and 3.07-fold higher risk of being hypertensive.

Discussion

The present study evaluated the association between the diagnosis of hypertension in schoolchildren and the presence of hypertension in their parents. It was observed that one third of the participants had a PFH of AH; girls with a PFH of hypertension were more likely to be overweight, centrally obese, and have increased

Table 1 - Anthropometric variables, blood pressure and level of physical activity according to the absence and presence of a family history of hypertension

	Negative Family History			Positive Family History			p t	p ♀	p ♂
	Total (n=77)	Girls (n=49)	Boys (n=28)	Total (n=41)	Girls (n=26)	Boys (n=15)			
Age (decimal) [a]	14.61 ± 1.43	14.91 ± 1.41	14.09 ± 1.32	14.60 ± 1.55	14.81 ± 1.32	14.24 ± 1.88	0.97	0.77	0.76
PHV (years) [a]	12.98 ± 0.80	12.58 ± 0.65	13.67 ± 0.51	12.75 ± 0.87	12.23 ± 0.51	13.64 ± 0.59	0.15	0.02	0.87
BM [#] (Kg) [b]	55.60 (15.20)	55.40 (14.60)	58.9 (20.90)	63.90 (14.50)	63.90 (17.20)	59.30 (14.20)	0.00	0.00	0.66
Height (cm) [a]	1.61 ± 0.08	1.59 ± 0.07	1.65 ± 0.09	1.65 ± 0.08	1.64 ± 0.05	1.66 ± 0.11	0.02	0.00	0.69
WC [#] (cm) [b]	66.00 (41.50)	65.5 (9.50)	70.00 (12.30)	72.00 (12.00)	72.00 (13.10)	72.50 (14.0)	0.00	0.00	0.26
BMI [#] (kg/m^2) [b]	21.45 (14.0-32.1)	21.52 (4.09)	20.74 (6.74)	23.36 (7.32)	24.17 (6.78)	20.52 (6.29)	0.01	0.00	0.80
BMI-z [a]	0.35 ± 1.19	0.19 ± 1.14	0.63 ± 1.26	0.83 ± 1.46	0.92 ± 1.49	0.66 ± 1.44	0.05	0.02	0.94
WHtR [#b]	0.41 (0.06)	0.40 (0.07)	0.42 (0.07)	0.43 (0.08)	0.43 (0.10)	0.42 (0.126)	0.04	0.06	0.32
SBP (mmHg) [a]	122.58 ± 12.34	119.42 ± 11.72	128.13 ± 11.58	125.59 ± 16.40	128.50 ± 15.97	120.53 ± 16.43	0.26	0.00	0.08
DBP [#] (mmHg) [b]	70.00 (13.00)	70.00 (12.80)	68.75 (14.80)	72.00 (11.30)	74.00 (13.50)	68.50 (10.50)	0.49	0.06	0.15
Light PA [#] (min/week) [b]	120.00 (330.00)	80.00 (270.00)	212.50 (360.00)	180.00 (252.50)	180.00 (288.75)	120.00 (210.00)	0.63	0.43	0.90
Moderate PA [#] (min/week) [b]	90.00 (162.50)	90.00 (120.00)	150.00 (217.50)	100.00 (300.00)	67.50 (287.50)	120.00 (780.00)	0.13	0.53	0.15
Vigorous PA [#] (min/week) [b]	30.00 (120.00)	15.00 (72.50)	65.00 (272.75)	50.00 (120.00)	60.00 (101.25)	30.00 (180.00)	0.24	0.53	0.22

Caption: statistical analysis: Student's t-test unpaired; #non-parametric, Mann-Whitney test; [a]: mean ± standard deviation; [b]: Median (interquartile range); t: total p-value; p ♀: female p value; p ♂: male p-value; BMI: body mass index; BMI-z: body mass index z-score; PHV: peak height velocity; BM: body mass; WC: waist circumference; WHtR: waist-to-height ratio; AF: physical activity; AH: arterial hypertension; SBP: systolic blood pressure; DBP: diastolic blood pressure

