

Stress and cardiovascular risk: multi-professional intervention in health education

Estresse e risco cardiovascular: intervenção multiprofissional de educação em saúde

Estrés y riesgo cardiovascular: intervención multiprofesional de educación en salud

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ABSTRACT

Objective: to identify cardiovascular risk in educators (administrators and teachers) from the South region of Brazil, evaluated before and after intervention with stress management activities and health education. **Method:** longitudinal study of the before and after type. The sample consisted of 49 participants. Variables studied were socio-demographic, morbidity antecedents and lifestyle habits. Measured risk factors for cardiovascular disease were arterial blood pressure, body mass index, ratio of waist to hip size, lipid profile and capillary blood glucose. Stress levels were evaluated using the Lipp Stress Symptoms Inventory (LSSI). The study ran for four months, with weekly meetings of a multidisciplinary team. **Results:** after intervention, the study observed a statistically significant reduction of the investigated variables, except for blood glucose levels in the administrators group. **Conclusion:** stress management activities are potential tools in the identification and control of the risk factors studied, particularly in those involving multi- and trans-disciplinary focus.

Key words: Psychological Stress; Cardiovascular Diseases; Health Education; Nursing; Psychology.

RESUMO

Objetivo: identificar o risco cardiovascular e o estresse em educadores (gestores e professores) do sul do Brasil, avaliados antes e depois de intervenção com atividades de gerenciamento do estresse e educação em saúde. **Método:** estudo longitudinal do tipo antes e depois. A amostra foi constituída por 49 participantes. Foram obtidas variáveis sociodemográficas, antecedentes de morbidade e hábitos da vida diária. Os dados de risco para doença cardiovascular foram pressão arterial, índice de massa corporal, relação cintura-quadril, perfil lipídico e glicemia capilar. O estresse foi avaliado pelo Inventário de Sintomas de Stress para Adultos de Lipp (ISSL). O gerenciamento ocorreu durante quatro meses, em encontros semanais com equipe multidisciplinar. **Resultados:** após as intervenções, observou-se redução estatisticamente significativa das variáveis investigadas, salvo glicemia no grupo gestores. **Conclusão:** atividades de gerenciamento são potenciais ferramentas na identificação e controle dos fatores de risco estudados, em especial aquelas de foco multi e transdisciplinar.

Descritores: Estresse Psicológico; Doenças Cardiovasculares; Educação em Saúde; Enfermagem; Psicologia.

RESUMEN

Objetivo: identificar riesgo cardiovascular y estrés en educadores (gestores y profesores) del sur de Brasil, evaluados antes y después de intervención con actividades de manejo del estrés y educación en salud. **Método:** estudio longitudinal, tipo antes y después. Muestra constituída por 49 participantes. Fueron obtenidas variables sociodemográficas, antecedentes de morbilidad

y hábitos de vida diarios. Los datos de riesgo de enfermedad cardiovascular fueron: presión arterial, índice de masa corporal, relación cintura-caderas, perfil lipídico y glucemia en sangre. El estrés fue evaluado por Inventario de Síntomas de *Stress* para Adultos de Lipp (ISSL). La acción se continuó cuatro meses, en encuentros semanales con equipo multidisciplinario. **Resultados:** luego de las intervenciones, se observó reducción estadísticamente significativa de las variables investidas, exceptuando glucemia en grupo de gestores. **Conclusión:** las actividades de manejo son potenciales herramientas de identificación y control de los factores de riesgo estudiados; en particular, aquellas de foco multi y transdisciplinario.

Palabras clave: Estrés Psicológico; Enfermedades Cardiovasculares; Educación en Salud; Enfermería; Psicología.

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INTRODUCTION

In recent decades, with increased awareness of chronic non-communicable diseases (NCD), preventive health care has become imperative to reduce vulnerability in cases of illness, as well as reducing the possibility that illness will lead to incapacity, chronic suffering and premature death. Among the most common NCDs are cardiovascular disease (CVD), diabetes, hypertension, cancer and respiratory diseases⁽¹⁾.

