Study of the Prevalence and Multiplicity of Cardiovascular Risk Factors in Hypertensive Individuals from the city of Brusque, SC, Brazil

Nilton Rosini*, Marcos José Machado*, Hermes Toros Xavier**

*Secretaria Municipal da Saúde de Brusque, *Universidade Federal de Santa Catarina e
**Faculdade de Ciências Médicas de Santos - Brusque, SC – Florianópolis, SC – Santos, SP - Brazil

OBJECTIVE

To investigate the prevalence and multiplicity of additional risk factors (RF) in a population sample of hypertensive smokers, diagnosed and enrolled at the Hiperdia Program of the Ministry of Health, in the city of Brusque, SC, Brazil.

METHODS

Determination of the anthropometrical parameters and laboratory variables recognized as cardiovascular risk factors.

RESULTS

Elevated prevalence of RF in addition to systemic arterial hypertension (SAH) and smoking, configuring the multiplicity that concurs with a marked elevation of the risk of cardiovascular events in this population sample.

CONCLUSION

In hypertensive populations, the prevention, identification and RF control measures must be implemented; computerized programs such as the Hiperdia/MS can help in patients' follow-up, allowing a more stringent multidisciplinary approach, especially regarding the analysis of the attainment of treatment goals and the subsequent decrease of cardiovascular risk.

KEY WORDS

Cardiovascular risk factors, arterial hypertension, smoking.

Cardiovascular diseases (CVD) have been the cause of more than 16.7 million deaths, representing 29.2% of the worldwide mortality[1,2]. In Brazil, 85,599 deaths occurred in 2002, corresponding to 1/3 of the total mortality in the country, with 2,868 of them only in the state of Santa Catarina[3].

The participation of multiple risk factors (RF) in the development of CVD is well-recognized; they are directly associated with the genesis, progression and occurrence of future cardiovascular events[4,5].

More recently, new evidence in the epidemiology of RF has been published. The important INTERHEART study, which was designed to evaluate, in a systematized form, the worldwide importance of RF for coronary disease, demonstrated that nine RF would explain more than 90% of the attributable risk for myocardial infarction. Surprisingly, smoking and dyslipidemia (measured through the ApoB/ApoA1 ratio) comprehended more than 2/3 of this risk, and the psychosocial factors, central obesity, diabetes mellitus (DM) and systemic arterial hypertension (SAH) were also significantly associated, even with some relative differences regarding the diverse studied regions[6].

This study aims at determining the prevalence and multiplicity of additional RF in a population sample of hypertensive smokers diagnosed and enrolled at the *Hiperdia* Program of the Ministry of Health[3] in the city of Brusque, SC, Brazil.

METHODS

After the study protocol was approved by the Ethics and Research Committee and after the patients had signed the written informed consent form, they underwent anamnesis, according to the following protocol: arterial pressure (AP) measurement, according to the Directives of the Brazilian Society of Cardiology (SBC)[7]; anthropometrical measurements [weight, height, abdominal circumference or waist circumference (C), hip circumference (H) and body mass index (BMI) and waist-hip index (WHI) calculations][8]; fasting blood sample collection for the determination of the following laboratory parameters: glucose (G), total cholesterol (TC), HDL-cholesterol (HDL-c), triglycerides (TG), urea (U), creatinine (Cr), measured by enzymatic assays in CCX-Abbott equipment and homocysteine (HCT) by Fluorescence Polarization Immunoassay (FPIA), in a IMX-Abbott equipment; and a urinary sample for proteinuria determination by pyrogallol red and read in a DRAKE[9] equipment. The values of LDL-cholesterol (LDL-c) were calculated using Friedwald equation, in accordance to the SBC Directives[10]. For the statistical analysis, the non-parametric Kruskal-Wallis test was used. The significance level was set at 5%[11].

RESULTS

All variables described above were analyzed in 139 patients (48 males and 91 females), who were all hypertensive smokers on regular treatment for SAH, with a mean age of 57.3 yrs (Table 1).

Regarding AP, the mean pressure levels observed were considered elevated (143 ± 23 x 87 ± 12 mmHg) for the total mean values and those of both genders, 148 ± 26.5 x 90 ± 14.5 and 140 ± 24.4 x 85 ± 11 mmHg, for the male and female genders, respectively.