Table 2 – Sample distribution according to the classification of anthropometric variables, blood pressure, physical activity level and family history of arterial hypertension

		Girls					Boys				
		PFH (n=26)		NFH (n=49)			PFH (n=15)		NFH (n=28)		
		F	%	F	%	p ♀	F	%	F	%	p ♂
WC (%)	Normal	21	81%	47	96%	0,03	11	73%	23	82%	0.49
	Central obesity	5	19%	2	4%		4	27%	5	18%	
BMI-z (%)	Normal weight	11	42%	37	76%	0,00	10	67%	16	57%	0.54
	Overweight	15	58%	12	24%		5	33%	12	43%	
WHtR (%)	Adequate	16	62%	44	90%	0,00	11	73%	20	71%	0.89
	High	10	38%	5	10%		4	27%	8	29%	
MVPA (WHO)	Active	7	27%	5	10%	0,11	5	33%	9	32%	0.93
	Inactive	19	73%	43	90%		10	67%	19	68%	
BP (%)	Normal	8	31%	30	61%	0,03	7	47%	7	25%	0.10
	Pre-hypertensive	4	15%	3	6%		5	33%	6	21%	
	Hypertensive	14	54%	16	33%		3	20%	15	54%	
SBP (%)	Normal	9	35%	31	63%	0,06	7	47%	9	32%	0.15
	Pre-hypertensive	3	12%	3	6%		5	33%	5	18%	
	Hypertensive	14	54%	15	31%		3	20%	14	50%	
DBP (%)	Normal	18	69%	41	84%	0,16	14	93%	21	75%	0.25
	Pre-hypertensive	3	12%	1	2%		1	7%	3	11%	
	Hypertensive	5	19%	7	14%		0	0%	4	14%	

Caption: statistical analysis: chi-square; ♀: female; ♂: male; F: frequency; PHF: positive family history; NHF: negative family history; BMIz: body mass index z-score; WC: waist circumference; WHtR: waist-to-height ratio; MVPA: moderate-to-vigorous physical activity; WHO: World Health Organization; BP: blood pressure; SBP: systolic blood pressure; DBP: diastolic blood pressure

SBP values than girls with NFH. However, there was no increased risk of AH and high anthropometric indicators in boys with a PFH of AH.

In the present investigation, higher means of SBP were identified among girls with a PFH, which suggests an influence of genetic factors upon these alterations, as found in some studies.[22] However, studies suggest that genetic factors are responsible for about 30% change in blood pressure, that is, AH may be much more frequent in subjects with one hypertensive parent.[23] Indeed, many studies have reported an important association between the presence of high BP and family history of hypertension, and highlighted the need for research to detect the likelihood of their children developing chronic diseases.[24,25]

Several lines of evidence indicate that both genetic and environmental factors are involved in BP elevation in schoolchildren.[26] In the present study, although the prevalence of hypertension was not different between children with PFH and NFH of AH, those with altered anthropometric measurements of obesity (BMI, WC and WHtR) were more likely to be hypertensive – approximately one third of hypertensive students had high WC and WHtR, while more than half were classified as overweight. This association between obesity anthropometric data and blood pressure elevation was previously reported,[27] underscoring the impact of excess weight and abdominal fat on the etiology of hypertension. According to Tozo et al.,[14] students with high WC and overweight (according to BMI) children may have, respectively, 6.11 times and 2.91 times higher

Table 3 - Distribution of blood pressure classification according to anthropometric values and physical activity level