In the case of CVD, many of the risk factors are modifiable variables with significant morbid-mortality rates in the general population. This study, conducted in southern Brazil, identified behavioral risk factors for CVD such as: tobacco use, lack of leisure time physical activity, habitual consumption of meat with exposed fat, and daily consumption of processed meat, red meat and whole milk. The study indicated the possibility of CVD prevention linked to behavioral changes, which represents a challenge to be overcome⁽²⁾. It is believed that, beyond the mentioned risk factors, stress is potentially harmful to health.

The concern with stress stems from the fact that it affects 90% of the world population, and is strongly linked to diseases of the circulatory system⁽³⁾, which are among the greatest causes of death in Brazil⁽⁴⁾. As we study the nature of a stressor event, we may define it as any circumstance that threatens, or is perceived as threatening, to someone's well-being. Such threats may be related to immediate or long term physical security, self-esteem, reputation and other behaviors and actions that the person values⁽⁵⁻⁶⁾.

The association between psychosocial factors and cardiovascular diseases is not new, and stems from the observation of harm caused by stress, not only in cardiac patients, but also in healthy subjects. This relationship is corroborated by evidence found in animal studies, which show that chronic psychosocial stress can be an aggravating factor in arteriosclerosis, as well as in endothelial dysfunction and even in apoptosis, which probably stems from excessive, reiterated and prolonged activation of the nervous system⁽⁷⁾.

Furthermore, this constant stimulation causes similar activation of the hypothalamus-pituitary-adrenal (HPA) group, provoking a series of neuroendocrine alterations in the organism, such as increased heart rate and elevated blood pressure, among others. Psychological effects are also set into motion, such as anxiety, attention deficit and memory deficit. Thus, more and more, studies indicate that stress is an important risk factor to be considered, treated and prevented, especially due to its implications for the development and aggravation of cardiovascular diseases⁽⁷⁻⁸⁾.

Bodily response to stress can be modeled into three stages: alarm, defense or resistance, exhaustion, and burn-out⁽⁹⁾. There is also a four-stage model, in which Lipp and Rocha added the phase of near-exhaustion⁽¹⁰⁾. According to this model, the stages of response to stress are: (i) alert phase, considered positive, in which the individual is more attentive, productive and motivated. This phase is also characterized by orientation and identification of danger; (ii) resistance phase, characterized by the resistance of the individual to stress stimulants, which demands large amounts of energy and adaptive effort. That is why in this phase there is increased vulnerability to risk factors; (iii) near-exhaustion phase, in which the individual oscillates between emotional equilibrium and disequilibrium, with manifestation of psychological symptoms (such as anxiety) and predisposition to the development of physical diseases, such as gastritis, hypertension and *diabetes mellitus*, among others; (iv) exhaustion phase, characterized by depletion of resistance mechanisms. This is the pathology phase, in which there is triggering of or susceptibility to diseases, due to the weakened state of the immune system in affected individuals.

Thus, as an individual experiences the successive phases of stress, there is a corresponding intensity and severity of physical and psychological symptoms; at the same time, there is a greater probability of disease, especially cardiovascular maladies, strongly linked to stress and certain lifestyle habits. Based on the foregoing analysis, we see that work conditions can be determining factors for increased risk of stress-related symptoms. The conditions that present elevated risk for cardiovascular diseases include those that require heightened psychological and physical exertion, reduced personal autonomy and decreased professional satisfaction⁽¹¹⁾. In other words, work-related stress may cause increased risk of CVD. Therefore, it is likely that educators have a potential for developing stress-related symptoms and CVD, in light of typical work overload and continuous contact with people who require their assistance.

In this context, we believe that health education initiatives are beneficial in the identification of cardiovascular and stress risk variables; and that nurses are key agents as health educators, working together with a transdisciplinary team.

OBJECTIVE

To investigate stress and cardiovascular risk indicators in educators, along with options for stress management and health education.

METHOD

Ethical considerations

This study was approved by the Ethics and Research Committee of the Faculdades Integradas de Taquara (FACCAT). In accordance with resolution 466/2012, all participants were duly informed regarding the study procedures, and indicated their voluntary participation by signing of free and informed consent forms.

Design, site and duration of the study

This is a longitudinal study of the before and after type, conducted in the city of Vale do Paranhana, Rio Grande do Sul, Brazil, from March to December, 2012.

