Original Article

Cardiovascular Risk Factors in a Cohort of Healthcare Professionals - 15 Years of Evolution

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Abstract

Background: According to the World Health Organization (WHO), cardiovascular diseases (CVD) account for 16.7 million deaths per year. Evidence shows that CVD result from the interaction of multiple risk factors that are present from childhood.

Objective: To evaluate the presence and evolution of several cardiovascular risk factors (CVRF) among medical professionals, in a period of 15 years.

Methods: We analyzed a group of individuals when they entered medical school, and repeated the analysis after 15 years, comparing the data found. We used CVRF questionnaires (systemic arterial hypertension (SAH); diabetes mellitus (DM); dyslipidemia and family history of premature CVD; smoking habit; alcoholism; and sedentary lifestyle). Cholesterol, blood glucose, BP, weight, height, body mass index (BMI) values were determined.

Results: We compared 100 subjects (64.0% men with a mean age of 19.9 years) with a total of 72 subjects (62.5% men, 34.8 years) that were included in the study 15 years later. There was an increase in the prevalence of hypertension (6.0% *vs* 16.7%, p = 0.024), overweight (9.0% *vs* 26.4%, p = 0.002), and dyslipidemia (4.0% *vs* 19.14%, p = 0.002). The other CVRF remained unchanged. Analyzing the values of systolic blood pressure (SBP); diastolic blood pressure (DBP); cholesterol; glucose; and BMI, we found an increase in the mean values of all variables ($p < 0.05$). We observed a positive correlation between the values of SBP, DBP, BMI, and blood glucose measured in the time interval ($p < 0.05$).

Conclusion: Among medical professionals, there was an elevation in SBP, DBP, glucose, BMI, and cholesterol values in 15 years. In the CVRF prevalence analysis, we found an increase in the prevalence of hypertension, overweight, and dyslipidemia. (Arq Bras Cardiol 2010; 95(3): 332-338)

Key words: Risk factors; health personnel/trends; cross-sectional studies.

Introduction

According to the World Health Organization (WHO), cardiovascular diseases (CVD) account for 16.7 million deaths per year. The projection of the prevalence of CVD for 2020 estimates them as the main cause of death and disability. Currently, developing regions contribute more to the burden of these diseases than developed regions[1]. In Brazil, it is estimated that CVD account for over 30.0% of deaths among adults 20 years of age or older[2].

The literature provides clear evidence that CVD manifestations in adulthood result from a complex interaction of multiple risk factors that are present from childhood and adolescence[3].

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Much of this knowledge about cardiovascular risk factors (CRF) results from the Framingham study[4]. This was one of the first cohorts in which the importance of some risk factors for developing heart disease and stroke were demonstrated. In 2004, Yusuf et al published the INTERHEART study[5], which was an international case-control investigation, outlined to systematically assess the importance of risk factors for coronary artery disease around the world. In this evaluation, nine risk factors accounted for more than 90.0% of the attributable risk for AMI. Albeit some regional differences, these contemporary data confirmed the traditional risk factors that had been previously established.[5]

Data regarding CVRF are scarce in Latin America[6]. In Brazil, the situation is not different. This occurs both with regard to the incidence and the prevalence, but especially in relation to an evolution analysis of these CVRF in the population[7-12].

Knowledge about the CVRF, the presence of these factors among children and youth population, and their evolution over time, as well as an assessment of risk behaviors, may contribute significantly to actions that could change the natural history of these risks, enabling the prevention of the onset of cardiovascular diseases[11-13].

With this objective in mind, we studied the presence and the evolution of cardiovascular risk factors in a population, which initially was composed of medical students, and in a later instance included medical professionals, in a period of 15 years.

Methods

The research project was evaluated and approved by the Ethics Commission in Human and Animal Medical Research of the Hospital of the School of Medicine of the Federal University of Goias.

This was a historical cohort study conducted in a population composed of students of the School of Medicine of the Federal University of Goiás who started the course in 1993. The same subjects were reassessed after 15 years, now as professionals in various medical specialties. Therefore, the study was conducted in two stages.

