Effects of an intervention in eating habits and physical activity in Japanese-Brazilian women with a high prevalence of metabolic syndrome in Bauru, São Paulo State, Brazil

Efeitos da intervenção em hábitos alimentares e atividade física de mulheres nipo-brasileiras com elevada prevalência de síndrome metabólica, residentes em Bauru, São Paulo, Brasil

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Abstract

We evaluated the impact of a lifestyle intervention on the cardiometabolic risk profile of women participating in the Study on Diabetes and Associated Diseases in the Japanese-Brazilian Population in Bauru. *This was a non-controlled experimental study including clinical and laboratory values at baseline and after a 1-year intervention period. 401 Japanese-Brazilian women were examined (age 60.8±11.7 years), and 365 classified for metabolic syndrome (prevalence = 50.6%). Subjects with metabolic syndrome were older than those without (63.0±10.0 vs. 56.7±11.6 years, p < 0.01). After intervention, improvements in variables were found, except for C-reactive protein. Body mass index and waist circumference decreased, but adiposity reduction was more pronounced in the abdominal region (87.0±9.7 to 84.5±11.2cm, p < 0.001). Intervention-induced differences in total cholesterol, LDL, and post-challenge glucose were significant; women who lost more than 5% body weight showed a better profile than those who did not. The lifestyle intervention in Japanese-Brazilian women at high cardiometabolic risk improved anthropometric and laboratory parameters, but it is not known whether such benefits will persist and result in long-term reduction in cardiovascular events.*

Nutritional Epidemiology; Metabolic Syndrome X; Population; Life Style

Introduction

Metabolic syndrome refers to a set of abnormalities entailing greatly increased cardiovascular risk [1]. Central obesity and insulin resistance have been identified as the main etiopathogenic factors that trigger disorders in glucose and lipid metabolism, endothelial dysfunction, increased blood pressure, and a proinflammatory and prothrombotic state, among others. Despite some controversy in conceptualizing the syndrome, it is agreed that proposals for diagnostic criteria serve to call health professionals' attention to the importance of convergent risk factors for cardiovascular diseases, currently the principal causes of mortality, including in developing countries like Brazil [2,3].

After the World Health Organization (WHO) defined the metabolic syndrome, with criteria including a marker for insulin resistance, the National Cholesterol Education Program – Adult Panel III (NCEP-ATP III) proposed simple criteria for its diagnosis [4], capable of identifying individuals at high risk of type 2 diabetes mellitus and cardiovascular diseases [5]. The five diagnostic criteria for metabolic syndrome were abdominal obesity (waist circumference), triglycerides, HDL-cholesterol, blood pressure, and fasting glucose. Borderline blood glucose levels were subsequently reviewed by the American Heart Association and National Heart, Lung, and Blood Institute [6]. The International Diabetes Federation (IDF) also took

a position on the metabolic syndrome, contending that central obesity – indicative of visceral fat deposits – should be a prerequisite for diagnosing the syndrome [7]. The IDF further emphasized that the waist circumference cutoff values proposed by the NCEP were too high, particularly for Asian populations. Controversies concerning diagnostic criteria have hindered the comparison of prevalence rates for metabolic syndrome in various regions of the world, but the IDF estimates that at least one-fourth of the world population has the syndrome [7].

Studies since 1993 in the resident Japanese-Brazilian population in Bauru, São Paulo State, have shown high prevalence rates for the abnormalities comprising the metabolic syndrome [8,9], including one of the world's highest diabetes rates [10]. The harmful impact of glucose metabolism disorders has been shown in terms of overall and cardiovascular mortality [11]. Considering that half the population was found to have central obesity [12], a high frequency of metabolic syndrome was expected. Indeed, the metabolic syndrome, as defined by different criteria, affected 48-58% of Japanese-Brazilians ≥ 30 years [13]. Based on the hypothesis of the role of Western lifestyle in this condition, associations between metabolic syndrome and diet were investigated, identifying the role of fat intake in the syndrome [14]. In the cohort, followed from 1997 to 2000, consumption of red meat by Japanese-Brazilian men was associated with the metabolic syndrome [15]. Low physical activity was also common in this population [16].

