

Life-Habit Intervention in a Public Institution

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Abstract

Background: Coronary disease is the major worldwide cause of death, according to the World Health Organization (WHO) and the second in Brazil. Sudden death occurs 4 to 6 times more frequently in those who have suffered an acute myocardial infarction (AMI); within 6 years, 18% of the men and 35% of the women will have a new AMI. The secondary prevention, of which effectiveness has been previously demonstrated, is of utmost importance.

Objective: To test the effectiveness of a multiprofessional program that aims at modifying risk factors for atherosclerosis in the public health system.

Methods: Of the 2,337 patients with coronary artery disease undergoing outpatient treatment, 513 with a coronary angiography study agreed to participate in the present study, which used lectures on how and why to control risk factors as therapeutic tool. Statistical analysis: significant variation pre and post-intervention; paired Student's t test or Wilcoxon's test; existence of a significant difference between the two groups; Student's t test for independent samples or Mann-Whitney test. Comparison among three groups: analysis of variance (ANOVA) or Kruskal-Wallis.

Results: Cholesterol, LDL, triglycerides, body mass index, Castelli indexes I and II and waist circumference showed a significant decrease, even in patients without hypolipemiant treatment. The assessment of the diet impact showed that 72% of the patients that did not follow a diet, started to do so. Physical activity: of the 55% sedentary patients, 71% started to exercise three or more times a week. Smoking: of the smokers, 60% (9% of the total) stopped smoking and 32% decreased the number of cigarettes.

Conclusion: These results demonstrated the effectiveness of the programs to improve life habits when applied to the units of the public health system. (Arq Bras Cardiol. 2010; [online]. ahead print, PP.0-0)

Key words: Secondary prevention; atherosclerosis; risk factors; coronary heart disease.

Introduction

Data from the World Health Organization (WHO) has shown that coronary disease is the major single cause of death worldwide (12.4%), followed by cerebrovascular accidents (9.1%), totaling 21.5% of total deaths¹. In Brazil, according to data from the Ministry of Health (2005), the circulatory system accounted for 31.46% of the deaths and the incidence of the major cause of death is higher than the sum of the two second major causes (neoplasia and external causes)².

Studies have demonstrated that risk factor control programs decrease hospital admissions, improve quality of life and the functional capacity of patients with coronary atherosclerosis, with great impact on survival and infarction prevention^{3,4}. The underuse of these programs seems to be related to cultural values and the lack of perception of their effectiveness. Neither

the population nor the politicians seem to be aware that life habit improvement helps to reduce healthcare-related costs⁵.

In 1990, Ornish et al⁶ demonstrated, using coronary angiography, the regression of the degree of coronary stenosis in 82% of the cases, after one year of vegetarian diet, discontinuation of the habit of smoking, emotional stress control techniques and moderate physical activity, without the use of hypolipemiant drugs. Other secondary prevention studies⁷⁻¹⁰ have also demonstrated the effectiveness of risk factor control, mainly of dyslipidemia, in the morbimortality of coronary disease. In all of them, in addition to drug therapy, the patients were also encouraged to practice regular physical activity, choose a diet low in saturated fat and cholesterol and stop smoking.

Nevertheless, the EUROASPIRE III European survey showed that this type of patient does not benefit from these changes without changing the prevalence of smoking, the increase in the tendency to obesity and central obesity and the onset of diabetes and concludes that "a handful of pills" is not enough¹¹.

The present study aimed at demonstrating the clinical-evolution and socioeconomic impact of the intervention

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on risk factors for coronary disease in a public healthcare unit, using a low-cost social program based on raising mass awareness and the teaching of effectiveness concepts that have previously demonstrated improvement in the evolution of this pathology.

Methods

The present cross-sectional study evaluated 2,337 patients with a diagnosis of coronary artery disease from a tertiary public hospital specialized in cardiology and cardiac surgery, who were being followed by the Department of Heart Diseases during this period; the patients were invited to participate in a group where they would be followed, would attend lectures on risk factors for coronary atherosclerosis and would keep regular control of the lipid profile, blood pressure, weight and abdominal circumference measurement.

The inclusion criteria were: age older than 18 years, presence of obstructive coronary artery disease confirmed by coronary angiography and patient compliance to attend the lectures scheduled by the social service group. The exclusion criteria were: cardiomyopathy of non-ischemic origin, concomitant orovalvular disease of rheumatic origin and other comorbidities that impaired the patient's attendance or adherence to the program, such as living in another city/town or state.