We excluded those who did not agree to participate in any of the stages of the study, patients with congenital heart disease, patients with type 1 diabetes mellitus, and those who were not enrolled in the Regional Medical Council at the time of the second stage of the study.

In the first stage, the subjects were selected at predetermined dates that were scheduled with the school board. In the second stage, they were located through the Regional Medical Council of Goiás, and then contacted by telephone to schedule an interview for the collection of data. For those individuals who did not live in the metropolitan area of Goiânia, this data collection was conducted by telephone. The data referred to in these specific cases were considered for final analysis. All participants were informed about the study procedures in 1993 and signed a consent form, and the same procedure was repeated at the later stage.

The questionnaire used in 1993 was applied again after 15 years, and the same variables were evaluated, namely: age; gender; diagnosis and previous treatment of hypertension; dyslipidemia; or diabetes. Individuals were also asked about the occurrence of major cardiovascular events (myocardial infarction - MIA, stroke, or coronary artery bypass grafting - CABG).

As for lifestyle, we analyzed the history of smoking habit (smoker or nonsmoker), alcohol consumption (drinking alcohol or not), and physical activity (sedentary - no physical activity; irregular physical activity - less than 30 minutes a day 3 times/week; and regular physical activity - 30 minutes or more a day 3 times/week). The presence of an early cardiovascular disease in a first degree relative (< 65 years for women and < 55 years for men) was also taken into account.

Objective measurements

In the first and second stages, the following variables were assessed using the same methodologies of the study:

Weight - individuals wearing light clothing and without shoes; a Plenna Lithium electronic scale, with a maximum capacity of 150 kg and precision of 100 g was used.

Height - subjects without shoes; a SECCA laser stadiometer, model 206, with an accuracy of 0.1 cm was used.

Body mass index (BMI) - the formula established by Quetelet (BMI = weight in kg/height^2 in meters)[14] was used. Values of BMI ≥ 25 kg/m^2 were classified as overweight[15].

Blood pressure (BP) - a semiautomatic OMRON HEM705 CP equipment was used. Measurements were taken in the right upper limb, after 5 minutes of rest, with the subject seated and the arm supported. Blood pressure was measured twice with a two-minute interval between them. For data analysis purposes the second blood pressure measurement was taken into account, and hypertension was defined by values greater than or equal to 140/90 mmHg[16].

Waist circumference (WC) - measured only in the second stage of the study (at the midpoint between the last rib and the iliac crest, at the end of expiration), with a measuring tape graduated in centimeters. WC was considered increased if greater than 88 cm in women and 102 cm in men[15].

Data collected by telephone

Data collection was conducted by telephone with 11 individuals. In these cases we used the reported weights and heights. The subjects were asked to measure their blood pressure, with a calibrated equipment used in their daily practice, and their waist circumference, following the recommendations provided in the study. As they were health professionals, there were no difficulties for the implementation of such procedures, and the data were considered reliable.

Laboratory data

In the first stage, after 12 hours of fasting, blood glucose and cholesterol levels were measured in a sample of blood taken by finger prick with a lancet, using the test strip method, with HEMOGLUCOTEST and REFLOTRON devices, respectively.

For the second stage, we used fasting glucose and lipid profile tests conducted up to six months before the questionnaire was completed, provided that the samples were collected after 12 hours of fasting and the recommendation of not drinking alcohol for 48 h prior to the collection was followed. Only five subjects did not have the test results needed to fit those requirements, and new collections were taken for them. The method used for measurement of total cholesterol (TC), HDL cholesterol (HDL), triglycerides (TG), and plasma glucose levels was the colorimetric-enzymatic method for all subjects included in the analysis, even though the collections were not performed in the same laboratory. The value of LDL cholesterol was estimated by the Friedewald formula, in which LDL = TC - (HDL + TG/5)[17].

The subjects who had total cholesterol levels of 200 mg/dl or over were considered dyslipidemic. We decided not to use cholesterol and triglyceride fractions in this evaluation, because these data did not exist in the initial analysis of the sample, thereby precluding a comparison.

Although the methodologies used to measure cholesterol and glucose values were not the same in the two stages of the study, this did not compromise the data analysis, because there is ample documentation in the literature regarding the correlation between values obtained by these methods[18-21].

