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Comparison of Cardiovascular Risk Factors in Different Areas of Health Care Over a 20-Year Period

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Abstract

Background: Cardiovascular diseases (CVDs) are the leading cause of death worldwide. Knowledge about cardiovascular risk factors (CVRFs) in young adults and their modification over time are measures that change the risks and prevent CVDs.

Objectives: To determine the presence of CVRFs and their changes in different health care professionals over a period of 20 years.

Methods: All students of medicine, nursing, nutrition, odontology, and pharmacy departments of Federal University of Goiás who agreed to participate in this study were evaluated when they started their degree courses and 20 years afterward. Questionnaires on CVRFs [systemic arterial hypertension (SAH), diabetes mellitus, dyslipidemia, and family history of early CVD, smoking, alcohol consumption, and sedentarism] were administered. Cholesterol levels, blood sugar levels, blood pressure, weight, height, and body mass index were determined. The Kolmogorov–Smirnov test was used to evaluate distribution, the chi-square test was used to compare different courses and sexes, and the McNemar test was used for comparing CVRFs. The significance level was set at a p value of < 0.05.

Results: The first stage of the study included 281 individuals (91% of all the students), of which 62.9% were women; the mean age was 19.7 years. In the second stage, 215 subjects were reassessed (76% of the initial sample), of which 59.07% were women; the mean age was 39.8 years. The sample mostly consisted of medical students (with a predominance of men), followed by nursing, nutrition, and pharmacy students, with a predominance of women ($p < 0.05$). Excessive weight gain, SAH, and dyslipidemia were observed among physicians and dentists ($p < 0.05$). Excessive weight gain and SAH and a reduction in sedentarism ($p < 0.05$) were observed among pharmacists. Among nurses there was an increase in excessive weight and alcohol consumption ($p < 0.05$). Finally, nutritionists showed an increase in dyslipidemia ($p < 0.05$).

Conclusion: In general, there was an unfavorable progression of CVRFs in the population under study, despite it having adequate specialized knowledge about these risk factors. (Arq Bras Cardiol. 2014; 103(6):493-501)

Keywords: Cardiovascular Diseases; Risk Factors; Health Personnel; Health Education/trends; Cohort Studies

Introduction

It is estimated that approximately 23.3 million people will die of CVD in 2030, mainly heart disease (HD) and stroke, with them being the leading cause of death worldwide[1]. The World Health Organization (WHO) estimates that 75% cardiovascular mortality can be decreased with appropriate lifestyle changes; this is the biggest challenge presented by the various guidelines on cardiovascular disease (CVD) prevention[2].

The most important behavioral factors associated with HD and stroke, referred to as cardiovascular risk factors (CVRFs), are unhealthy diet, sedentarism, smoking, and excessive alcohol consumption. These risk factors account for approximately 80% cases of coronary artery and cerebrovascular diseases[2].

Unhealthy diet and sedentarism have negative effects, such as high blood pressure, elevated glucose and lipid levels, excessive weight gain, and obesity on individuals. CVRFs can be evaluated in basic health care centers and indicate an increased risk of acute myocardial infarction, stroke, heart failure, and other complications[3].

Health education is an indispensable tool in the prevention and control of nontransmissible chronic diseases[4-6]. Theoretically, the study of the progress of some CVRFs in a group of individuals with health-related university education can determine the real impact of health education as a measure of health promotion. This assumption is based on the fact that this is a population with formal training in health and therefore with in-depth knowledge of the risks and harms associated with CVRFs and the associated risk behaviors.

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For this purpose, we compared the presence and changes in some CVRFs in a population of individuals with professional training in health care over a period of 20 years.

Methods

The research project was submitted to and approved by the Research Ethics Committee of the Hospital das Clínicas, Federal University of Goiás.

This was a longitudinal study that included two assessment stages separated by a period of 20 years. The population under study consisted of all the students of the Faculties of Medicine, Nursing, Nutrition, Dentistry, and Pharmacy of the federal university located in a large city of the Center-West region of Brazil, who began their courses in 1993 and who agreed to participate in the study. The same individuals were reassessed 20 years afterward, as health professionals in various specialty areas. The study was thus developed in the two stages.

The individuals who did not agree to participate in either stage of the study and those with congenital heart disease and type-1 diabetes mellitus were excluded.