The inclusion period ranged from August 13 1997 to December 2002. Of the 2,337 individuals who came to consultation during this period, 513 patients who had been previously submitted to coronary angiography, participated in the entire program by means of voluntary adhesion and who had at least two measurements of their lipid profile performed were included in this prospective study. Their family members were also invited to attend the lectures, as well as watch a video, shown continuously at the waiting room of the outpatient clinic, which covered the same subjects.

During a consultation with a specialist in nutrition (dietitian or nutritionist) and a nurse, the anthropometric data - including weight and height - were obtained and the body mass index (BMI) was calculated, as well as the waist (measured at the midpoint between the lower costal border and the iliac crest), hip (measured at its widest point with the measurement tape placed over the greater trochanters) and blood pressure measurements.

Two questionnaires were applied, one to be answered by the assistant physician (on the risk profile, medications, last examinations and diagnoses) and another by the patients (on their life habits and family history).

The analyzed risk factors were: level of physical activity, dietary habits, blood pressure, body weight, abdominal circumference, lipid profile, smoking status and level of emotional stress.

The lectures were given to small groups of patients who, in some cases, came accompanied by family members and included the following themes:

- *Coronary disease* - what is it? Risk factors: what are they? What is their evidence in relation to coronary disease? What risks do they represent? How to control them? What are the benefits?

- *Arterial hypertension* - what is it? What is its association with AMI and CVA? What is the possibility of symptom absence and the importance of adhering to medication? What are the deleterious effects of smoking and what is its association with coronary disease? The importance of quitting smoking and tips to successfully accomplish it. Physical activity: its importance; modalities of physical activity; how and when to practice; the immediate and late benefits; precautions and quantification.
- *Healthy diet* - its association with cardiovascular diseases: how and what to eat without forgoing the pleasure of eating; tips to manipulate foods and the most recommended foods; emotional stress: its profound association with cardiovascular diseases; the difficulty in eliminating stress from modern life and how to minimize it (halfway from the start of the intervention period, eastern relaxation techniques were ministered by a specialist).

The national official metric units were used for the measurements, such as height in meters and centimeters and weight in kilograms. The body mass index (BMI) was calculated as weight/height squared (kg/m^2) and a BMI $\geq 30 \text{ kg}/\text{m}^2$ was used as parameter for obesity and $> 24.9 \text{ kg}/\text{m}^2$ as excess weight.

The measurement of the abdominal circumference was considered normal up to 94 cm for men and 80 cm for women, as recommended by the International Diabetes Federation (IDF).

The cholesterol goal was a TC level $\leq 200 \text{ mg}/\text{dl}$, LDL cholesterol $\leq 100 \text{ mg}/\text{dl}$, taxa de triglycerides $\leq 150 \text{ mg}/\text{dl}$ and HDL cholesterol $\geq 40 \text{ mg}/\text{dl}$ for men and $\geq 50 \text{ mg}/\text{dl}$ for women, as recommended by the IV Brazilian Guideline on Dyslipidemia and Atherosclerosis Prevention of the Department of Atherosclerosis of the Brazilian Society of Cardiology.

The plasma levels of total cholesterol were measured by an enzymatic method (Mega-Merck, Merck, Darmstadt, Germany). HDL cholesterol was measured by selective inhibition.

Blood pressure was measured, whenever possible, in the right upper limb, with the patient relaxed and in the sitting position. An adequately calibrated mercury sphygmomanometer was used and the blood pressure was measured by a well-trained professional. The diagnosis of arterial hypertension was attained when the BP levels were $> 140/90 \text{ mmHg}$ - $130/80 \text{ mmHg}$ for diabetic patients - or when the patient was being treated for arterial hypertension.

Subjects were considered sedentary if they did not engage in regular physical activity at least three times a week, for at least 30 minutes a day.

As for the habit of smoking, the criterion used was that of the regular and daily habit of cigarette smoking, regardless of the number of cigarettes smoked and individuals were considered ex-smokers when they had not smoked for at least 30 days.

The criterion used to define a person as being anxious or emotionally stressed was totally subjective: the patient's own evaluation was taken into account.