These findings justified a lifestyle intervention with dietary orientation and encouragement for physical activity in the Japanese-Brazilian community [17]. Examples in the literature show the efficacy of healthy diet and physical activity for preventing diabetes [18,19] and improving the metabolic profile of individuals with metabolic syndrome [20]. The current study proposed to evaluate the impact of the first year of a community-based intervention on cardiometabolic risk profile among women participating in the *Study on Diabetes and Associated Diseases in the Japanese-Brazilian Population in Bauru*, São Paulo. The hypothesis was that reaching the program's target – a reduction of at least 5% in body weight – would be associated with a decrease in both the mean values of the diagnostic parameters for metabolic syndrome and its prevalence.

Material and methods

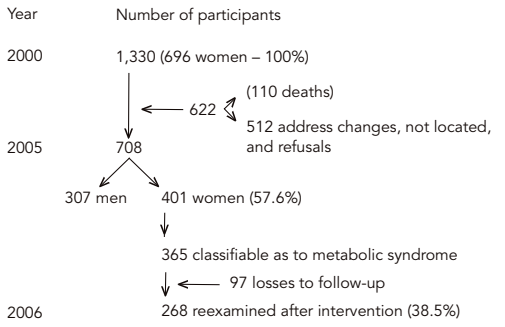
Participants in the *Study on Diabetes and Associated Diseases in the Japanese-Brazilian Population in Bauru*, conducted in 2000 [10], who were located in 2005, were invited to participate in a third phase, a two-year lifestyle intervention, approved by the institutional review board of the Federal University in São Paulo (UNIFESP). In 2000, 1,330 Japanese-Brazilians participated (696 women), ≥ 30 years of age, including both first-generation (born in Japan) and second-generation (children of the first generation, born in Brazil). Although the entire sample was the target of this third-phase intervention, losses to follow-up (excluding the 101 deaths among participants of the study's second phase) represented 38.4% of all the individuals examined in the year 2000 (moved to another city or country, addresses not located, and refusals). Thus, 708 Japanese-Brazilians (56.6% of whom were women) participated in the baseline evaluation (2005) of the third phase. These individuals were informed of the study's objectives and signed a term of consent. A comparison of the group of participants and refusals showed no difference as to mean age or gender and generation distribution (data not shown).

The study adopted an experimental, non-controlled design, and the lifestyle intervention targeted all the participants. It included three moments of clinical and laboratory evaluation, at baseline, after the first year of intervention, and at the end of the second year (data not shown), when the individuals had blood samples drawn and consultations with the interdisciplinary health team. The current analysis considered only the women (n = 401) (Figure 1) and the data from the first year of intervention.

Individuals presented (after at least 8 hours of fasting) at the Clinical Laboratory of the Sacred Heart University (USC) in Bauru, where blood samples were drawn to measure blood chemistry, hormone levels, and inflammatory markers, in addition to a 24-hour food recall interview. Prior to drawing blood samples, a capillary blood sample was drawn to screen for individuals for an oral glucose tolerance test with a 75g load (Glutol, Laborclin, Pinhais, Paraná State, Brazil). Individuals with self-reported diabetes or capillary glucose ≥ 180mg/dl did not perform the OGTT, but only fasting blood glucose. All subjects were then scheduled for baseline outpatient appointments at the same institution, and were examined by the interdisciplinary team. Subjects underwent a complete medical examination (including anthropometry and blood pressure readings) and were informed as to their laboratory results. On

Figure 1

Diagram illustrating number of participants in phases 2000 and 2005-2006 (intervention) in the *Study on Diabetes and Associated Diseases in the Japanese-Brazilian Population in Bauru*, São Paulo, Brazil.



the same occasion, physical education professionals applied the international physical activity questionnaire (short form), previously validated for Brazil [21], and nutritionists applied a 48-hour food recall questionnaire (including items, number, and sizes of food portions). Participants then received verbal and written healthy lifestyle orientation and were scheduled for new activities (see intervention strategy).