We observed a prevalence of overweight in the total means (27.6 ± 5.7 kg/m^2) and for both genders, 27.2 ± 4.6 and 28.1 ± 5.8 kg/m^2, male and female

Table 1 – Variables and values obtained for the sample studied (means ± sd) and levels of statistical significance between genders (p); numbers in bold express significance			
Risk factors	Total sample (n = 139)	Males (n = 48)	Females (n = 91)	p
Age (yrs)	57.3	58.8 ± 11.9	56.6 ± 13	0.2987
Systolic AP (mmHg)	143 ± 23	148 ± 26.5	140 ± 24.4	0.2480
Diastolic AP (mmHg)	87 ± 12	90 ± 14.5	85 ± 11	0.0988
Weight (kg)	72.5 ± 15.8	76.6 ± 16.2	69.8 ± 14.9	**0.0098**
BMI (kg/m^2)	27.6 ± 5.7	27.2 ± 4.6	28.1 ± 5.8	0.3673
C (cm)	-x-	98.5 ± 11.1	92.3 ± 12.8	**0.0209**
WHI	-x-	0.94 ± 0.1	0.89 ± 0.1	**< 0.0001**
Glucose (mg/dl)	97.3 ± 17.2	100.5 ± 18.4	95.7 ± 16.4	0.1265
TC (mg/dl)	230.3 ± 46.8	223 ± 49.2	234.4 ± 45	**0.0407**
HDL-c (mg/dl)	47.5 ± 9.2	44.2 ± 10.1	49.3 ± 8.2	**0.0004**
LDL-c (mg/dl)	151.3 ± 42.2	143 ± 44.9	155.7 ± 40.2	0.0958
TG (mg/dl)	159.3 ± 83.9	168.3 ± 87.3	154.5 ± 82.1	0.2232
U (mg/dl)	35.2 ± 11.2	37.4 ± 10.7	34 ± 11.3	0.0853
Cr (mg/dl)	1.04 ± 0.2	1.14 ± 0.2	0.99 ± 0.2	**< 0.0001**
HCT (µmol/l)	14.3 ± 5.6	15.3 ± 6.9	14.1 ± 5.5	0.2076
Proteinuria (mg/dl)	12.4 ± 9.7	13.8 ± 13	11.6 ± 7.3	0.6562

genders, respectively, with a predominance of the female sex. Regarding the waist circumference and the hip circumference, the mean values observed were above those recommended for the female gender, 92.3 ± 12.8 and 0.89 ± 0.1 whereas the mean values observed in men were within those recommended for the male gender, 98.5 ± 11.1 and 0.94 ± 0.1, with a statistically significant difference between the genders, p=0.0209 and p< 0.0001, respectively.

Laboratory parameter assessment showed that mean proteinuria (12.4 ± 9.7 mg/dL) and serum urea (35.2 ± 11.2 mg/dl) and creatinine (1.04 ± 0.2 mg/dl) levels did not present alterations in comparison to reference values; however, it is noteworthy that creatinine showed a statistically significant difference between the genders (p<0.0001).

Glycemia presented normal mean levels for the whole group (97.3 ± 17.2 mg/dL) and for females (95.7 ± 16.4 mg/dL), whereas males presented elevated mean levels (100.5 ± 18.4 mg/dL), compatible with glucose intolerance and/or diabetes mellitus. As for the lipid profile, mean TC values were above the desired levels, 230.3 ± 46.8, 223 ± 49.2 and 234.4 ± 45 mg/dl, respectively, for the total sample, males and females, with a significant difference between genders (p=0.0407). LDL-c was elevated for the cardiovascular risk attributed to the studied population, 151.3 ± 422, 143 ± 44.9 and 155.7 ± 40.2 for the total, males' and females' means, respectively. As for HDL-c, a more favorable pattern was observed, being 47.5 ± 9.2, for total, 44.2 ± 10.1 for males and, especially, for females, 49.3 ± 8.2 mg/dl, showing a statistical significance (p = 0,0004). Mean levels of TG were slightly elevated, despite the great variability observed, in the total, males' and females' means, 159.3 ± 83.9, 168.3 ± 87.3 and 154.5 ± 82.1 mg/dl, respectively.