In the first stage, the subjects were selected with the help of the boards of the faculties on prescheduled dates. In the second stage, they were located via the State's Regional Councils of Medicine, Nursing, Nutrition, Dentistry, and Pharmacy and contacted by telephone. Interviews were then schedule for data collection. Moreover, the subjects were located individually using the Internet as search tool. Data regarding the individuals who did not reside in Greater Goiânia or Brasília was collected by telephone. In these specific cases, data were included in the final analysis because these were health professionals. All the participants were informed about the study's procedures and signed the informed consent document, both in in 1993 and in 2013.

The questionnaire used in 1993 was again administered 20 years afterward. In both stages, the study's variables were the following: age; sex; diagnosis and previous treatment for systemic arterial pressure, dyslipidemia, or diabetes mellitus. In addition, the individuals were asked about the occurrence of major cardiovascular events [acute myocardial infarction (AMI), stroke, or the need for myocardial revascularization (MRV)]. With regard to lifestyle, history of smoking (smoker or nonsmoker), alcohol consumption (yes or no), physical activity (sedentarism, without any physical activity; irregular physical activity, 30 min 3×/week; and regular, ≥ 30 minutes 3×/week). The presence of early cardiovascular disease in the first-degree family (<65 years for women and < 55 years for men) was also taken into consideration.

Objective measures

Evaluated parameters:

Weight: the individuals were weighed when they were wearing light clothes and barefoot, using Plenna Lithium electronic scales (maximum capacity of 150 kg and precision of 100 g).

Height: the individuals were measured barefoot, using a SECCA laser stadiometer, model 206, with a precision of 0.1 cm.

Body mass index (BMI): determined using the formula established by Quetelet [BMI = Weight in kg/(height in m)^2][7].

Blood Pressure (BP): measured using a mercury sphygmomanometer in the first stage and a calibrated OMRON HEM705 CP semiautomatic device in the second stage. The measurements were performed twice on the right arm of the individuals in the seated position and with the arm supported, after 5 min of rest, and at an interval of 2 min. The values obtained in the second blood pressure measurement were used.

Data collected by telephone

Sixteen individuals were interviewed over the telephone for data collection. In these cases, weight and height measurements provided by the subjects were used and the subjects were asked to measure blood pressure using a calibrated device used in the routine clinical practice according to the recommendations of the study. Because these subjects were health professionals there were no difficulties in performing these procedures and data were considered reliable.

Laboratory data

In the first stage of the study, the measurement of blood glucose and cholesterol levels was performed after a 12-h fasting period in a blood sample collected via finger-stick procedure, and the reading was performed with strips using the HEMOGLUCOTEST and the REFLOTRON devices, respectively.

In the second stage, fasting blood glucose and lipid profile tests performed up to 12 months before the filling of the questionnaire were used; the sample was collected after a 12-h fasting period and the subjects were instructed to avoid alcohol consumption 48 h before sample collection. Only five individuals did not have the required test results, and new sample collections were performed for them. The colorimetric-enzymatic method was used to measure total cholesterol (TC), high-density lipoprotein cholesterol (HDL), serum triglycerides (TG), and plasma glucose. Low-density lipoprotein cholesterol (LDL) values were estimated using the Friedewald formula, where LDL = TC − (HDL + TG/5)[8].

Although the method used to determine cholesterol and glucose levels was not the same in the two stages of the study, the literature is full of reports on the good correlation between the values obtained by these methods. Therefore, data analysis was not affected by this fact[9-12]. In addition, there was no modification in the reference values between the two evaluations. Moreover, level modification over time was the aim of the study, rather than the absolute values.

Database and Statistical Analysis

The data were stored in a specific database, compiled in Excel (Microsoft) software, and a comparative analysis was performed. The statistical analysis was performed using the SPSS software (Statistical Package of Social Science, version 20.0, Chicago, IL, USA). The Kolmogorov–Smirnov test was used to assess the normal distribution

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of the continuous variables. The association between the categorical variables, such as degree and sex, was analyzed using the chi-square test. The comparative analysis of CVRFs between 1993 and 2013 was performed using the McNemar test for categorical variables and by analyzing each risk factor on both stages; the Wilcoxon signed test was used to compare CVRFs with continuous data, such as cholesterol levels, between both stages, considering that these were nonparametric data and that the comparison was performed using the same population at two distinct stages. A p value of < 0.05 was considered statistically significant.