		Blood Pressure							Systolic Blood Pressure							Diastolic Blood Pressure						
		Adequate		Pre-hypertensive		Hypertensive		p BP	Adequate		Pre-hypertensive		Hypertensive		p SBP	Adequate		Pre-hypertensive		Hypertensive		p DBP
		F	%	F	%	F	%		F	%	F	%	F	%		F	%	F	%	F	%	
Gender (%)	Female	38	73%	7	39%	30	63%	0.26	40	71%	6	38%	29	63%	0.34	59	63%	4	50%	12	75%	0.489
	Male	14	27%	11	61%	18	38%		16	29%	10	63%	17	37%		35	37%	4	50%	4	25%	
WC (%)	Adequate	49	94%	16	89%	37	77%	0.01	52	93%	14	88%	36	78%	0.03	83	88%	6	75%	13	81%	0.327
	High	3	6%	2	11%	11	23%		4	7%	2	13%	10	22%		11	12%	2	25%	3	19%	
BMI-z (%)	Adequate	41	79%	12	67%	22	46%	0.01	44	79%	10	63%	21	46%	0.00	62	66%	5	63%	8	50%	0.271
	High	11	21%	6	33%	26	54%		12	21%	6	38%	25	54%		32	34%	3	38%	8	50%	
WHtR (%)	Adequate	47	90%	13	72%	31	65%	0.00	50	89%	11	69%	30	65%	0.00	74	79%	6	75%	11	69%	0.377
	High	5	10%	5	28%	17	35%		6	11%	5	31%	16	35%		20	21%	2	25%	5	31%	
MVPA (%) (WHO)	Active	12	23%	6	33%	9	19%	0.75	13	23%	5	31%	9	20%	0.81	24	26%	2	25%	1	6%	0.125
	Inactive	40	77%	12	67%	39	81%		43	77%	11	69%	37	80%		70	74%	6	75%	15	94%	
PFH (%)	No	37	71%	9	50%	31	65%	0.48	40	71%	8	50%	29	63%	0.35	62	66%	4	50%	11	69%	0.978
	Yes	15	29%	9	50%	17	35%		16	29%	8	50%	17	37%		32	34%	4	50%	5	31%	

Statistical analysis: Chi-square test; F: frequency; WC: waist circumference; BMI: body mass index z-score; WHtR: waist-to-height ratio; MVPA: moderate-to-vigorous physical activity; WHO: World Health Organization; PFH: positive family history; BP: blood pressure; SBP: systolic blood pressure; DBP: diastolic blood pressure

Table 4 - *Odds ratios* of the presence of family history of hypertension for anthropometric variables. Physical activity level and arterial hypertension

	PFH – Total n=118	p	PFH – Girls n=75	p	PHF – Boys n=43	p
	OR (95%CI)		OR (95%CI)		OR (95%CI)	
Overweight (BMI-z)	2.24 (1.02 – 4.89)	0.04	4.48 (1.55 – 12.94)	0.01	0.67 (0.18 – 2.46)	0.54
Central obesity (WC)	2.81 (0.96 – 8.22)	0.06	4.34 (0.74 – 25.21)	0.10	1.66 (0.36 – 7.56)	0.51
Elevated WHtR	2.57 (1.06 – 6.15)	0.04	5.98 (1.66 – 21.47)	0.01	0.91 (0.27 – 3.77)	0.91
Physically active (MVPA-WHO)	0.57 (0.23 – 1.40)	0.23	0.38 (0.11 – 1.34)	0.13	0.98 (0.22 – 4.25)	0.99
Pre-hypertensive (BP)	2.62 (0.83 – 8.20)	0.10	4.43 (0.77 – 2.35)	0.09	0.83 (0.16 – 4.16)	0.83
Hypertensive (BP)	1.37 (0.59 – 3.22)	0.46	3.07 (1.03 – 9.13)	0.04	0.20 (0.03 – 1.02)	0.05

BMI-z: body mass index z-score; WC: waist circumference; WHtR: waist/height ratio; MVPA: moderate-vigorous physical activity; WHO: World Health Organization; AH: arterial hypertension; BP: blood pressure; PFH: presence of family history

risk of being hypertensive. This last result was similar to the study by Moser et al.,[11] which BMI (odds ratio of 2.9) and triceps skinfold (odds ratio of 1.9) were predictors of high BP, regardless of abdominal adiposity, sexual maturation and socioeconomic level.