Weight was measured using a digital scale (150kg capacity, accurate to 100g), barefoot and with a minimum of clothing, and height was measured using a portable stadiometer. Body mass index (BMI) was calculated by dividing weight by height-squared. Waist circumference was measured with a non-elastic tape measure, halfway between the last floating rib and the iliac crest, with the patient standing and the abdomen relaxed. Three blood pressure measurements were taken using an automatic instrument (Omron model HEM-712C; Omron Health Care Inc., USA), adjusting the cuff to the brachial circumference, after 5 minutes resting in sitting position, with the right arm level with the left atrium. Final systolic and diastolic values were defined as the means of the last two measurements.

Fasting blood samples were used to determine the plasma glucose levels, lipid profile (total cholesterol, fractions, and triglycerides), uric acid, creatinine, insulin, and C-reactive protein (CRP). The levels were measured right after the blood samples were drawn, except for insulin and CRP, which were stored at -70º for subsequent measurement. Blood glucose was measured using the glucose oxidase method, creatinine according to the Jaffé reaction, and lipoproteins with enzymatic kits. CRP was measured by chemiluminescence and insulin by monoclonal antibody immunofluorometric assay.

Diagnosis of metabolic syndrome employed the IDF criteria [7], using waist circumference cutoff values specific to Japanese populations (≥ 80cm for women) as a prerequisite, plus 2 other alterations in the diagnostic criteria. Excess weight among the Japanese-Brazilian women was defined as BMI ≥ 23kg/m² [22].

Lifestyle intervention strategy

To reach the target of at least a 5% reduction in body weight, the intervention strategy was based on individual consultations, group sessions on healthy lifestyle, and community events with physical activities, administered by researchers from the UNIFESP and Bauru. The first year included an individual nutritional consultation and two group sessions, coordinated by professional nutritionists and nutrition students and physical educators. The target for physical activity was a minimum of 150 minutes per week of moderate activities [23]. Community events during this first year of intervention occurred on two weekends, including walks, stretch exercises, and localized gymnastics and dance.

The individual nutritional appointment included prescription of an adequate diet for individual energy needs and nutritional status, with a food replacement list, besides orientation on healthy diet and stimulus for routine and leisure-time physical activities. Diets were fractionated, with 50-60% of total calories coming from carbohydrates, 10-15% from protein, and 20-30% from fat (< 10% from saturated fatty acids and > 20% from monounsaturated fatty acids). Daily cholesterol intake < 300mg and fiber intake > 15g (foods naturally rich in fiber, like whole grains, fruits, and vegetables) were recommended, encouraging typical Japanese meals rich in vegetables, with low fat, sugar, and sodium. A maximum of 10 subjects participated in each group activity, which focused on the program's food intake and physical activity goals, the importance of adherence to healthy lifestyle, and observations by participants.

Evaluation of response to intervention program

Since the study design did not include a control group and the intervention was generalized (community intervention), as compared to the overall population, different variables were eva-

luated at baseline and compared to those obtained after a year of lifestyle intervention. In addition to body weight, the study's principal target variables were variations in waist circumference, lipid profile, and glucose, insulin, and CRP levels. Metabolic syndrome rates at baseline and after one year of intervention were compared.

Statistical analysis

The effects on cardiometabolic risk profile in the Japanese-Brazilian population before and after one year in the program were analyzed using Stata 8.02 (Stata Corp., College Station, USA) and the Statistical Program for Social Science 9.0 (SPSS Inc., Chicago, USA). The means and standard deviations (SD) were estimated for the quantitative variables with normal distribution (anthropometric and laboratory) at baseline and post-intervention; these were compared using the Student t-test or ANOVA when indicated. Variables without normal distribution were compared using log transformation. Correlations were tested between the percentage deltas of anthropometric and laboratory variables using Pearson's correlation coefficient. Absolute and relative variations in these variables based on the intervention were compared among the strata of individuals that achieved (versus did not achieve) the weight loss goal during the intervention. Frequencies of metabolic abnormalities were compared by the chi-squared test. Metabolic syndrome rates were calculated by point estimates and confidence intervals (95%CI). Statistical significance was set at 5% ($p < 0.05$).