Results

The database of the first stage included 281 individuals (representing > 91% of all the students enrolled in the first year), of which 220 (78.3% of the initial sample) were examined 20 years afterward for the second stage. Five individuals were excluded: 4 because they did not agree to participate and 1 because he/she was diagnosed with type-1 diabetes mellitus during this period. Therefore, we used the data of 215 health professionals to analyze data.

Of the 281 individuals under study in 1993, 62.99% were women and the mean age was 19.7 years (minimum 17 years and maximum 22 years). In the 2013 group, the mean age was 39.8 years (minimum 37 years and maximum 42 years) and 59.07% individuals were women. There was no statistically significant difference in age between the different health professions.

The distribution of participants was analyzed according to the university degree and sex, at both stages of the study. In 1993, there was predominance of medical students and, among whom there was a predominance of men. In contrast, there was a higher proportion of women among nursing, nutrition, and pharmacy students. In addition, there was a predominance of women among dentists; however, the difference was not statistically significant (Table 1).

In 2013, the distribution according to the university degree was similar; however, with regard to sex there was a change in the pharmacists group, where although there was a predominance of women; however, the difference was not statistically significant (Table 2).

All the assessed groups showed excessive weight gain, with statistically significant differences among physicians, dentists, nurses, and pharmacists (Figure 1).

A statistically significant increase in the prevalence of systemic arterial hypertension (Among nurses,) with time was observed among physicians, dentists, and pharmacists. Although the same trend was observed among nurses and nutritionists, the difference was not statistically significant (Figure 2).

Table 1 - Distribution of participants according to the training degree and sex in 1993. Goiânia–GO

	Male		Female			Total	
Degrees	n	%	n	%	p*	n	%
Medicine	59	61.5	37	38.5	0.025	96	34.2
Nutrition	1	3.8	25	96.2	≤ 0.001	26	9.3
Dentistry	23	38.3	37	61.7	0.071	60	21.4
Nursing	4	9.5	38	90.5	≤ 0.001	42	14.9
Pharmacy	17	29.8	40	70.2	0.002	57	20.3
Total	104	37.0	177	63.00	≤ 0.001	281	100.0

*chi-square test, *significance at a p value < 0.05.*

Table 2 - Distribution of participants according to the training degree and sex in 2013. Goiânia–GO

	Male		Female			Total	
Degrees	n	%	n	%	p*	n	%
Medicine	48	64.0	27	36.0	0.015	75	34.9
Nutrition	1	4.2	23	95.8	≤ 0.001	24	11.2
Dentistry	20	43.5	26	56.5	0.376	46	21.4
Nursing	4	11.8	30	88.2	≤ 0.001	34	15.8
Pharmacy	14	38.9	22	61.1	0.182	36	16.7
Total	87	40.5	128	59.5	≤ 0.001	215	100.0