A multiprofessional group, comprising cardiologists,

nurses, nutritionists/dietitians, social workers, psychologists and psychiatrists was trained to give, during a 15-20 minute lecture, the information and advice on the main risk factors, aiming at providing objective, clear and practical data in order to prevent time-wasting. The medical consultations and blood collections were also grouped, in order to spare the patients unnecessary costs, by preventing many visits to the outpatient clinic and loss of work hours. This group was advised not to use certain terms such as "it is prohibited to" and "You cannot", abolishing any repressive elements as much as possible and giving emphasis to other terms such as "decrease", "avoid" and "cut down the excesses". The only exception concerned smoking, which was greatly discouraged.

The objective was to disseminate the concept of improving life habits, providing information and access to scientifically-proven facts. The entire process was created using easy, accessible language and had an optimistic, rather than punitive, emphasis. The patients received a diary that contained the program schedule, the dates and themes of the lectures, the days when they had to fast for 12-14 hours prior to the consultation for blood collection and an explanatory folder on the disease and the meaning of each one of the main risk factors for atherosclerosis.

The flowchart/program schedule used in the study is shown in Scheme 1.

Scheme Study flowchart, after the patient agreed to participate in the program.

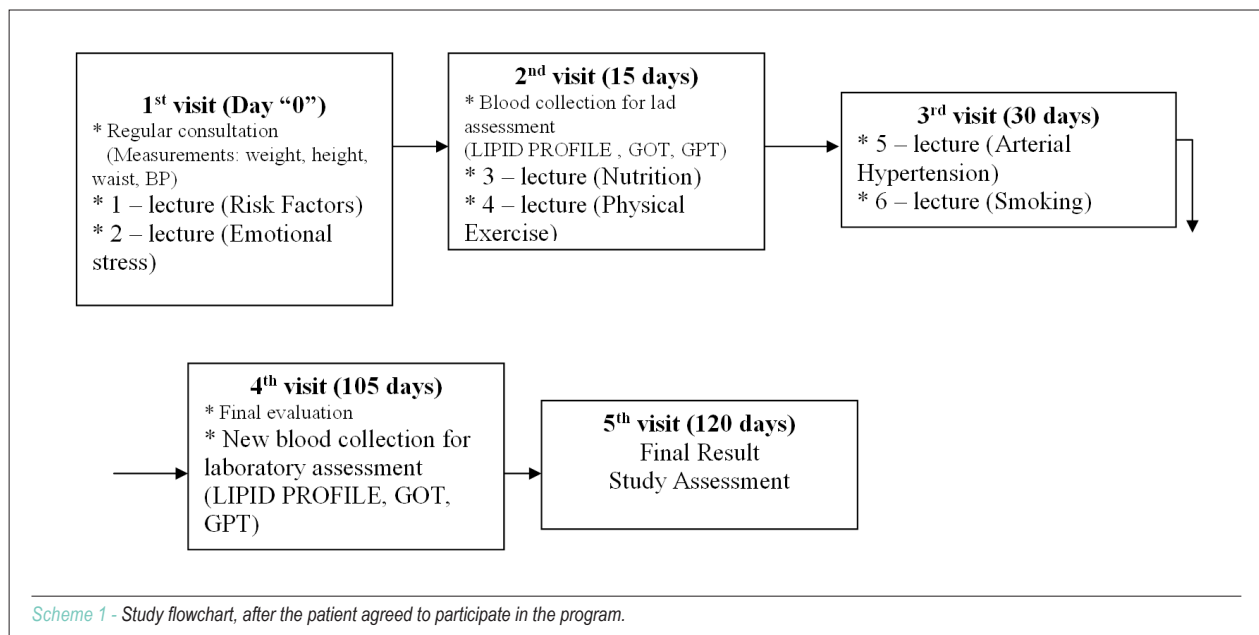
Only data regarding the patients that participated in the entire lecture schedule and had at least two laboratory assessments - one at the start of the study and one after the lectures were given - were considered for the analysis. During the program, the patients continued to be followed and treated by the assistant physicians, who, in spite of being part of the clinical staff of a cardiology reference hospital, had not been successful in achieving control of

the risk factors in these patients. After the 120-day period, the patients started to be followed only by their own physicians, but were still monitored at distance by the study group and invited to occasional meetings in larger groups with the multiprofessional team, carried out at the hospital amphitheater in order to reinforce the recommendations and answer questions. After a period of at least 12 months, the study authors received information on the risk factor control evolution, provided by the assistant physicians.