Results

In 2005, the mean age of the 401 Japanese-Brazilian women examined was 60.8 years (SD = 11.7 years), and 86% were second-generation. Due to incomplete information on one or more of the diagnostic criteria for metabolic syndrome, of the 401 examined at baseline, it was possible to classify 365 (91%) for presence/absence of the syndrome. Women with complete anthropometric, clinical, and laboratory data, as compared to the others (n = 36) were younger (59.9 versus 68.4 years) and showed a higher proportion of second-generation individuals. An estimated 50.6% (95%CI: 45.3-55.8) of the classifiable women in 2005 had the metabolic syndrome.

Mean age of the women with metabolic syndrome in 2005 was statistically higher (63.0 years; SD = 10.0) than for women without the syndrome (56.7 years; SD = 11.6). No statistically significant association was observed between metabolic syndrome and generation (52.4% of first-generation versus 50.5% of second-generation women had the syndrome).

Table 1 shows the mean anthropometric, clinical, and laboratory values for the 268 Japanese-Brazilian women examined at both points in the study (pre- and post-intervention), stratified by presence of metabolic syndrome. Mean age, anthropometric, clinical, and laboratory values of women who failed to appear in 2006 (n = 97) did not differ from those who participated. Among the latter, most of the target variables improved, with the exception of CRP. The changes in triglycerides and HDL-cholesterol were in the opposite direction from expected, but remained practically within normal range. Importantly, from 2005 to 2006 there was a small but significant decrease in BMI and waist circumference for women with metabolic syndrome, and the most striking decrease was in abdominal adiposity. No significant correlations were detected ($p > 0.05$) between the percentage deltas in waist circumference and the deltas in laboratory variables used to define metabolic syndrome. Despite improvement in the mean anthropometric, laboratory, and blood pressure values, the rates of metabolic syndrome in participants at the two stages in the study did not decrease significantly (50% to 49%, $p > 0.05$).

Table 2 shows the percentages or mean values of demographic, anthropometric, clinical, and laboratory variables for the 268 Japanese-Brazilian women examined at the two stages in the study, according to alterations in their body weight during the study period. The majority (n = 149) were above the recommended weight; of these, 27 showed a decrease of at least 5% in body weight (18.1%). Analyzing the entire sample, the differences induced by the intervention were only statistically significant for waist circumference and total cholesterol, LDL-cholesterol, and 2-hour glucose tolerance, while women who lost ≥ 5% of their body weight showed a better profile in 2006 than those who remained the same or gained weight. The increase in triglycerides (see Table 1) was due to the women who gained weight.

Discussion

The current study investigates the cardiometabolic risk profile of women from a population group with a known high prevalence of glucose and lipid metabolism disorders [8,9,10]. By analyzing the metabolic and hemodynamic abnormalities jointly, i.e., based on the diagnosis of metabolic syndrome, our findings are relevant in the sense of highlighting the increased cardiovascu-

Table 1

Mean values (and standard deviations) for anthropometric, clinical, and laboratory variables in 268 Japanese-Brazilian women according to year of sample collection and presence of metabolic syndrome (MS).