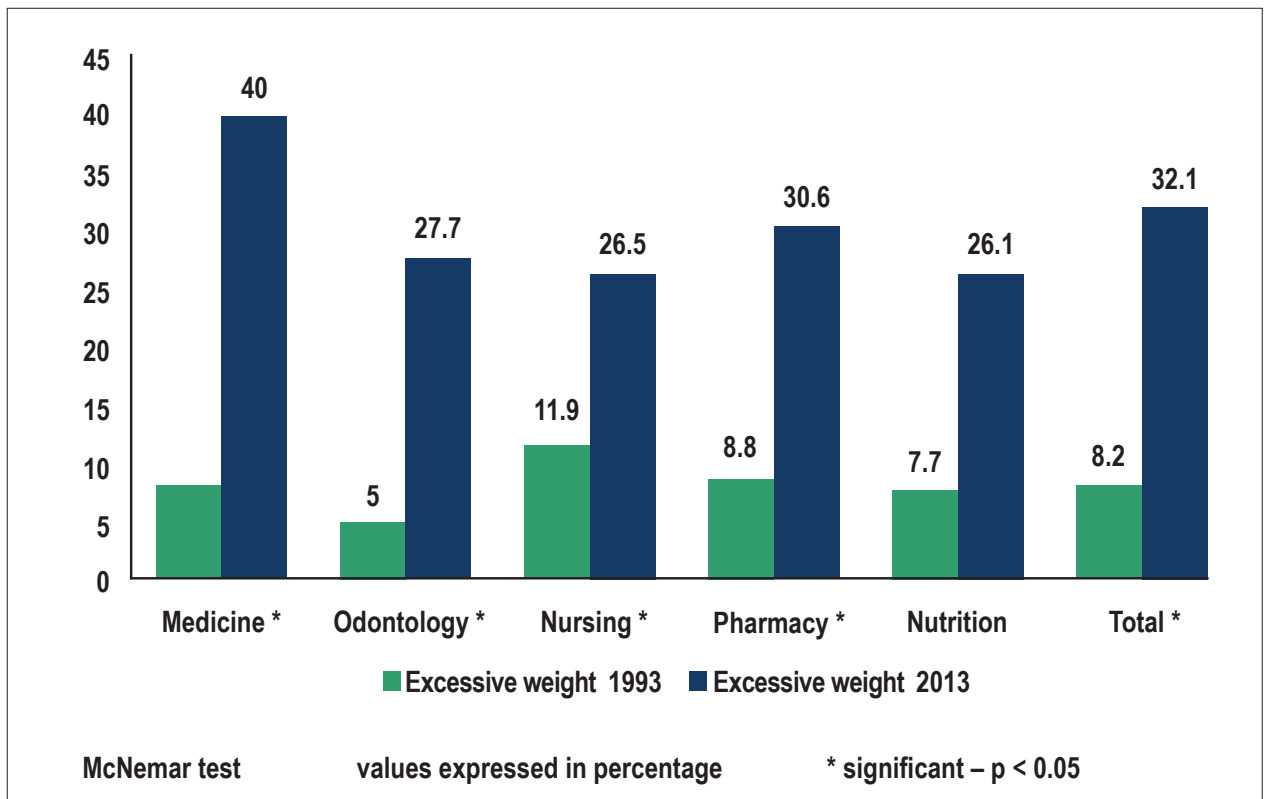*chi-square test, *significance level at a p value < 0.05.*

Figure 1 - *Prevalence of excessive weight in 1993 and 2013, according to the course. Goiânia – GO. McNemar test*
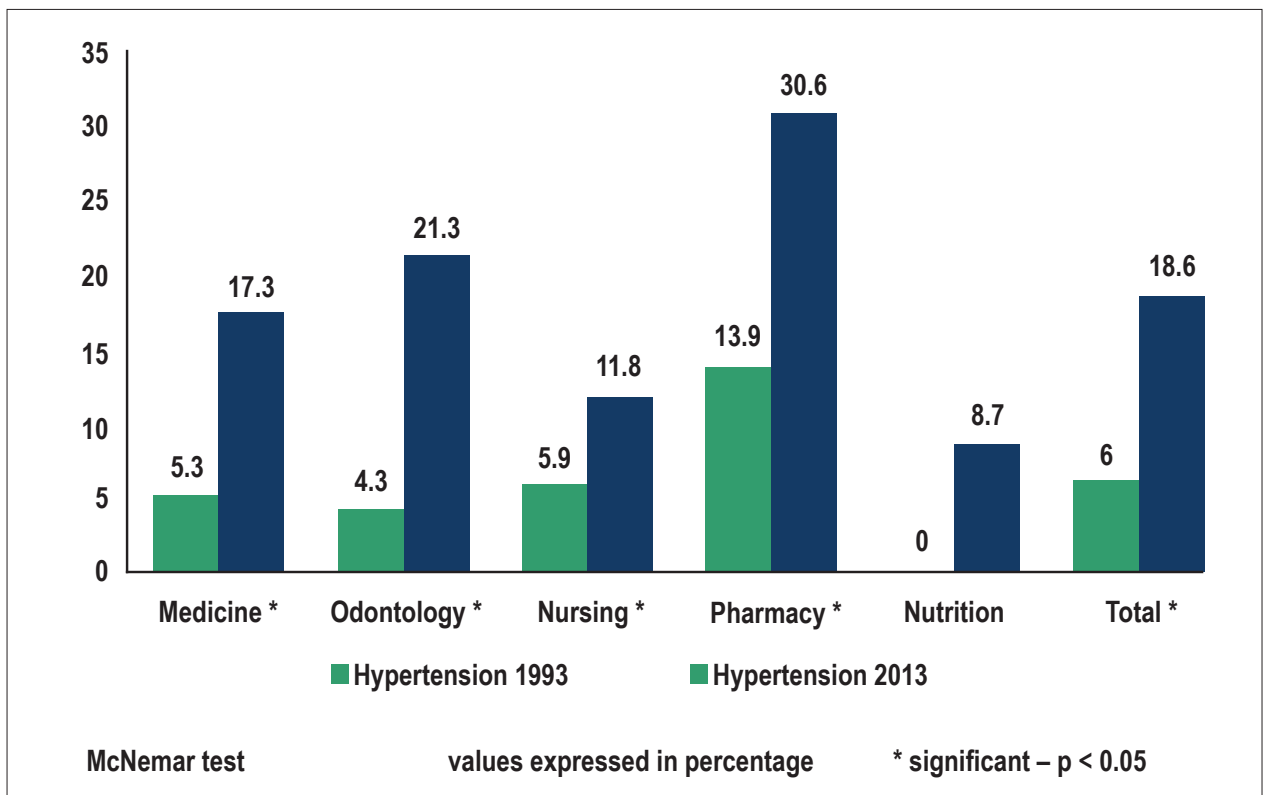