Through a questionnaire applied by the social worker and developed by the institution to be easily understood by individuals from different socio-cultural levels, a new evaluation was carried out on the patients' behavior regarding the change in life habits and how the program influenced their behavior and that of their families regarding the participation in the treatment of the disease. The degree of understanding regarding the lectures, the intelligibility of the information provided by each professional and the eventual practical benefits due to access to information were also assessed, in this case through a written questionnaire that did not require patient identification.

Statistical analysis

The paired Student's *t* test or the non-parametric Wilcoxon test was used to assess the variation between pre and post-intervention numerical variables, when the variable did not present a normal distribution. The assessment of the means between the two groups was carried out with the Student's *t* test for independent samples or the non-parametric Mann-Whitney test. The comparison of the three groups was carried out using the Analysis of Variance (ANOVA) or the Kruskal-Wallis Analysis of Variance for data without normal distribution. The Chi-square test (χ^2) was used for the comparison of the proportions of the risk factors between the sexes (or age ranges). The criterion for statistical significance was set at 5%.



The statistical analysis was carried out using the statistical software SAS System.

Results

The comparison between the initial sample (2,337 patients) and the patients that participated in the study (513) showed the following results, respectively: mean age 62.7 ± 9.9 (26-89) and 62.5 ± 9.5 (29-87); male sex: 60.8% and 67.8%; coronary angiography: 59.5% and 100%; AMI: 57.4% and 11.7%; angina: 17.2% and 41.8%; surgical revascularization: 17.2% and 21.1%; ATC: 9.6% and 17.1%; BMI > 25 kg/m²: 66% and 56%; ASA use: 83.4% and 87.6%; use of hypolipemiant agents: 14.8% and 19.1%; undergoing nutritional therapy: 65% and 72.6%.

The present study sample was considered representative of the initial cross-sectional design. The percentage of patients with total cholesterol (TC) $t > 200$ mg/dl or LDL > 100 mg/dl at the first laboratory assessment was 91.6%.

The initial lipid profile (pre-intervention), when compared to that after the lectures were given (post-intervention) can be seen in Figure 1.

The behavior of the body mass index also presented a favorable evolution, decreasing from 27.17 to 26.80 kg/m² ($p = 0.0001$), as well as the measurement of the abdominal circumference, 93.9 cm (SD = 11 cm) on average at the first assessment and 93.07 cm (SD = 10.90), which was statistically significant ($p < 0.001$). Blood pressure also showed good evolution, but it is not part of the scope of the present study.

Of the total, 137 individuals (26.7%) were continuously treated with hypolipemiant agents and 51% never used them due to several reasons. However, when this group was evaluated alone, an improvement in the lipid profile was observed, even in those who were not receiving this type of medication, which helps to demonstrate the effectiveness of the program.

However, it is noteworthy the fact that the most significant and intense results were obtained by those undergoing

treatment with specific medication, particularly concerning total cholesterol and LDL-cholesterol, which showed more significant benefits.

Regarding the dietary habits, at the end of the lecture schedule, 72% of those who did not follow a healthy diet started to do so, when assessed through their food diaries (Figure 2). Regarding the physical activity, only 36% practiced regular physical activity at least three times a week before joining the program; at the assessment after the lecture schedule, of the 55% of those who did not exercise, 71% started to do so three or more times a week (Figure 3). However, there was no statistically significant difference regarding the lipid profile or BMI when compared to whether the patient maintained his or her level of physical activity, started to practice exercises or continued sedentary.

At the start of the study, 47% of the individuals were ex-smokers and 9% were smokers (in spite of advice against it by the cardiologists who followed them) - of these, 60% stopped smoking stimulated by the program. Although the initial number of smokers was small, the results without the use of medications were highly significant (Figure 4).

Finally, when the patients were asked about the quality of the program, 84.3% of them answered that it was excellent/very good. When we asked those who started to practice physical activities, what benefit was perceived by them, 70.1% declared that they felt much better. As for the comprehension, 92.6% answered that they did not have any difficulties in understanding the program. Concerning the participation of family members in the treatment, 70.2% of the patients said the family members had an active participation in it. As for the degree of emotional stress, 59.3% of the patients declared that they had improved a lot by following the recommendations made during the lectures. Table 1 shows the impact of the intervention on lipid levels observed during the follow-up period.