Variable	Year of sample				p-value	
	2005		2006			
	Without MS	With MS	Without MS	With MS	Without MS	With MS
Body mass index (kg/m2)	22.0 (2.9)	26.6 (3.7)	21.8 (3.1)	26.3 (3.8)	0.182	0.002
Waist circumference (cm)	79.2 (8.2)	91.1 (7.6)	78.6 (8.7)	89.8 (8.4)	0.133	0.000
Systolic blood pressure (mmHg)	128.2 (20.1)	143.9 (23.2)	123.7 (19.3)	137.9 (22.1)	0.001	0.002
Diastolic blood pressure (mmHg)	76.1 (11.7)	82.4 (11.6)	73.8 (11.8)	78.6 (11.5)	0.003	0.000
Total cholesterol (mg/dL)*	211.5 (57.4)	227.3 (41.1)	196.1(47.3)	203.9 (39.1)	0.000	0.000
Triglycerides (mg/dL)	111.5 (70.1)	179.0 (105.8)	121.4 (129.8)	198.4 (125.1)	0.238	0.038
HDL-cholesterol (mg/dl)*	61.0 (11.7)	53.1 (11.4)	55.4 (13.3)	48.1 (15.2)	0.000	0.000
LDL-cholesterol (mg/dL)*	126.3 (36.1)	136.5 (37.4)	116.0 (29.5)	115.9 (33.7)	0.001	0.000
Fasting glucose (mg/dL)*	96.3 (12.4)	115.6 (40.4)	92.7 (14.1)	110.7(37.7)	0.001	0.135
2-hr. post-load glucose (mg/dL)*	128.2 (37.1)	172.2 (50.4)	112.9 (30.1)	144.1 (43.7)	0.001	0.000
Fasting insulin (mU/mL)*	3.4 (2.8)	8.5 (16.0)	4.2 (4.5)	10.8 (19.6)	0.076	0.010
Creatinine (mg/dL)*	0.78 (1.00)	0.73 (0.83)	0.55 (0.10)	0.60 (0.16)	0.029	0.073
Uric acid (mg/dL)	4.0 (3.8)	5.3 (4.6)	3.5 (1.0)	4.5 (1.3)	0.138	0.072
C-reactive protein (mg/dL)*	0.18 (0.37)	0.27 (0.65)	0.17 (0.51)	0.26 (0.30)	0.811	0.956

* Variables log-transformed to perform statistical test.

p-value refers to matched Student t test (without MS in 2005 versus without MS in 2006; with MS in 2005 versus with MS in 2006).

Table 2

Percentage or mean value (and standard deviation) of demographic, anthropometric, clinical, and laboratory variables in 268 Japanese-Brazilian women examined in 2005 and 2006, according to weight change during the period.

Variable	Weight change from 2005 to 2006			p-value *
	Decrease of 5 to 15% (n = 30)	Maintained (n = 221)	Increase of 5 to 26% (n = 17)	
% with diabetes in 2005 **	33.3	25.5	31.3	0.426
% with hypertension in 2005 ***	55.6	66.5	87.5	0.745
Age (years)	61.5 (9.8)	61.0 (10.9)	59.1 (10.5)	0.755
Differences for values observed in 2006 minus those recorded in 2005				
Waist circumference (cm)	-4.70 (3.85)	-0.70 (3.80)	2.35 (4.63)	< 0.001
Systolic blood pressure (mmHg)	-5.7 (14.2)	-5.0 (19.0)	-6.6 (14.3)	0.934
Diastolic blood pressure (mmHg)	-3.9 (8.6)	-2.9 (9.7)	-2.3 (10.5)	0.846
Total cholesterol (mg/dL) #	-46.8 (36.6)	-15.5 (37.7)	-30.7 (44.8)	<0.001
HDL-cholesterol (mg/dL) #	-7.6 (9.8)	-4.5 (14.6)	-10.2 (10.9)	0.191
LDL-cholesterol (mg/dL) #	-33.6 (36.4)	-12.8 (36.2)	-23.2 (40.0)	0.020
Triglycerides (mg/dL)	-28.7 (70.4)	17.2 (104.5)	32.7 (102.6)	0.065
Fasting blood glucose (mg/dL) #	-10.7 (23.0)	-3.2 (18.6)	-18.1 (78.0)	0.060
2-hour blood glucose (mg/dL) #	-45.3 (35.0)	-18.5 (39.0)	-29.9 (45.6)	0.018
Fasting insulin (mU/mL) #	-0.4 (2.9)	1.8 (7.7)	4.0 (9.4)	0.189
Creatinine (mg/dL) #	-0.1 (0.2)	-0.2 (1.0)	-0.1 (0.1)	0.487
Uric acid (mg/dL)	-0.5 (0.7)	-0.7 (4.8)	-0.2 (0.9)	0.855
C-reactive protein (mg/dL) #	0.01 (0.18)	-0.02 (0.66)	0.05 (0.59)	0.870