Figure 2 - *Prevalence of hypertension in 1993 and 2013, the second course. Goiânia - GO*

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Dyslipidemia followed the same increasing trend; however, this increase was only statistically significant among physicians, dentists, and nutritionists (Figure 3).

A statistically significant decrease in sedentarism was observed in the whole sample, and showed a decreasing tendency in each separate group of professionals; however, the difference was only statistically significant among pharmacists (Figure 4).

Excessive alcohol consumption behavior was variable, with a tendency to increase in the whole sample; however, there was a statistically significant increase in its prevalence in the group of nursing professionals (Table 3).

Smoking prevalence, which was low in 1993, was maintained at the same levels in all the specialty areas over the 20-year period (Table 4).

Discussion

The knowledge of CVRFs, the monitoring of their presence in young populations and their progression over time, as well as the evaluation of risk behaviors have an important role in the implementation of measures that modify the natural history of these risk factors and prevent the occurrence of cardiovascular diseases[13-15].

This study showed statistically significant differences in the progression of the prevalence of some CVRFs in different groups of health professionals over a period of 20 years.

There was a statistically significant increase in excessive weight gain among physicians, dentists, pharmacists, and nurses. In addition, there was a clear increase in excessive weight gain among nutritionists; however, the difference was not statistically significant, probably because of the sample size of this subgroup. Because of the high percentage of increase, it is also possible but less probable that the nutritionists' training, which is more focused on food-related aspects of human health, contributes to their weight gain. This increase in the prevalence of excessive weight gain over time has been demonstrated in studies that follow specific populations, especially when the follow-up is initiated at a younger age[16-17].

The prevalence of SAH also increased among the groups. This increase was statistically significant among physicians, dentists, and pharmacists. Although an increase was also observed in nutritionists and nurses, it was not statistically significant.

Dyslipidemia also increased and the difference was statistically significant among physicians, dentists, and nutritionists.

We highlight that we observed an increase in the prevalence of all the variables among physicians and dentists. These two groups, in this study, showed the worst progression of the assessed CVRFs and deserve special attention. An explanation may be related to the professional activity itself. On one hand these are highly sedentary activities and on the other hand these professionals experience a high degree of stress.