Database and statistical analysis

The data were stored in a database structured in the Excel program (Microsoft) and analyzed comparatively. The statistical analysis was performed using the SPSS software (Statistical Package of Social Science, version 15.0, Chicago, IL, USA). The Kolmogorov-Smirnov test was used to see whether the continuous variables presented normal distribution. The Student t test for paired samples was used to compare the numerical variables of the study, expressed as mean and standard deviation. The comparative analysis of CVRF in the period between 1993 and 2008 was performed using the chi-square test and the Fisher test. The analysis of correlation of the numerical variables between the two stages of the study was conducted by the Pearson correlation test. The significance level was set at $p < 0.05$.

Funding

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Results

The database of the first stage of the study consisted of 100 individuals, of which 74 (74.0%) were located for the second stage of the analysis after 15 years. We excluded two individuals, one for not agreeing to participate, and the other for having been diagnosed as having type 1 diabetes; the data of 72 physicians were used for data analysis.

Of the 100 individuals studied in 1993, 39.0% were female, with a mean age of 19.9 years (minimum 18 and maximum 22 years). In the group studied in 2008, the average age was 34.8 years (minimum 33 and maximum 37), 37.5% of these being female.

In the first stage of the study, none of the medical students reported having hypertension, dyslipidemia, or diabetes. In the second analysis, regarding hypertension awareness, an individual reported to be hypertensive and to be under treatment. Regarding dyslipidemia, this number was higher, as 6 subjects reported having lipid profile abnormalities, and only three (50%) were under treatment (pharmacological or not). There was no reference to type 2 diabetes awareness.

No early cardiovascular event was reported in first degree relatives in 1993, whereas 15 individuals reported such events in 2008.

No cardiovascular event occurred in the group evaluated after 15 years of evolution.

In the analysis of the prevalence of cardiovascular risk factors in the population studied in the period of 1993-2008, there was a significant increase in hypertension, overweight, and dyslipidemia. For other CVRF (sedentary lifestyle, smoking habit, and alcohol consumption), the changes were not significant (Table 1).

The comparison between systolic blood pressure (SBP), diastolic blood pressure (DBP), blood glucose and cholesterol values in the two stages showed elevated mean values with significant differences in all variables (Table 2).

In evaluating the same variables by gender, we found that in males there was a significant increase in all variables (systolic and diastolic blood pressures, BMI, blood glucose, and cholesterol), whereas in females there was only a significant increase in BMI, blood glucose, and cholesterol (Tables 3 and 4).

There was no difference in the prevalence of CVRFs, when each gender was evaluated separately, except for overweight. Regarding this variable, among men, we found 6 (13.33%) individuals with BMI ≥ 25 kg/m² in 1993, whereas in 2008, we found 14 (31.1%) young subjects with this classification of BMI ($p < 0.001$).

In the correlation analysis between the values obtained

Table 1 - Comparison of the prevalence of cardiovascular risk factors, between 1993-2008

	1993 (n = 100)	2008 (n = 72)	P
Cholesterol ≥ 200 mg/dl	4.0% (4)	19.14% (14)	0.002**
BP ≥ 140x90 mmHg	6.0% (6)	16.7% (12)	0.024*
BMI ≥ 25 kg/m²	9.0% (9)	26.4% (19)	0.002*
Sedentary lifestyle	35.0% (35)	27.8% (20)	0.316*
Smoking habit	1.0% (1)	5.6% (4)	0.162**
Alcoholism	35.0% (35)	30.6% (22)	0.541*

** Chi-square Values expressed in percentage and absolute numbers. ** Fisher test. BP - blood pressure, BMI - body mass index.*

Table 2 - Comparison of the mean BP, BMI, blood glucose, and cholesterol, between 1993-2008

	1993 (n = 100)	2008 (n = 72)	P
SBP (mmHg)	112.96 (11.80)	119.34 (14.93)	0.002
DBP (mmHg)	71.12 (8.81)	75.94 (9.44)	0.001
BMI (kg/m²)	21.22 (2.40)	24.7 (3.53)	<0.001
Glucose (mg/dl)	76.47 (5.50)	82.02 (7.65)	<0.001
Cholesterol (mg/dl)	144.78 (31.69)	179.10 (26.46)	<0.001

Values expressed as mean and standard deviations. Student t test for paired samples. SBP - systolic blood pressure; DBP - diastolic blood pressure; BMI - body mass index.