* p-value refers to chi-squared test or ANOVA. Bold print indicates significant differences;

** Presence of diabetes: fasting blood glucose ≥ 126mg/dL or 2-hour blood glucose ≥ 200mg/dL or in use of glucose-lowering medication;

*** Presence of hypertension: systolic/ diastolic pressure ≥ 130/ 85mmHg or in use of anti-hypertensive medication;

Variables log-transformed to perform statistical test.

lar risk attributable to women of Japanese origin who have adopted the Western lifestyle. This affirmation is backed by the previous observation of a high frequency of cardiovascular diseases in this same population [24]. Equally relevant is the observation that certain changes in habits – not always associated with weight reduction – are generally related to improvement in classical risk factors.

Importantly, the waist circumference values used in this study to diagnose women with metabolic syndrome were lower than those often used in the international literature [4]. Our research group has already suggested that the NCEP criteria tend to under-diagnose abdominal obesity in Japanese-Brazilians [13]. Consistent with this position, the present study used the IDF criteria, setting 80cm as the normal limit for Japanese women [7].

The consistent improvement observed in anthropometric, blood pressure, and laboratory (glucose and lipid) values did not hold true for serum triglycerides or HDL-cholesterol, particularly among women with metabolic syndrome. There was an increase in triglycerides and a reduction in HDL, but both changes were slight. In women without metabolic syndrome, HDL dropped in parallel with total cholesterol and practically within the normal range. The dietary orientation (to reduce the percentage of fat intake, with a resulting increase in carbohydrates) may have contributed to this trend in the lipid profile. Interestingly, among women who lost weight, the mean triglyceride levels did not change.

Half of the Japanese-Brazilian women living in a city in the State of São Paulo with high socioeconomic development had metabolic syndrome in 2005, confirming the urgent need for intervention to minimize the associated risk. In men, a study comparing individuals with and without metabolic syndrome had already documented the increased risk of death, especially from cardiovascular diseases [25]. The extent of the health problem in the Japanese-Brazilian population in Bauru led our research group to opt for a community-based intervention. This choice introduced a limitation in the current study, i.e., the absence of a control group. The working premise was that if a portion of the women with excess weight adhered to the program with changes in eating habits and physical activity and reduced their body weight, then a 5% weight loss target could be used as suggestive of adherence. This 5% target has been used in other epidemiological studies [18,19], and in fact similar percentages were associated with metabolic and cardiovascular benefits and decreased mortality [26,27]. Adopting this criterion, only 18.1% of the Japanese-Brazilian women with BMI ≥ 23kg/m^2 would have reduced their body weight in the current study. The usefulness of this marker to indicate adherence is somewhat limited, considering that metabolic benefits can be achieved even without reducing weight, due to the redistribution of body adiposity resulting from physical activity [28,29]. When data on food intake and physical activity are available, adherence to the intervention program can be evaluated more thoroughly.

The decrease in the sample from 2000 to 2005 was due to deaths, address changes, and refusals after being informed of the study's objectives. Due to the considerable morbidity in this population, high mortality was expected. It is also not surprising that adult individuals would be reluctant to change their lifestyle. One cannot rule out the possibility of a selection bias in the current study, which could have included participants more prone to switching to more healthy living habits. However, the response to the proposed program was heterogeneous, since some women gained weight, others lost weight, and some remained the same. Difficulties in implementing behavior changes and sustaining weight loss have been observed consistently in other lifestyle intervention studies.

The didactic plan set for the Japanese-Brazilian population was based on prior observations in this same group that the dietary fat content was relatively high as compared to their country of origin [30]. In addition, considering the international recommendations and potential benefits of fiber intake on glucose and lipid metabolism [31], this plan was adopted. However, in the Japanese-Brazilian cohort followed for seven years, consumption of red meat was only associated with metabolic syndrome in men, and there was no clear explication for the absence of this association in women [15]. At any rate, this finding in Japanese-Brazilian men is consistent with other studies showing a direct association between frequent red meat consumption and myocardial infarction in men [32].