Another relevant aspect of the assessment of excessive weight gain, SAH, and dyslipidemia is the fact that these three variables increased even when the increase in the prevalences of sedentarism, excessive alcohol consumption, and smoking
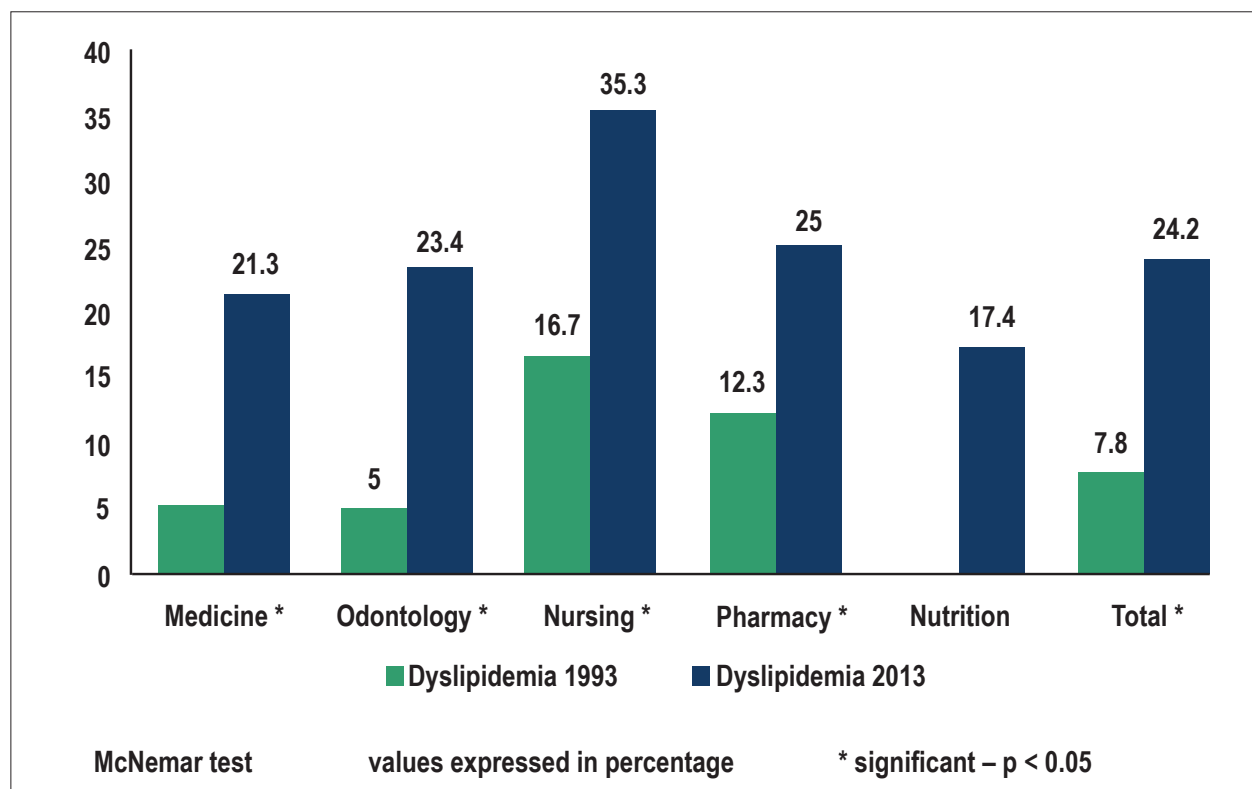

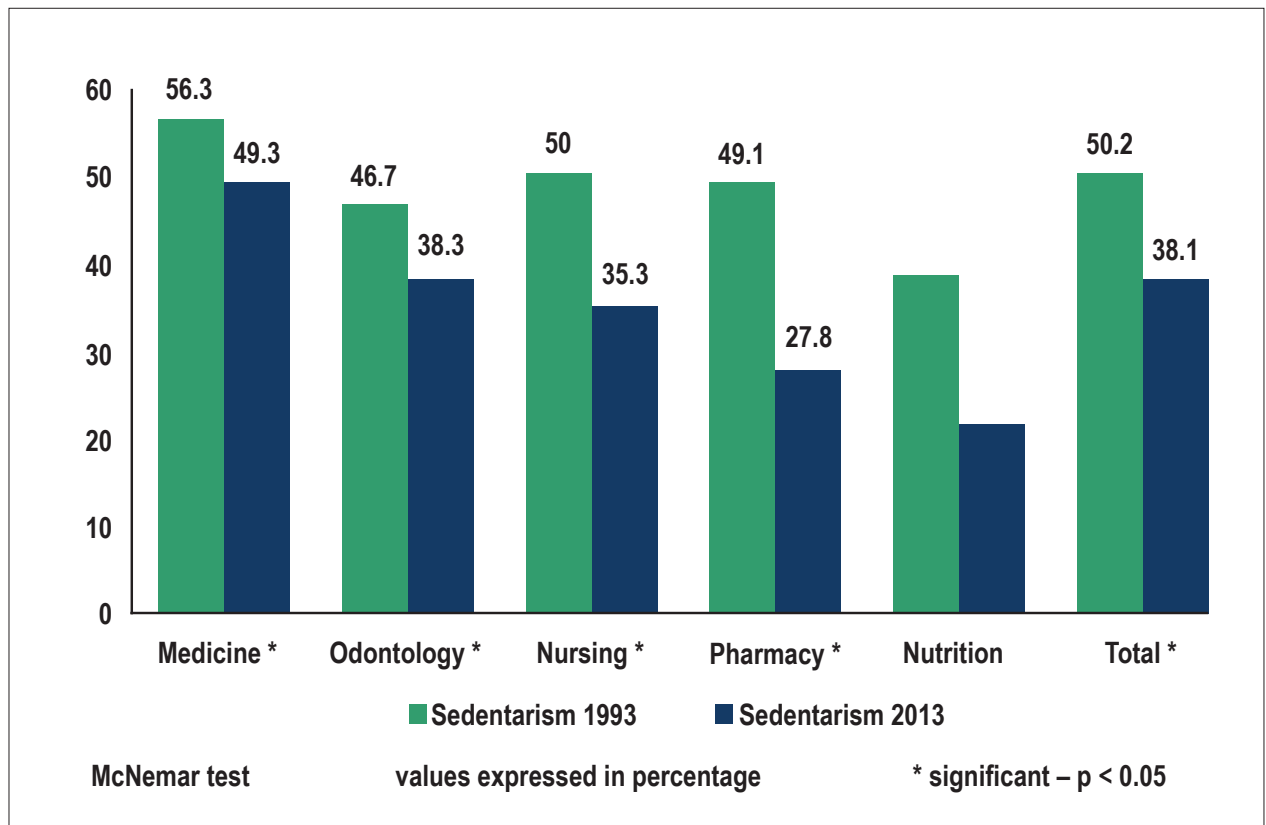**Figure 3 -** *Prevalence of dyslipidemia in 1993 and 2013, the second course. Goiânia – GO*