The third analysis of the lipid profile showed a statistically significant decrease in the levels of total cholesterol and the LDL-cholesterol in relation to the initial gain. The losses regarding the

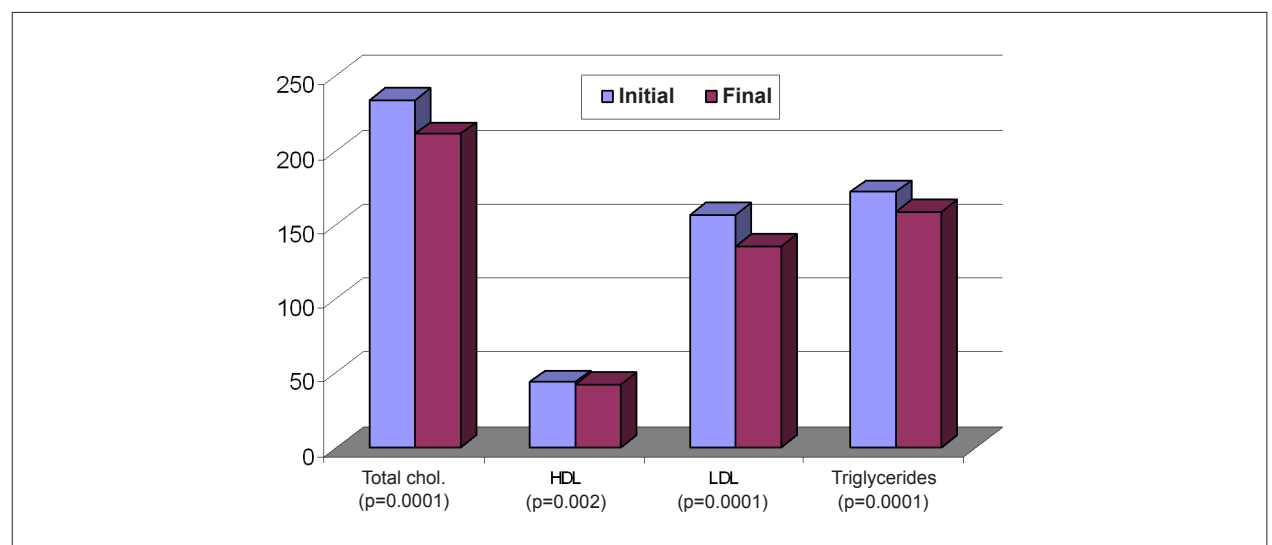


Figure 1 - Pre- and post-intervention lipid level variations. N - number of patients that underwent blood collection.

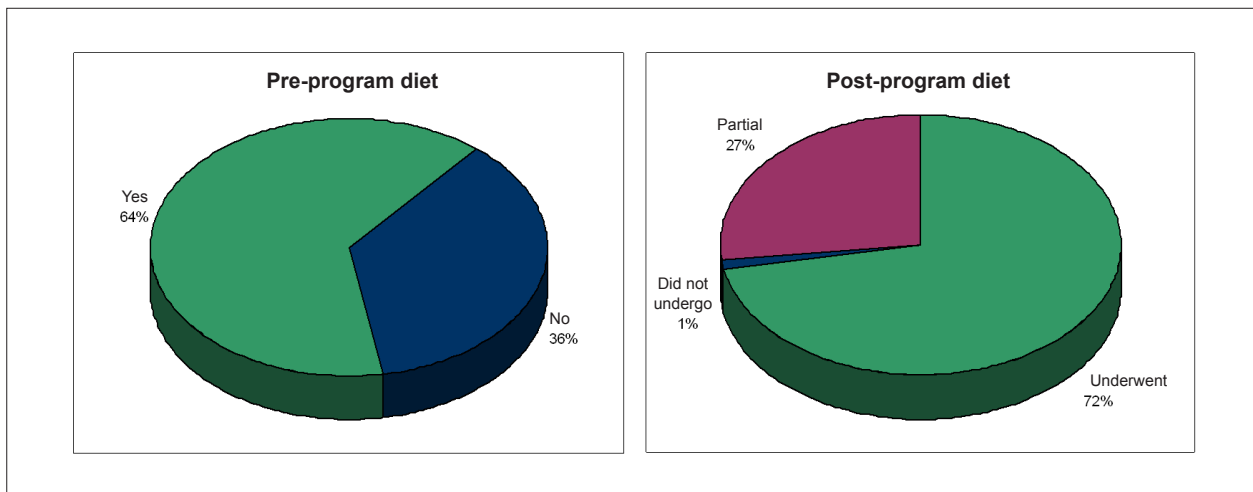


Figure 2 - Pre and post-program diet evolution.