Metabolic disorders in women – with increased cardiovascular risk – have become an important public health concern. The decreasing cardiovascular mortality rates reported in various studies occurred to a lesser degree or disappeared in the presence of diabetes, as is the case for women. Epidemiological data for the United States show that cardiovascular mortality in diabetic women has not decreased, or has even increased [33]. A similar situation may be reported in women with metabolic syndrome, in whom the range of metabolic abnormalities is even wider.

In summary, a simple lifestyle intervention program was implemented here, based on a

healthy, low-fat, high-fiber diet, associated with physical activity, in a sample of Japanese-Brazilian women with high cardiovascular risk due to metabolic syndrome. The findings generally suggest benefits in the women's anthropometric and laboratory profile. It is not known whether these benefits will persist or will be associated with a reduction in cardiovascular events in the long term. Similar initiatives should be developed in other Brazilian population segments, since cardiovascular diseases are the country's principal cause of mortality.

Resumo

Avaliou-se o impacto de intervenção no estilo de vida no perfil de risco cardiometabólico de mulheres participantes do Estudo de Diabetes e Doenças Associadas na População Nipo-Brasileira de Bauru. *O delineamento foi experimental não-controlado, incluindo avaliação clínico-laboratorial basal e um ano após a intervenção. Examinaram-se 401 nipo-brasileiras (60,8 ± 11,7 anos) sendo 365 classificáveis quanto à presença de síndrome metabólica, estimada em 50,6%. Portadoras de síndrome metabólica eram mais velhas que aquelas sem a síndrome (63,0 ± 10,0* vs. *56,7 ± 11,6 anos; p < 0,01). A intervenção associou-se à melhora nas variáveis avaliadas exceto na proteína C reativa. O índice de massa corporal e a cintura caíram, sendo a redução da adiposidade mais marcante na região abdominal (87,0 ± 9,7 para 84,5 ± 11,2cm; p < 0,001). As diferenças induzidas pela intervenção nos níveis de colesterol total, LDL e glicose pós-sobrecarga foram significantes; mulheres que reduziram ≥ 5% do peso apresentaram melhor perfil que as que mantiveram ou ganharam. Programa de intervenção no estilo de vida em nipo-brasileiras de alto risco cardiometabólico, melhorou o perfil antropométrico e bioquímico, porém, se desconhece se serão duradouros, reduzindo eventos cardiovasculares em longo prazo.*

Epidemiologia Nutricional; Síndrome X Metabólica; População; Estilo de Vida

Contributors

S. R. G. Ferreira participated in the data collection and was the principal author in charge of drafting the manuscript. S. G. A. Gimeno collaborated in the production of the databank and was the principal person in charge of the statistical analysis, besides assisting in drafting the manuscript. A. T. Hirai, H. Harima, and L. Matsumura participated in the data collection and verifying the databank, and assisted in drafting the manuscript. B. A. Pittito worked in the data collection (having a thesis topic related to the intervention in the target population) and literature survey, and participated in drafting the manuscript.