Figure 4 - *Prevalence of sedentary in 1993 and 2013, the second course. Goiânia - GO*

Table 3 - Distribution of the number and proportion of alcohol-consuming participants in 1993 and 2013, according to the degree. Goiânia–GO

	1993		2013		
	n	%	n	%	p*
Medicine	34	35.4	27	36.0	0.549
Nutrition	7	26.9	8	34.8	0.508
Dentistry	23	38.3	18	38.3	1.000
Nursing	6	14.3	9	26.5	0.039
Pharmacy	22	38.6	13	36.1	0.687
Total	92	32.7	75	34.9	0.037

*McNemar test *significance level at a p value <0.05*

were not as significant. A simplistic yet plausible explanation is the natural aging of the population under study. SAH and dyslipidemia are degenerative diseases and their prevalence tends to increase with aging[18,19], as was observed in the study group. This explanation does not apply to the increase in excessive weight because the individuals were adults in the first assessment. In this case, it was demonstrated that university training in health care did not modify the increase the prevalence of excessive weight gain over the years, as occurs in the general population.

A statistically significant reduction in sedentarism occurred among pharmacists. Although a trend for reduction was observed in the other health professional groups, the differences were not statistically significant, probably because of the different sample sizes. These data demonstrate the inverse relationship between sedentarism and level of schooling, which had already been shown in population surveys and studies with specific populations[16,20].

Excessive alcohol consumption was one of the analyzed variables that progressed in a particular manner among

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Table 4 - Distribution of the number and proportion of participants who were smokers in 1993 and 2013, according to the degree. Goiânia–GO

	1993		2013		
	n	%	n	%	p*
Medicine	5	5.2	2	2.7	0.453
Nutrition	-	-	-	-	1.000
Dentistry	4	6.7	3	6.4	1.000
Nursing	1	2.4	1	2.9	1.000
Pharmacy	3	5.3	2	5.6	1.000
Total	13	4.6	8	3.7	0.289

*McNemar test *significance level at a p value < 0.05.*

the health professionals. There was an increase in alcohol consumption among nutritionists and nurses; however, the difference was only statistically significant in the latter group. Among physicians, dentists and pharmacists, who already consumed more alcohol, no difference was observed between the two stages. In general, the results of publications on this topic show an increase in alcohol consumption with educational attainment and socioeconomic class[20,21]. In the first report on this population, in which only physicians were analyzed, a reduction in alcohol consumption was observed 15 years after the initial data collection; however, the difference was not statistically significant[16].

The change in the prevalence of smoking was small among the groups. It was low in the initial data collection and remained low after 20 years, with no statistically significant variation with time among the groups. The antismoking campaigns and the various laws to prevent and restrict smoking that have been adopted in Brazil in recent years have achieved a statistically significant reduction in the number of smokers in the general population[20,22] and we conclude that these comprehensive actions also achieved positive results in the population assessed in this study.