Population and sample

The population was composed of all educators in the municipal public school system, and we invited all of them to participate in the study. Participants were selected according to the following inclusion criteria: they were considered teachers in the municipal public school system in the aforementioned city, and they agreed to participate in the study. The sample was determined by those who voluntarily agreed to sign the free and informed consent form. Initially, the sample had 100 participants, of which 60 were teachers and 40 were administrators; 20 administrators and 29 teachers actually participated in all phases of the study – a total of 49 people.

Research protocol

Sociodemographic data were obtained through a questionnaire that investigated gender, age, marital status, schooling, wages, hypertension and *diabetes mellitus*, medications, physical activities, smoking and alcohol consumption.

Regarding risk data for cardiovascular disease, these were determined by measurement of arterial blood pressure (BP), body mass index (BMI), ratio of waist to hips (WHR), a lipid profile and capillary blood glucose test. Measurement of BP and respective classification of results followed guidelines set by the Brazilian Society of Cardiology⁽¹²⁾. The BMI was estimated according to indicators set by the Brazilian Ministry of Health⁽¹³⁾. The WHR data were classified according to recommendations of the World Health Organization⁽¹⁴⁾.

Levels of triglycerides, cholesterol and glucose were measured with a finger-stick test, using the Accutrend Plus (Roche®) and requiring a 12-hour fast before collection. Normal ranges were considered to be the following: serum triglycerides ≤ 150 mg/dl, total serum cholesterol ≤ 200 mg/dl, serum glucose ≤ 99 mg/dl⁽¹⁵⁾.

Stress levels were evaluated according to the Lipp Stress Symptoms Inventory (LSSI), which classifies the phases of alarm, resistance, near exhaustion and exhaustion, according to symptom incidence during a period of 24 hours, one week and one month. For any given subject, the inventory shows if stress is present, which phase of stress is experienced and whether the prevalent symptoms are physical or psychological⁽¹⁰⁾.

Stress management and health education were administered during a four-month period, with weekly meetings, alternating between teachers and administrators. In each meeting, the subjects participated in activities that helped them

learn to control symptoms of stress and prevent cardiovascular disease. The classes were taught by professors and students of Nutrition, Psychology, Chiropractic, and Physical Education. Health education actions included workshops for relaxation, muscle stretching, dietary education, physical exercise and self-monitoring for cardiovascular risk factors.

After completing four consecutive months of stress management and health education, the aforementioned variables were tested again.

Results and statistical analysis

Statistical analysis was performed using the program *Statistical Package for the Social Sciences* (SPSS), version 14.0. The data were analyzed by the Wilcoxon Test for sample analysis, Student t-test, and also by descriptive frequency analysis. The degree of certainty was 95% ($p < 0.05$).

RESULTS

The 49 educators who participated in the study had an average age of 34.9 years, were predominantly white (93.8%), women (95.9%) and married (40%). Twenty-nine participants (59%) had finished undergraduate degrees and 36% (18) had graduate degrees or were in graduate study. The average monthly wage of the educators varied between two and three minimum salaries.

Regarding chronic NCD, 14 participants (28.6%) said they suffered from hypertension and three participants (6.1%) said they were diabetics. Fourteen participants said that they used regular medication to control these pathologies.

Regarding lifestyle habits, 18.4% (9) said they were tobacco users, and 30.6% (15) said they drank alcoholic beverages at least once weekly. Thirty participants (61.2%) said they exercised at least once a week; of those, 42.8% (21) said they exercised three or more times a week.

This study also evaluated the stress levels of the participants. Using the Lipp four-phase model, we found that a large proportion of administrators (63.6%) and teachers (50%) were in the resistance phase, and many were in the near exhaustion phase (31.82%). At the end of the study program, there was a statistically significant reduction of stress levels ($p=0.02$). The percentage of participants in the resistance phase was reduced: administrators to 33.3% and teachers to 27.27%, as recorded in Table 1.

The following tables present the variables relative to stress in administrators and teachers, separately, before and after the management activities, for better visualization of the impact of the activities on the results.

The LSSI showed that stress management significantly reduced the symptoms of stress in participants (administrators: $Z -1.897$; $p = 0.05$; teachers: $Z -4.436$; $p = 0.0000$) and positively impacted the stress phase of each subject (administrators: $Z -2.3119$; $p = 0.02$; teachers: $Z -2.456$; $p = 0.02$), using the Wilcoxon test.