Thus, our results reinforce that both genetic and anthropometric factors are important predictors of AH in schoolchildren. Several reports with adolescents and adults have shown a relationship between blood pressure and anthropometric information, suggesting obesity as a strong risk factor for the development of hypertension.[14,28,29] In addition, although WC and WHtR measurements cannot discriminate between visceral fat and subcutaneous fat, there is evidence that individuals with increased WC have a higher risk of hypertension, diabetes, dyslipidemia and metabolic syndrome.[30]

In the present investigation, it was observed that girls with a family history of AH had higher anthropometric and SBP values, and also practiced more (vigorous) physical activity. This finding may reflect an engagement in physical activities as a strategy to reduce body weight, in addition to a greater concern on the part of parents for their children to maintain an active lifestyle, given the benefits of physical activity for health. Besides, unhealthy behaviors such as physical inactivity, and poor diet quality may increase the risk of hypertension. In this sense, the practice of physical activity can contribute to the reduction of BP levels, metabolic risk and obesity.[31,32]

Our results indicate that about a quarter of hypertensive students met the recommendations for moderate-to-vigorous physical activity and did not have a history of hypertension. In fact, previous studies failed to show a direct relationship between AH and the practice of moderate-intensity physical activity.[14,33] However, physical activity is known to be an important tool in the prevention and treatment of obesity,[30] and may hence act as an adjunct in the prevention and treatment of hypertension.

In this study, it was observed that in boys, the risk of AH was not different between those with and without a PFH of AH. In this sense, interventions towards an increase in physical activity level could positively contribute with BP levels in this population.[32] Furthermore, the results of this research show that boys practice more physical activity than girls, reinforcing the protective aspect of this practice, which was also demonstrated in other studies.[34] In parallel, studies have pointed out that the lack of public safety, together with the globalized and computerized world, contribute to a sedentary behavior.[8,35] Therefore, low level of moderate to vigorous physical activity, in and out of school, in the juvenile population supports the idea that a sedentary child may be more likely to become an adult with possible problems. of health.[36,37]

The present work has some limitations that must be considered when interpreting the results. First, the cross-sectional nature of the study precludes the establishment

of cause-effect relationships. A parental diagnosis of AH was self-reported, which can be considered a limiting factor. In addition, the assessment of variables of socioeconomic status and dietary salt intake was not performed. However, this study was able to assess BP levels and the frequency of AH associated with family history of AH in children, establish the relationship of BP with anthropometric indicators of obesity, in addition to highlight the importance of the practice of moderate-to-vigorous physical acidity as a protective factor against changes in BP in schoolchildren.

Conclusion

We conclude that the diagnosis of hypertension in school in the study is associated with excess weight and abdominal fat accumulation. In addition, in girls with a PFH of AH, elevated BP was associated with excess weight. No significant relationship was found between the presence of AH and a PFH among boys, but the higher percentage of physically active individuals (compared with girls) supports the protective role of physical activity in maintaining adequate BP values.

This study highlighted the need for overweight and obesity prevention in during childhood and adolescence, and the importance of behavioral and lifestyle changes, including physical activity, periodic anthropometric and BP assessment, as well as a greater participation of parents for the prevention of chronic non-communicable diseases.

Author contributions

Conception and design of the research: Tozo TA, Pereira BO, Montenegro CM, Moreira CMM, Leite N. Acquisition of data: Tozo TA. Analysis and interpretation of the data: Tozo TA, Pereira BO, Menezes Junior FJ, Montenegro CM, Moreira CMM, Leite N. Statistical analysis: Menezes Junior FJ. Obtaining financing: Pereira BO, Leite N. Writing of the manuscript: Tozo TA, Pereira BO, Menezes Junior FJ, Montenegro CM, Moreira CMM, Leite N. Critical revision of the manuscript for intellectual content: Tozo TA, Pereira BO, Moreira CMM, Leite N.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Study Association

This article is part of the doctoral thesis by Tatiana Affornali Tozo - University of Minho under co guardianship regime with Universidade Federal do Paraná.

Ethics approval and consent to participate

This study was approved by the Ethics Committee of the Pontifical Catholic University of Paraná, PUC – PR under the protocol number CAAE71324017.1.0000.0020/2017. All the procedures in this study were in accordance with the 1975 Helsinki Declaration, updated in 2013. Informed consent was obtained from all participants included in the study.

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