In general, the progression of some CVRFs varied among different groups of health professionals; however, all tended to increase. Among physicians and dentists, there was an increase in excessive weight gain, SAH, and dyslipidemia. Among pharmacists, there was an increase in excessive weight gain and SAH and reduction in sedentarism. Nurses showed an increase in excessive weight gain and alcohol consumption. Nutritionists only showed an increase in dyslipidemia. The analysis of these compiled data, considering only the number of CVRFs that had a positive or negative variation over the 20 years, suggests more CVRF progression among physicians and dentists and less CVRF progression among nutritionists.

The evaluation of CVRF modification over a specific period of time in different groups of health professionals had not been performed in studies using an appropriate scientific methodology. Some findings of studies with specific groups of health professionals, such as the Nurses Health Study II[23] with nurses and the Physicians Health Study I[24] with physicians, showed that the prevalence of CVRFs is statistically significantly lower among these professionals than

in the general population[25-27]. However, there are no studies comparing the different groups of health professionals, which is the novelty of this research.

Some limitations of this study deserve to be discussed. One is the fact that in 2013 we were not able to locate all the individuals assessed in 1993. The explanation is the long interval between the two data collections, lack of updated records in the institutions that regulate the activities of health professionals in Brazil, and the high mobility of the analyzed population, with professionals often working in places distant from where they studied. This is particularly important because Brazil is a country with the size of a continent with many asymmetries in regional development. Nevertheless, a group of > 75% individuals of the initial group was a representative sample and allowed us to draw meaningful conclusions.

Another limitation was the use of different methods to determine cholesterol and glucose levels at the two stages in the study. However, the literature is full of reports on the good correlation between the values obtained by these methods. Therefore, this did not harm the analysis of data[9-12]. Hence, the use of different devices to measure blood pressure was not considered to a confounder because the semiautomatic method has been validated and has a good correlation with the measurements performed using the mercury sphygmomanometer[28] and the standardized measurement technique in two stages[29].

It is worth noting that further data on the progression of CVRFs in individuals with university training in health care areas, such as those presented in this study, would allow for the validation of our findings.

There was a statistically significant increase in the CVRFs in some groups and for some of the analyzed variables, whereas the increase was not statistically significant for others. Smoking was the exception: a small percentage of students already had this habit in 1993, which tended to decrease even further. It is worth noting that, in general, there was an increase in the prevalence of most CVRFs in the 20-year period, despite the individuals' training in health-related subjects.

The study of a population with formal education in health, with appropriate knowledge on CVRFs and their implications, should highlight some fundamental aspects. First, the increase in the prevalence of the majority of CVRFs in the follow-up

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suggests a marked gap between knowing the risks and adopting protection measures. This fact was demonstrated by Jardim et al[16] and Dioguardi et al[13] in their studies with physicians, in which there was also a high prevalence of most CVRFs under study. Furthermore, in this analysis we found a CVRF prevalence profile that was similar, in many aspects, to that of the general population. Despite some differences that were favorable to the health professionals (as shown in other studies[16,23,24]), university training in health-related subjects did not correspond to an effective reduction in the CVRFs. If, for example, we compare the smoking behavior of this population with that of the general population, we conclude that the sum of the actions aimed at society as a whole (laws, public policies, propaganda) are more effective than university training in a health-related subject.

Conclusions

In general, there was an increase in the prevalence of CVRFs assessed in the population studied, despite the individuals' technical knowledge of these risk factors. There was an increase in excessive weight gain, SAH, and dyslipidemia among physicians and dentists. Excessive weight gain, increased prevalence of SAH, and decreased sedentarism were observed among pharmacists. Excessive weight gain and alcohol consumption was observed among nurses. Nutritionists showed an increased prevalence of dyslipidemia.

Author contributions

Conception and design of the research: Jardim, TV; Sousa, ALL; Barroso, WS; Chinem, B; Jardim, PCV. Acquisition of data: Jardim, TV. Analysis and interpretation of the data: Jardim, TV; Sousa, ALL; Povoa, TR; Jardim, PCV. Statistical analysis: Jardim, TV; Sousa, ALL; Povoa, TR. Obtaining Funding: Jardim, TV. Writing of the manuscript: Jardim, TV; Jardim, PCV. Critical revision of the manuscript for intellectual content: Jardim, TV; Sousa, ALL; Barroso, WS; Chinem, B; Jardim, PCV.

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