In relation to the variables studied as risk factors for cardiovascular disease, there was a statistically significant reduction after stress management interventions in both groups, except for the blood glucose variable in administrators, using the Student t-test for paired samples, as outlined in Table 2.

Table 1 – Frequency and prevalence of symptoms, stress phases and characteristics of stress symptoms in administrators and teachers, before and after stress management activities

	Administrators				Teachers			
	Pre-management (n = 20)		Post-management (n = 20)		Pre-management (n = 29)		Post-management (n = 29)	
	n	%	n	%	n	%	n	%
Presence of stress symptoms								
No stress symptoms	9	45	17	85	7	23.8	18	61.8
Stress symptoms present	11	55	3	15	22	76.2	11	38.2
Phases of stress								
Alarm	1	9.09	2	66.66	4	18.18	6	54.4
Resistance	7	63.6	1	33.33	11	50	3	27.27
Near exhaustion	0	0	0	0	7	31.82	2	18.31
Exhaustion	3	27.31	0	0	0	0	0	0
Symptom characteristics								
Physical symptoms	4	36.36	1	33.33	7	31.82	3	27.27
Psychological symptoms	7	63.64	2	66.67	15	68.18	8	72.73

Table 2 – Average \pm standard error of risk factors for cardiovascular disease in administrators and teachers, before and after stress management

	Administrators		p	Teachers		p
	Pre-management	Post-management		Pre-management	Post-management	
Systolic BP (mmHg)	119.2 \pm 3.00	99.75 \pm 2.06	0.00	137.71 \pm 4.19	112.21 \pm 3.13	0.000
Diastolic BP (mmHg)	82.5 \pm 3.4	71.00 \pm 2.07	0.003	92.03 \pm 2.58	75.92 \pm 2.11	0.000
Cholesterol (mg/dl)	170 \pm 17.33	142.27 \pm 14.01	0.000	199.69 \pm 6.82	176.07 \pm 7.64	0.011
Triglycerides (mg/dl)	145.44 \pm 18.19	96.5 \pm 6.53	0.002	174.62 \pm 16.32	129 \pm 10.62	0.001
BMI (Kg/m ²)	30.17 \pm 0.93	27.94 \pm 0.84	0.000	30.83 \pm 1.52	28.15 \pm 1.22	0.000
WHR (cm)	0.84 \pm 0.01	0.78 \pm 0.01	0.003	0.88 \pm 0.14	0.83 \pm 0.01	0.04
Glucose	81.33 \pm 7.62	75.29 \pm 4.35	0.58	81.45 \pm 5.10	71.8 \pm 4.25	0.05

Table 3 – Average \pm standard error of risk factors for cardiovascular disease in administrators and teachers, with and without stress, before and after stress management

	Systolic BP (mmHg)	Diastolic BP (mmHg)	Cholesterol (mg/dl)	Triglycerides (mg/dl)	BMI (Kg/m ²)	WHR (cm)	Glucose (mg/dl)
Administrators pre-management							
Without stress	113.2 \pm 3.4	75.2 \pm 1.5	118.1 \pm 15.5	94.9 \pm 5.9	28.5 \pm 1.4	0.80 \pm 0.06	65.00 \pm 4.80
With stress	126.4 \pm 4.2	91.3 \pm 6.3	236.8 \pm 10.8	214.0 \pm 21.7	33.4 \pm 1.24	0.92 \pm 0.06	72.09 \pm 3.48
P value	0.02	0.01	0.000	0.000	0.009	0.001	0.23

To be continued

Table 3 (concluded)

Administrators post-management							
Without stress	100.2±2.2	75.5±3.9	104.3±31.8	78.3±4.4	29.9±1.5	0.80±0.02	75.29±4.35
With stress	96.6±6.6	78.5±2.7	150.6±14.2	100.1±7.4	27.7±0.9	0.76±0.02	81.33 ± 7.62
P value	0.54	0.52	0.21	0.2	0.61	0.25	0.58
Teachers pre-management							
Without stress	114±3.8	79.6±10.4	160.8 ±10.9	113±9.0	24.1±1.3	0.81±0.02	61 ± 5.94
With stress	148 ±4.1	96.9 ± 10.6	206.7±9.4	205.7 ± 24.9	35.3±2.0	0.92 ± 0.01	74.7± 7.05
P value	0.000	0.005	0.02	0.055	0.008	0.008	0.31
Teachers post-management							
Without stress	113.5±6.9	75.5±3.9	151.5±19.9	107.7±12.10	0.79±0.01	0.80±0.02	80.42 ± 6.5
With stress	117.16±3.7	78.5±2.7	175.8±9.1	158.9±20.2	0.84±0.01	0.83±0.02	92.63±6.5
P value	0.62	0.5	0.23	0.07	0.17	0.35	0.39