Mean levels of HCT were slightly increased, with com 14.3 ± 5.6, 15.3 ± 6.9 and 14.1 ± 5.5 µmol/l, for the total, males' and females' means, respectively.

DISCUSSION

This study consisted of a group of patients who presented, by itself, an increased cardiovascular risk, as the inclusion criteria were being hypertensive as well as a smoker[12]. Data discussion is based on the prevalence of additional RF detected throughout the study (Table 2).

Regarding arterial pressure, 43.2% of the patients (50% males and 39.6% females) had AP ≥ 140 x 90 mmHg, showing the need to implement measures of arterial pressure control according to the recommendations in the current SBC Directives for SAH[7].

When the anthropometrical data are analyzed in this representative sample of a population of hypertensive individuals, we observe a clear prevalence of overweight, 40.3% (56.3% for males and 31.9% for females) and obesity, 28.1% (16.7% for males and 34.1% for females), according to the classification of World Health organization (WHO) for BMI, conferring a higher prevalence of this risk factor to the female group. This same trend was observed for waist circumference, a parameter relative to visceral fat, where 67.6% of the women and 35.4% of the men presented C > 88 and 102 cm, respectively (WHO), and especially for WHI, where 75.5% of the whole group presented altered waist-hip indexes, being 52.1% of the men and 87.9% of the women[13]. These data, which presented a statistical significance when grouped by gender, show an important association between SAH and potential metabolic alterations, related to overweight/obesity. The Nurses' Health Study, for instance, which followed a cohort of 84,941 American nurses for 16 years, showed that BMI, measured every two years, was strongly correlated with the risk of developing diabetes mellitus type 2, in which women with BMI between 25-29 and 30-35 kg/m² presented a 7.6 and 20 times higher risk, respectively, when compared to those with BMI < 23 kg/m², considered as controls[14].

The metabolic profile of hypertensive patients has as one of its criteria the measurement of fasting glycemia, and in this study, it was observed that 35.4% of the males and 31.9% of the females presented glucose levels

Table 2 – Most prevalent risk factors in the sample studied (%)			
Risk factors	Total sample (n = 139)	Males (n = 48)	Females (n = 91)
AP > 140 x 90 mmHg	43.2	50	39.6
BMI 25 – 29,9 kg/m²	40.3	56.3	31.9
BMI > 30 kg/m²	28.1	16.7	34.1
Waist > 102(M) and 88(F) cm	56	35.4	67
WHI < 0.94 (M) and < 0.80 (F)	75.5	52.1	87.9
Glucose 100 – 125 mg/dl	33.1	35.4	31.9
TC 200 – 239 mg/dl	38.1	41.7	36.2
TC ≥ 240 mg/dl	37.4	33.3	39.6
HDL-c < 40 mg/dl	21.6	39.6	12.1
LDL-c > 130 mg/dl	69.1	58.3	74.7
TG > 150 mg/dl	48.9	54.2	46.1
HCT > 15 µmol/l	35.2	37.5	34.1

between 100 and 125 mg/dL, establishing a glucose intolerance diagnosis (WHO)[15].

Regarding the lipid profile, at the TC determination, 41.7% and 36.2% presented levels considered to be borderline (200 to 239 mg/dl) and 33.3% and 39.6%, presented elevated levels ($\geq$ 240 mg/dl); at HDL-c measurements, 39.6% and 12.1% presented levels below the recommended one (< 40 mg/dl); as for TG levels, 54.2% and 46.1% presented increased levels (> 150 mg/dl); all the data above refer to men and women, respectively, with a significant statistical diference between the genders (p = 0.0407 for TC and p = 0.0004 for HDL-c)[10]. As for LDL-c levels that follow as the main objective of the treatment of dyslipidemias and decrease of CVD risk, there was a very significant prevalence of elevated levels (58.3% for men and 74.7% for women, which is a non-significant difference between the genders, with p = 0.0958), above 130 mg/dl, which we consider as the upper limit of the treatment goal for this population of primary prevention and an intermediate or middle risk, at least[16].

As for the HCT determination, an emergent risk factor, despite the fact that the studied population consisted of hypertensive individuals who smokes, factors that can traditionally create an interpretation bias, it was observed that 37.5% and 34.1% of the patients presented values above the currently recommended levels (15 μmol/l), for males and females, respectively[17].