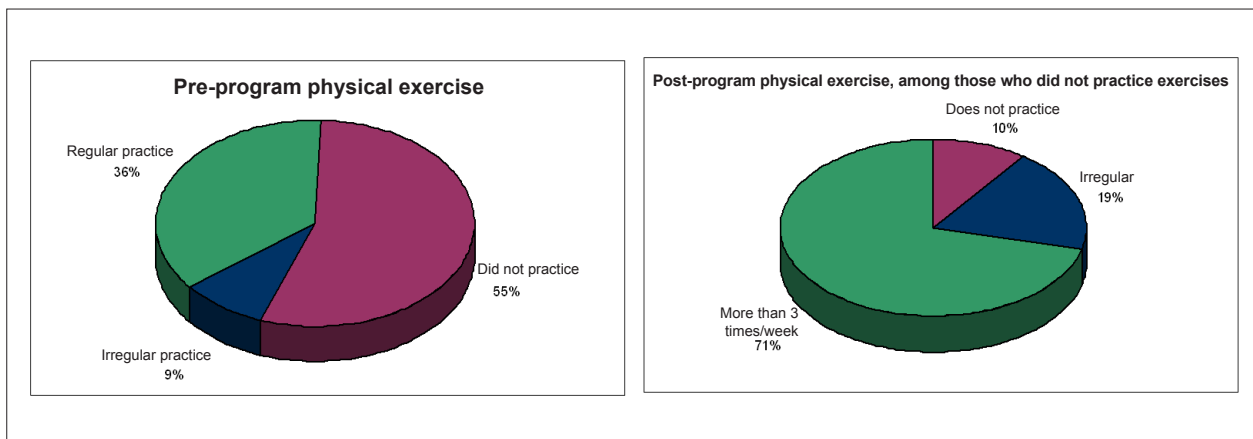


Figure 3 - Pre and post-program physical exercise evolution.

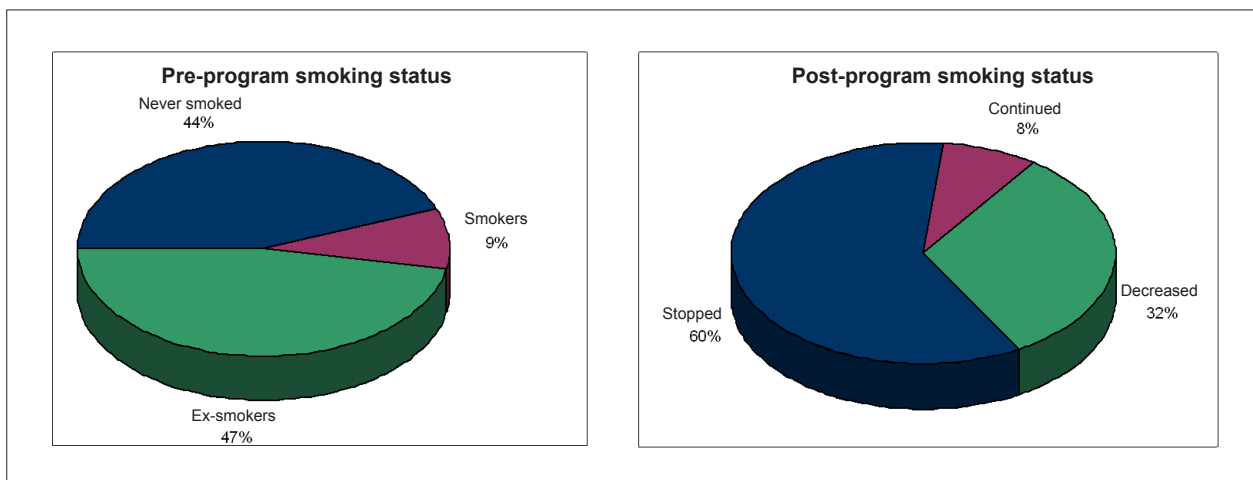


Figure 4 - Pre and post-program smoking status evolution.

number of analyzed individuals were due to the fact that the assistant physician did not request the examinations or when the patient did not undergo the examination.