Table 3 shows the averages and standard error for stress variables related to variables for cardiovascular risk.

In the data collected after stress management, there was no statistically significant difference in relation to the variables of cardiovascular risk (Table 3) in the groups of educators with and without stress. Therefore, upon completion of stress management, the averages of the indicators for cardiovascular disease of the group with stress exhibit no apparent difference from the group without stress.

DISCUSSION

The presence of stress and other cardiovascular risk variables was significant in the studied groups. The participants were in the middle of their productive years (average age of 34.9 years), which could possibly be linked to excessive workload, stress symptoms and lifestyle habits related to cardiovascular risk factors.

When asked about lifestyle habits, some participants in this study said that they used tobacco (18.4%) and consumed alcoholic beverages at least once a week (30.6%). Those that practiced physical exercise three or more times per week were 42.8% of the group. In a separate study conducted in the city of Pelotas (Rio Grande do Sul, Brazil), 21.3% of the participants said they used tobacco. In the same study, however, the proportion of those who practiced little or no physical activity was 75.6%⁽²⁾, which is different from the physical activity data of this study. The element of physical activity was an important discovery in this study. While physical activity was reported by a large portion of the participants, it was also observed that such isolated activities was not able to guarantee, by itself, protection against injury, since many people in the group presented stress symptoms and risk factors for CVD at the outset of the study.

Concerning habits and daily activities, they are connected to bodily manifestations, whether physical or psychological.

Thus, an overload of activities and workplace pressure may be triggers of stress, just as stress and sedentariness may be related to cardiovascular diseases. It should be emphasized that, in the group of administrators and teachers studied, there is not only concern for the shared strenuous work routine, but also for professional training, which is demonstrated by the number of participants in graduate programs or who have completed graduate study (18.36%).

It is important to note that stress may not only be linked to lifestyle, but also to the work environment. This study identified that 67% of the participants presented stress symptoms before the application of management activities. It has been demonstrated that work conditions which induce stress, such as those that include intense psychological and work demands, reduction of personal autonomy and satisfaction in the workplace, correlate with higher risk factors for cardiovascular diseases⁽¹¹⁾. Indeed, the educators who participated in this study presented elevated stress levels, with predominantly psychological symptoms, which may be associated with the work environment.

The high prevalence of stress levels in educators may indicate the presence of a significant and accentuated degree of tension, which favors the occurrence of injury due to disequilibrium of the immune system. A large part of the participants was in the resistance phase before management activities and health education (63.6% of administrators and 50% of teachers). It is important to note that, in this phase, the organism seeks to return to a state of equilibrium, using a large amount of energy in this task. This may cause a general sensation of fatigue with no apparent cause, along with memory lapse, among other consequences. The more effort an individual makes to readapt and reestablish interior equilibrium, the greater the weakening of the organism⁽¹⁶⁾.

Although most participants were initially in the resistance phase, 31.82% of the teachers were in the near-exhaustion phase, and 36.2% in the exhaustion phase. After stress

management, however, there was a reduction in the percentage of individuals in the resistance phase (teachers 22.73%, administrators 30.27%) and the near-exhaustion phase (teachers 23.51%). At the same time, there was an increase in the number of participants in the alarm phase (teachers 36.2%, administrators 57.7%), which corresponds to the first phase of stress. We observed that, after performing the proposed activities, the participants presented a reduction in stress symptoms and were better able to deal with daily situations of stress. This was demonstrated by the change in stress phase they were experiencing.