As a result, this study demonstrated an elevated prevalence of RF in addition to SAH and smoking, configuring the multiplicity that concurs with a marked elevation of the risk of cardiovascular events in this population sample[18]. We observed, regarding differences between genders, that women presented a more unfavorable metabolic profile compared to men. As a last analysis, we observed that treatment goals, currently recommended for the analyzed range of RF, are not being attained in the studied group, and that more effective measures must be employed in order to control and reduce the impact of multiple RF in the population sample.

Concluding, our study presents a very good correlation with the main epidemiological evidence[19] of risk factors and suggests that, in populations of hypertensive individuals, risk factor prevention, identification and control measures must be implemented, and that the use of programs such as the Hiperdia/MS can help with patient follow-up, allowing a more stringent multidisciplinary approach, especially in the analysis of the attainment of treatment goals and the consequent reduction of cardiovascular risk. We also understand that local initiatives, such as our own, can encourage other researchers and definitely contribute to data assembly on the prevalence and multiplicity of RF in Brazil.

REFERENCES

1. World Health Organization (WHO): http://www.who.int.

2. Bonow RO, Smaha LA, Smith SC, et al. World Heart Day 2002: The international burden of cardiovascular disease: responding to the emerging global epidemic. Circulation 2002; 106: 1602-5.

3. Brasil. Ministério da Saúde. Plano de reorganização da atenção à hipertensão arterial ao diabetes mellitus. http://www.saude.gov.br.

4. Ross R. Atherosclerosis: na inflammatory disease. N Eng J Med. 1999; 340: 115-26.

5. Davignon J, Ganz P. Atherosclerosis: evolving vascular biology and clinical implications. Role of endothelial dysfunction in atherosclerosis. Circulation 2004; 109(supll. III): III27-III32.

6. Yusuf S, Hawken S, Ounpuu S, et al. INTERHEART Study Investigators. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet 2004; 364: 937-52.

7. IV Diretrizes Brasileiras de Hipertensão Arterial. Arq Bras Cardiol 2004; 82 (supll.IV): IV1-IV14.

8. Janssen I, Katzmarzyk PT, Ross R. Body mass index, waist circumference and health risk. Arch Intern Med 2002; 162: 2074-9.

9. Associação Brasileira de Normas Técnicas. CB36 – Comitê Brasileiro de Análises Clínicas e Diagnósticos in vitro. Rio de Janeiro, 2002; p.19.

10. III Diretrizes Brasileiras de Dislipidemias e Prevenção da Aterosclerose. Arq Bras Cardiol 2001; 77(supll. III): III1-III48.

11. Rosner B. Fundamentals of Biostatistics. Second edition. Boston: PWS Publishers, 1986.

12. Grundy SM, Pasternak R, Greenland P, et al. Assessment of cardiovascular risk by use the multiple-risk-factor assessment equations: a statement for healthcare professionals from American Heart Association and American College of Cardiology. Circulation 1999; 100: 1481-92.

13. Diretrizes Brasileiras para Cardiologistas sobre Excesso de Peso e Doença Cardiovascular. Arq Bras Cardiol 2002; 78(supll. I): I1-I14.

14. Hu FB, Manson JE, Stampfer MJ, et al. Diet, life-style and the risk of type 2 diabetes mellitus in women. N Engl J Med 2001; 345: 790-7.

15. Commitee Report: Follow-up report on the diagnosis of diabetes mellitus. Diabetes Care 2003; 26: 3160.

16. Grundy SM, Cleeman JI, Merz CNB, et al. for the Coordinating Committee of the NCEP. Implications of recent clinical trials for the NCEP Adult Treatment Panel III guidelines. Circulation 2004; 110: 227-39.

17. Boushey CJ, Beresford SA, Omenn GS, et al. A quantitative assessment of plasma homocysteine as a risk factor for vascular disease: probable benefits of increasing folic acid intakes. JAMA 1995; 274: 1049-10.

18. Xavier HT. Manual de Dislipidemias e Cardiometabolismo – São Paulo: BBS Editora, 2004.

19. Polanczyk CA. Fatores de risco cardiovascular no Brasil: os próximos 50 anos. Arq Bras Cardiol 2005; 84(3): 199-201.