Table 3 - Comparison of the mean BP, BMI, blood glucose, and cholesterol, between 1993-2008, for males

	1993 (n = 61)	2008 (n = 45)	P
SBP (mmHg)	117.54 (11.57)	126.69 (12.89)	<0.001
DBP (mmHg)	73.98 (8.32)	80.02 (8.15)	<0.001
BMI (kg/m²)	21.46 (2.56)	25.19 (3.55)	<0.001
Glucose (mg/dl)	77.54 (4.93)	83.58 (6.82)	<0.001
Cholesterol (mg/dl)	137.46 (29.30)	180.42 (21.91)	<0.001

Values expressed as mean and standard deviations. Student t test for paired samples. SBP - systolic blood pressure; DBP - diastolic blood pressure; BMI - body mass index.

Table 4 - **Comparison of the mean BP, BMI, blood glucose, and cholesterol, between 1993-2008, for females**

	1993(n=39)	2008(n=27)	p
SBP (mmHg)	105.79 (8.08)	107.11 (8.89)	0.534
DBP (mmHg)	66.64 (7.71)	69.15 (7.35)	0.190
BMI (kg/m^2)	20.84 (2.11)	22.20 (2.63)	0.023
Glucose (mg/dl)	74.79 (5.98)	79.44 (8.36)	0.011
Cholesterol (mg/dl)	156.23 (32.25)	177.18 (30.07)	0.013

Values expressed as mean and standard deviations. Student t test for paired samples. SBP - systolic blood pressure; DBP - diastolic blood pressure; BMI - body mass index.

in 1993 and 2008, we found a positive correlation between systolic blood pressure, diastolic blood pressure, glucose, and BMI ($p < 0.001$). For cholesterol, no such correlation was demonstrated ($r = 0.186$, $p = 0.117$;) (Figure 1).

Waist circumference was measured only in the second stage of the study, thus making comparison impossible. We found 9 (12.5%) individuals with increased WC, three women and six men.

Discussion

This study showed a significant increase in the prevalence of some cardiovascular risk factors (overweight, dyslipidemia, and hypertension) in this population. These findings were not repeated for the other cardiovascular risk factors analyzed. Smoking habit, physical inactivity, and alcohol consumption were behavioral aspects that did not change significantly over the study period.

The increasing prevalence of overweight over time has already been reported by some Brazilian studies, including the Ciorlia and Lotufo studies, which analized the evolution of BMI in specific populations[9,22]. Moreover, the obesity epidemic is a reality in developed countries, and has also been observed in developing countries[23,24]. Our study group, although distinguished by their formal education in health, did not show a different pattern. However, the prevalence of overweight in this group was lower in the two stages of the study, when compared with that of the same age population of the capital cities of Brazil[25].

The prevalence of dyslipidemia, even though it rose significantly during the study, was much lower than that described in the literature produced in Brazil, in both stages of the study. Studies conducted in the population of nine capitals, with a mean age of 35.4 years - in this respect quite similar to the population of the second stage of our analysis - revealed a 38.0% prevalence of total cholesterol ≥ 200 mg/dl for males, and 42.0% for females[26]. Our data showed only 19.4% for both genders.

When comparing the number of hypertensive individuals in both stages of our study with that of the population of Goiânia[27] divided by age group, we found lower rates of hypertension in our group, in both stages, despite the detection of an increased prevalence of hypertension over the 15-year period. This information corroborates the existance of a relationship between hypertension and low levels of schooling, since our study population was composed, at the first stage, by students, and at the second stage, by professionals with a college degree and who, therefore, had a higher degree of instruction when compared to the general population of Goiânia.