After four months of stress management, conducted through workshops and meetings with various health care professionals, there was a significant reduction in the number of participants with stress symptoms (from 67% to 28.6%), showing the positive impact of the work of the multi-professional team. We believe that activities that strengthen and stimulate the individual toward proactivity and personal ownership of health care are able to augment the ability to deal with adverse situations. This was the tenor of a study conducted in Rio de Janeiro with a patient suffering from Post-Traumatic Stress Disorder (PTSD) and Major Depressive Disorder. The study concluded that after four months of psychotherapy, the patient showed a reduction of the sympathetic balance, negative affectivity and symptoms of post-traumatic stress, depression, anxiety and dissociation, in addition to an increase in resilience scores, social support and positive affectivity, as well as normalization of physiological alterations of the autonomous nervous system and the neuroendocrine system linked to PTSD⁽¹⁷⁾.

These conclusions were corroborated by another study conducted in a hospital in Rio de Janeiro, which investigated the impact of a three-month program of music therapy on stress levels of health care professionals. Observers noted a statistically significant reduction (60%, $p < 0.001$) in stress levels of the subjects of the study⁽¹⁸⁾. The stress management activities of this study included relaxation exercises, self-awareness training for identification of stress-provoking situations, diet evaluation, physical exercise and lifestyle education for dealing with stress and disease. All of these activities may have contributed to the adoption of strategies for health improvement, although they may not have been the only factors that influenced the study's conclusions. The participants may have discovered motivation and a favorable environment for ownership and adoption of positive health behaviors, so that group initiatives became drivers of change, strengthened by the fact that these activities happened in the workplace, where people spend a large part of their lives.

It deserves mention that an adequate response of a person's stress defense system is a crucial prerequisite to a feeling of well-being and positive social interaction. By contrast, if the person's resistance to stress is inadequate, or if she is subjected to simultaneous stressors, a stress reaction process will evolve to the phase of exhaustion⁽¹⁶⁾; an inappropriate response to stress will cause a series of endocrine, metabolic, autoimmune and psychiatric alterations⁽¹⁹⁾, culminating in the triggering or worsening of cardiovascular diseases.

In both the administrators and teachers groups, there was a significant improvement of the variables linked to cardiovascular risk after stress management and health education

activities were applied ($p < 0.05$), except in the glucose variable for the administrators group ($p = 0.58$).

The average systolic blood pressure in administrators and teachers was reduced from 119.2 to 99.7 mmHg and from 137.7 to 112.2 mmHg, respectively, at the end of the study. In the case of diastolic pressure, there was a reduction from 82.5 to 71 mmHg in administrators and from 92.03 to 75.92 mmHg in teachers. A study conducted in the city of São Paulo achieved a reduction in systolic blood pressure from 139.7 to 134.8 mmHg after nutritional intervention of 20 weeks with hypertensive patients⁽²⁰⁾. A similar randomized study conducted in Madrid (Spain) investigated the effectiveness of an integrative Yoga program alongside clinical treatment of hypertension. After three months with two sessions weekly, the intervention group had a statistically significant reduction in systolic and diastolic blood pressure, measured before and after the sessions, in comparison with the control group. The same study showed reduction of symptoms for anxiety and stress⁽²¹⁾. In light of such data, we can infer that health education actions and management of stressful situations favor reduced blood pressure. Although the period of the cited studies was relatively brief, the results showed that it was possible to impact pressure markers as well as stress symptoms, as the present study also indicates.

The participants of this study, in relation to lipid profiles, achieved results that kept them within the safety range for prevention of cardiovascular diseases. Total cholesterol readings were reduced from 170 ± 17.33 to 142.27 ± 14.01 mg/dl for administrators, and from 199.69 ± 6.82 to 176.07 ± 7.64 mg/dl for teachers, which indicates that as the participants reduced their risk factors for cardiovascular events, they also achieved universally accepted levels for prevention of such events, according to Framingham's risk score⁽¹⁵⁾. The same score indicates absolute zero risk when one considers total isolated cholesterol < 160 mg/dl, an index achieved by the group of administrators. When triglycerides are considered, although the group of administrators were already in an acceptable range for cardiovascular risk at the onset of the study (≤ 150 mg/dl), there was a significant improvement in the two groups studied, which achieved readings of 96.5 ± 6.53 mg/dl (administrators) and 129 ± 10.62 mg/dl (teachers) post-management, which is consistent with the recommendations of the Brazilian Cardiology Society for control of dyslipidemias and prevention of arteriosclerosis⁽¹⁵⁾.