Discussion

The multiprofessional intervention has demonstrated its benefits in relation to the isolated medical practice, with 4.4-fold more patients achieving their lipid goals, 2.7-fold more patients achieving BP control, 1.9-fold more patients engaging in physical activity and 1.3-fold more patients following a fat-poor diet, which was accompanied by a 24% decrease in cardiovascular events¹².

In our sample, there was no statistical variation regarding the lipids and BMI when comparing those who maintained their usual diet and the ones who started it, stimulated by the program. The comparison between those who already practiced physical exercises prior to the program, those who started to practice it and the ones who remained sedentary did not show statistical significance either, regarding the lipid profile and BMI. The West of Scotland Coronary Prevention¹³ study did not show significant improvement in lipid levels in the control group, who was not treated with hypolipemiant agents.

The outcomes presented here did not show the same performance as those obtained by Ornish et al³ without the use of medications to improve lipid levels, only with the life habit improvement. In this case, the data were significant at the 1-year, as well as at the 5-year assessment¹⁴. The same

conclusions were drawn by Rutledge et al¹⁵ in their two-year assessment of 43 men and women with coronary disease who adopted a risk factor modification program, when compared to 28 who abandoned the program, presenting decrease in total cholesterol and LDL-cholesterol as the result of dietary changes. In this case, the conditions were quite similar to those in the present study, as the patients were not removed from their natural habitat, as in the case studied by Ornish et al, in which the individuals were confined to a hotel. The patients presented here were assessed in the “real world”. In the STARS¹⁶ study, the group that went on a diet showed good results regarding LDL-cholesterol decrease.

However, it is important to consider the results of the Lyon Diet Heart Study, which compared the evolution of a group of 302 patients after AMI, receiving a Mediterranean diet, with other 303 patients who followed the usual diet recommended after an AMI. These patients with coronary disease ate less saturated fats, cholesterol and linoleic acid and consumed more oleic and alpha-linolenic acids than their controls.

When compared after 27 months and also after 46 months, a significant decrease in general mortality and cardiac death combined with death by AMI was observed. Such results did not correspond to significant differences in the decrease of BMI, serum lipids or blood pressure between the two groups. This fact led to the hypothesis that the Mediterranean diet has a beneficial effect beyond its association with the decrease in total cholesterol levels¹⁷⁻¹⁹.

Among the limitations of the present study is the fact that it was carried out in the “real world”, with patients remaining in their homes and carrying out their usual activities of daily living. All collected data, therefore, came from information provided by each patient, except for the serum lipid measurements, body weight, body mass index and abdominal circumference, which can generate distortions. The time between the assessment of the initial serum levels and the second assessment may have been too short to demonstrate more striking effects on the physical activity, diet, better control of mental stress and discontinuation of the smoking habit. Some patients, especially the most severe ones, when giving their opinion on the program effectiveness, did so without taking into account the severity of their disease. Perhaps the results related to the decrease in the HDL-cholesterol levels, or even the isolated effect of the diet, physical activity, discontinuation of the smoking habit and decrease in the degree of anxiety were not more striking due to the fact that the assessment period lasted 3-6 months, which was not sufficient for more significant conclusions to be drawn.

The non-inclusion of a control group was due to ethical reasons. It would be unethical not to give adequate advice and recommendations on risk factor control, but the analysis of these patients' data, before, during and one year after the program can validate the intervention, considering that the patients were being treated by a cardiologist and continued being treated by one from a national reference center in cardiology.