Our study showed that even for the cardiovascular risk factors whose prevalence increased significantly over the 15-year follow-up, these prevalence rates were lower than in the general population. These data are superimposable to those found in the Physicians Health Study[28], which demonstrated that the prevalence of cardiovascular risk factors was substantially lower among American physicians when compared to that of the general population.

A household survey data from the Ministry of Health revealed that the prevalence of smoking habit ranged from 12.9 to 25.2%, depending on the city analyzed, with an increase in prevalence in individuals with lower education and older age[25]. Taking into account the prevalence of 1.0% and 5.6% in the two stages of our research, we concluded that the health professionals analyzed in this study smoked less than the general population, following the same pattern of age distribution of the population of the Brazilian capital cities.

In the group investigated, sedentary lifestyle was identified in 35.0% of the subjects in the first stage, and in 27.8% of the subjects in the second, but this reduction was not statistically significant. In the population of nine Brazilian capitals, this risk factor for cardiovascular disease ranged from 28.2% to 54.5%. However, differing from our findings, the population tended to be most active between 15-24 years. Another interesting finding was the absence of the influence of the education level on the prevalence of physical inactivity;[25] these data confirm our findings.Alcohol consumption did not change significantly, and its prevalence in the two stages of our study was similar to that found in the population of Brazilian capital cities. We should point out that the trend of increasing alcohol consumption with increasing age and education level[25] was not observed in our study.

Separating the prevalence of risk factors by gender, we found differences only in overweight, which was higher in males. All the other CVRF, when analyzed by gender, did not change over the years. This fact suggests that in this group of individuals, the evolution of these prevalences occur homogenously in both genders, except for overweight. However, the sample was not large enough to safely demonstrate differences in the evolution between genders.

In the numerical analysis of the levels of blood pressure, cholesterol, glucose, and BMI, we found a significant elevation in all of these variables over the 15-year period, perhaps due to the population aging. Observing these same variables by gender, we detected a significant increase in BMI, blood glucose, and cholesterol in both genders, whereas the increase in blood pressure (systolic and diastolic) was only significant in males.

In the study of the correlation between values obtained in 1993 and in 2008, we found a significant positive correlation between DBP, SBP, blood glucose, and BMI, i.e. the same individuals who had higher levels in 1993 also had higher levels in 2008. However, cholesterol values were not