Among the preferred methods for control of lipid profiles are physical exercise and dietary education, which were the approaches used in the present study. The results corroborated those of studies that involved research of lipid profiles, physical exercise⁽²²⁻²³⁾ and nutritional intervention⁽²⁴⁾. Therefore, we believe that multi-professional interventions bring benefits in different areas, but they should be maintained so the observed results may be preserved.

The body mass index of participants also showed a statistically significant reduction, such that both groups, on the average, moved from the obese category to the overweight category. Obesity is known as one of the major risk factors for predisposition to hypertension and, consequently, other cardiovascular diseases. Linked to the BMI, the other anthropometric variable that should be highlighted is the waist-hip ratio

(WHR). WHR is related to the deposit of adipose tissue in the abdomen, especially in internal visceral deposits, intrinsically related to risk for *Diabetes Mellitus*, hyperlipidemia, arterial hypertension and arteriosclerosis⁽²⁵⁾. Our study showed a significant reduction of WHR values: the average WHR of administrators post-management was 0.78 ± 0.01 cm, while that of teachers was 0.83 ± 0.01 cm. Thus, the group of administrators achieved values consistent with the recommended numbers for the WHR variable, which is 0.82 cm⁽¹⁴⁾.

It is worth noting that, although the study showed significant reduction in anthropometric variables, the final general average BMI of the participants was localized in the overweight category. A study conducted in the city of São Paulo highlighted BMI and abdominal circumference consistent with the average increase of these values among other populations around the world⁽²⁵⁾. The authors observed that, in developing countries, obesity is related to unhealthy lifestyles, which include sedentariness and a diet heavy in processed foods. In this context, health education initiatives are potential tools for the identification and management of modifiable risk factors by multi-professional teams, with the goal of giving patients greater autonomy in the identification of health threats and the ability to cope with them.

During the final phase of data collection, in addition to providing the measurements that resulted in the statistical findings, participants told of the positive impact of the study: they adopted a healthier lifestyle using simple techniques, such as walking to work and exchanging snacks of processed food for fruit. These actions influenced weight loss and an improvement in interpersonal relationships in the workplace.

Among the limitations of the study, we should mention the attrition of some participants, resulting in a reduction of the sample size. Also, the four month time frame for the study is considered relatively short. In addition, beyond the formal semi-weekly meetings of the two groups, there was no systematic follow-up of participants to insure that they were actually implementing the suggested stress management and health betterment activities.

Based on this study, we may infer that trans-disciplinary activity is an important strategy for health improvement, prevention and care of existing problems. The proposed activities represent low cost and high effectiveness, and are able to be strategically adopted in educational settings, with the goal of contributing to the improvement of the overall health of educators.

CONCLUSION

Stress and poor lifestyle choices represented risk factors for cardiovascular disease among the educators who participated in the study. Nevertheless, health education activities and stress management both contributed to revert this process. The cardiovascular system actively participates in adaptations to stress, so actions that reduce stress levels through educational initiatives and that are directed at potential risk factors become important tools for prevention and treatment. It should be noted that stress management also caused an improvement in those individuals who did not change their stress phase, for a reduction of the intraphase measurements of the LSSI was observed, although it is not possible to present such results in absolute numbers in the published tables.

Although it is not possible to affirm that stress management activities and health education were solely responsible for the positive results found among the participants in this study, it is plausible that they had a positive influence on the patients' ownership of and commitment to their individual health. In this situation, the nurse as an educator has a key role, since nurses contribute directly in health evaluation, information and orientation for the adoption of proactive initiatives in relation to individual and collective health.

Similarly, a focus on multi- and trans-disciplinary approaches maximizes health initiatives, because a collaborative posture reinforces the goals of prevention, control and treatment of health problems. Thus, nurses can substantially contribute to the widening of multi-disciplinary investigation, since research helps build evidential incentives for health care focused on the patient and his/hers needs.

For the field of health research, and specifically for nursing, this study shows that it is possible to act with autonomy and leadership in the performance of health education initiatives, thus contributing to the improvement of human health conditions and, consequently, to the work they perform for society.

It is advisable that other studies of this type be conducted, with larger samples and longer duration, and prolonged follow-up of participants.

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