This study did not aim at associating the findings with clinical outcomes or the angiographic analysis, as in some previously mentioned studies. The effectiveness of these data have been demonstrated and the present study aimed

Table 1 - Impact of the intervention on the lipid levels at the three assessments

Variables	N	Mean	S.D.	Median	p value	Significant differences
Cholesterol 1	149	244.02	53.70	236	0.0001	1 ²
Cholesterol 2	149	218.03	50.26	210		1 ³
Cholesterol 3	149	230.39	51.10	229		2 ³
HDL 1	113	43.16	11.00	43	0.0001	1 = 2
HDL 2	113	41.06	10.35	42		1 ³
HDL 3	113	46.66	12.74	45		2 ³
LDL 1	107	166.20	48.59	156	0.0001	1 ²
LDL 2	107	137.42	37.71	135		1 ³
LDL 3	107	149.15	40.01	149		2 ³
Triglycerides 1	132	168.66	92.11	153	0.11	
Triglycerides 2	132	154.67	80.35	136		
Triglycerides 3	132	171.13	130.51	137.5		
Castelli 1 - 1	113	5.99	1.82	5.84	0.0008	1 ²
Castelli 1 - 2	113	5.51	1.74	5.24		1 ³
Castelli 1 - 3	113	5.33	2.13	4.83		2 = 3
Castelli 2 - 1	105	4.13	1.80	3.74	0.0001	1 ²
Castelli 2 - 2	105	3.51	1.27	3.36		1 ³
Castelli 2 - 3	105	3.41	1.33	3.26		2 = 3

S.D. - standard deviation-p.

solely at showing the viability of the program and its effects. The results obtained after the third measurement of the serum lipids in 149 of these patients were also considered of utmost importance. The time interval between the first measurement and the third was around one year; at that time, the patients had already been referred back to the care of their own assistant physicians. At this phase, the Analysis of Variance for repeated measures and Bonferroni's multiple comparison tests were used. From the second to the third assessment, there was a significant increase in the levels of total cholesterol, LDL-cholesterol, Castelli index I and II, as well as of HDL-cholesterol, but no variation in the levels of triglycerides (Table 1). In spite of this retrogressive behavior, the values of the third assessment did not reach the initial levels. Such data represent, in our opinion, the permanent need to fight risk factors, by constantly informing and advising the patients on the importance of maintaining good life habits. One cannot forget, as well, that these patients were being treated in a cardiologic center without obtaining the expected improvement of risk factors and that, without the stimulation of the research support group, these indexes started to decline again.

A research in, PUBMED shows that there are few Brazilian data on the control of risk factors in the secondary prevention of coronary disease, which corroborates the statements made in the present study. One of the analyzed studies, by Ladeia and Guimarães²⁰, demonstrated the poor control of this type of patient: 58% with non-controlled blood pressure, 62.5% with BMI > 25 kg/m² and only 8.1% with LDL cholesterol < 100 mg/dl, also demonstrated by the initial data of the present study.

Another study, carried out in countries with low or middle-economical level - and among them, Brazil - that contributed with 836 patients with coronary disease, showed that 12.5% were still smokers, 25% did not know about the benefits of physical activity and 47.5% were sedentary, in addition to a significant proportion of patients that were not aware of risk factors, although they were treated by health professionals, including physicians²¹.

A highly effective program like this, which can be carried out in different units and requires low technology, has a crucial social role, decreasing costs, suffering and possibly the need for greater interventions. Moreover, it has the advantage of the possibility of being adapted to different scenarios in the public health system.

By gathering the patients in small groups, one can optimize everybody's time and also concentrate the patients' visits, decreasing costs with transportation and loss of work hours. The cost of this program was exclusively that of time required to train the professionals (a nutritionist/dietitian, a nurse, a psychiatrist, a social worker and 4 cardiologists) during their working hours, for about two hours, complemented by constant inquiries by the coordinator to the professionals from several areas in order to promote patient understanding and adherence.

This program can also be carried out with a medical coordinator advising nurses and social workers in units that do not have a multiprofessional team and even in cases where only the physician is available, it should be possible to develop similar actions.

Conclusions

There was a significant improvement in the assessed risk factors. We observed a higher adherence to a healthy diet, decrease in the number of smokers, a higher number of patients practicing physical activities regularly (at least three times a week) and decrease in the degree of emotional stress (according to the patients' own assessment). A decrease in the levels of total cholesterol, LDL-cholesterol and triglycerides, as well as body mass index, abdominal circumference and Castelli indexes I and II was verified, all with statistical significance. There is still much to be improved, however, regarding the secondary prevention recommendations and adherence to the latter, which can be achieved by incorporating a multidisciplinary program such as the one proposed here.

Potential Conflict of Interest

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

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Study Association

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