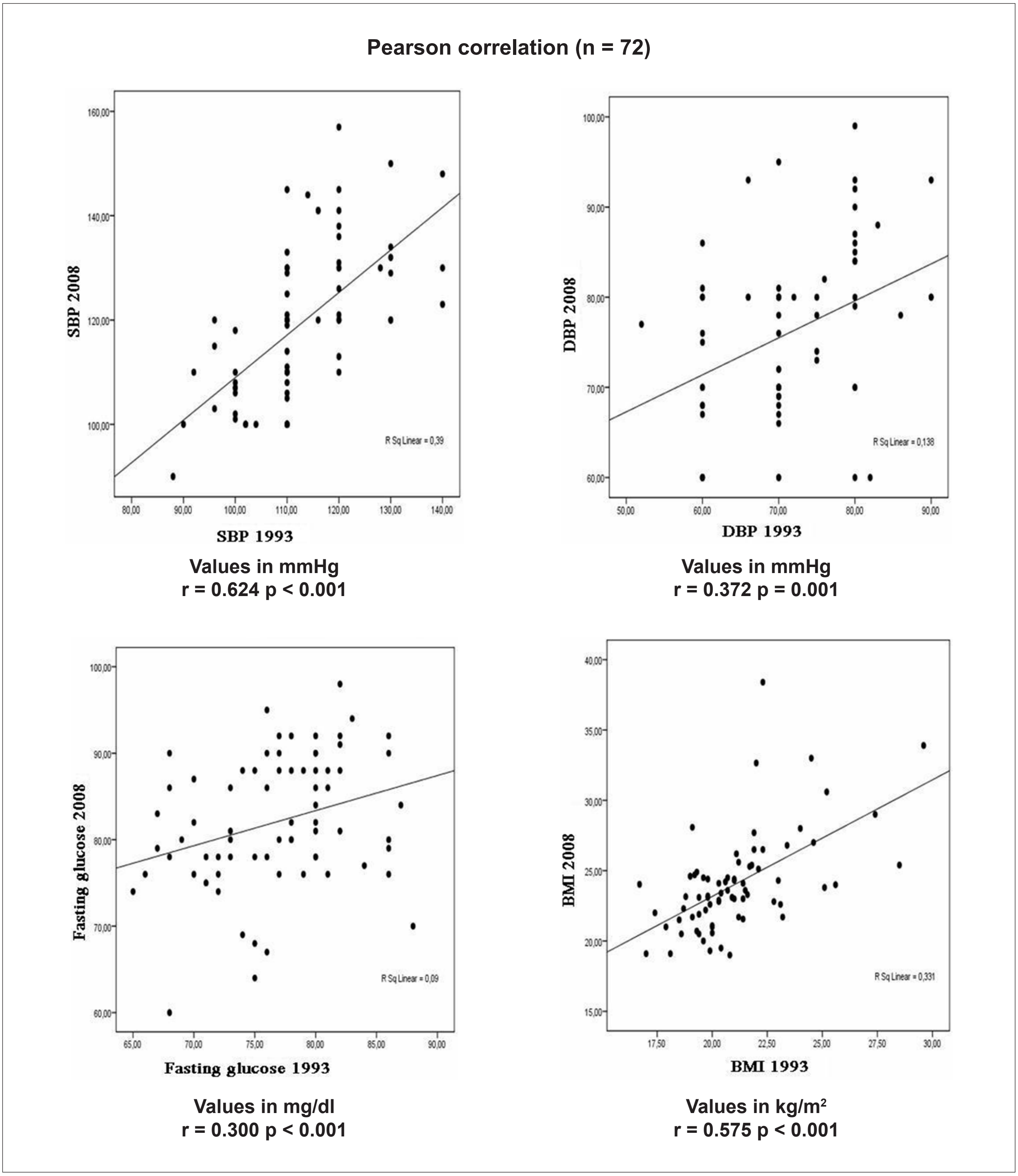

Figure 1 - Correlation between SBP, DBP, fasting glucose, and BMI, in 1993 and 2008.

correlated between the two stages of the study. On further analysis of these data, we observed higher correlations (greater r values) for systolic blood pressure and body mass index. This suggests that monitoring and a more aggressive approach to the control of these variables could have great impact as health promoting measures, although *p* values have shown significant results in the comparison of all variables considered above.

As already suggested by Monego & Garden, when studying the determinants of cardiovascular disease risk in school-aged population[29], these data can be used in strategies for early intervention on modifiable risk factors.

Some limitations of our study should be mentioned. One of them was the fact that not all individuals evaluated in 1993 were located in 2008. This is explained by the long interval between the two data collections, and by the fact that no contact was maintained with these research subjects in this period. Nonetheless, the revaluation of more than 70% of the initial group of individuals makes the sample representative and allows for the conclusions drawn.

The glucose and lipid profile samples in the second evaluation should also be mentioned. These samples were obtained in different laboratories, and for some of the physicians (11 subjects, 15.27% of the sample in the second evaluation), the results were obtained by telephone. It is noteworthy that the methodology used in the analysis of biochemical variables was the same (colorimetric-enzymatic method), regardless of the fact that the laboratories were not the same and that the collection had been carried out by telephone. We also emphasize the quality of the information obtained by telephone, inasmuch as the subjects were medical professionals.

Another limitation to be noted was the use of different methodologies for the analysis of cholesterol and glucose levels in the two stages of the study. Although the methodologies were not the same, there is ample documentation in the literature that confirms the correlation between values obtained by such methods, without compromising the data analysis[18-21]. Furthermore, the lipid profile and serum glucose analysis expands the possibilities for future approaches in this population with regard to these factors, which are important determinants of cardiovascular risk.

Conclusions

In a cohort of medical professionals, there was an increase in SBP, DBP, glucose, BMI, and cholesterol levels in 15 years of evolution. In the analysis of the prevalence of cardiovascular risk factors, we observed an increased prevalence of hypertension, overweight, and dyslipidemia.

Potential Conflict of Interest

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

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