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References

1. Eckel RH, Grundy SM, Zimmet PZ. The metabolic syndrome. Lancet 2005; 365:1415-28.
2. Thom T, Haase N, Rosamond W, Howard VJ, Rumsfeld J, Manolio T, et al. Heart disease and stroke statistics-2006 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Circulation 2006; 113: e85-151.
3. Oliveira GMM, Silva NAS, Klein CH. Mortalidade compensada por doenças cardiovasculares no período de 1980 a 1999 – Brasil. Arq Bras Cardiol 2005; 85:305-13.
4. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. Executive summary of the Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). JAMA 2001; 285:2486-97.
5. Galassi A, Reynolds K, He J. Metabolic syndrome and risk of cardiovascular disease: a meta-analysis. Am J Med 2006; 119:812-9.
6. Grundy SM, Cleeman JI, Daniels SR, Donato KA, Eckel RH, Franklin BA, et al. Diagnosis and management of the metabolic syndrome: an American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement: executive summary. Circulation 2005; 112:2735-52.
7. Alberti G, Zimmet P. On behalf of the IDF Task Force on Epidemiology and Prevention. The IDF consensus worldwide definition of the metabolic syndrome. http://www.idf.org/webdata/docs/IDF_Meta_def_final.pdf (accessed 23/May/2007).
8. Ferreira SRG, Iunes M, Franco LJ, Iochida LC, Hirai A, Vivolo MA, et al. Disturbances of glucose and lipid metabolism in first and second generation Japanese-Brazilians. Diabetes Res Clin Pract 1996; 34 Suppl:S59-63.
9. Japanese-Brazilian Diabetes Study Group. Diabetes mellitus e doenças associadas. São Paulo: Centro de Estudos de Nipo-brasileiros, Universidade Federal de São Paulo; 2004.
10. Gimeno SG, Ferreira SRG, Franco LJ, Hirai AT, Matsumura L, Moises RS. Prevalence and 7-year incidence of Type II diabetes mellitus in a Japanese-Brazilian population: an alarming public health problem. Diabetologia 2002; 45:1635-8.
11. Gimeno SGA, Osiro K, Matsumura L, Massimino FC, Ferreira SGF; Japanese-Brazilian Diabetes Study Group. Glucose intolerance and all-cause mortality in Japanese migrants. Diabetes Res Clin Pract 2005; 68:147-54.
12. Ferreira SRG, Lerario DDG, Gimeno SGA, Sanudo A, Franco LJ. Obesity and central adiposity in Japanese immigrants: role of the Western dietary pattern. J Epidemiol 2002; 12:431-8.
13. Rosenbaum P, Gimeno SG, Sanudo A, Franco LJ, Ferreira SRG. Analysis of criteria for metabolic syndrome in a population-based study of Japanese-Brazilians. Diabetes Obes Metab 2005; 7:352-9.
14. Freire RD, Shinzato AR, Cardoso MA, Ferreira SRG; Japanese-Brazilian Diabetes Study Group. Dietary fat is associated with metabolic syndrome in Japanese-Brazilians. Diabetes Care 2005; 28:1779-85.
15. Freire RD, Castro TG, Cardoso MA, Gimeno SGA, Ferreira SRG. Dietary intakes associated with metabolic syndrome in a cohort of Japanese ancestry. Br J Nutrition 2006; 96:532-8.
16. Doro AR, Gimeno SGA, Hirai AT, Matsumura LK, Ferreira SRG. Análise da associação de atividade física à síndrome metabólica em estudo populacional de nipo-brasileiros. Arq Bras Endocrinol Metabol 2006; 50:1066-74.
17. Ferreira SRG, Almeida B, Siqueira AFA, Khawali C. Intervenções na prevenção do diabetes mellitus tipo 2: é viável um programa populacional no nosso meio? Arq Bras Endocrinol Metabol 2005; 49:479-84.
18. Tuomilehto J, Lindstrom J, Eriksson JG, Valle TT, Hamalainem H et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. N Engl J Med 2001; 344:1343-50.
19. Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med 2002; 346:396-403.
20. Katzmarzyk PT, Leon AS, Wilmore JH, Skinner JS, Rao DC, Rankinen T, et al. Targeting the metabolic syndrome with exercise: evidence from the HERITAGE Family Study. Med Sci Sports Exerc 2003; 35:1703-9.
21. Matsudo S, Timóteo A, Matsudo V, Andrade D, Andrade E, Oliveira C, et al. Questionário Internacional de Atividade Física (IPAQ): Estudo de validade e reprodutibilidade no Brasil. Rev Bras Ativ Fís Saúde 2001; 6:5-18.
22. Surgeon General's Report on Physical Activity and Health. From the Centers for Disease Control and Prevention. JAMA 1996; 276:522.
23. International Diabetes Institute. The Asia-Pacific perspective: redefining obesity and its treatment. 2000. http://www.diabetes.com.au/pdf/obesity_report.pdf (accessed in Jan/2001).
24. Siqueira AAF, Franco LJ, Gimeno SGA, Matsumura LK, Barros Jr. N, Ferreira SRG. Macrovascular disease in a Japanese-Brazilian population of high prevalence of metabolic syndrome: associations with classical and non-classical risk factors. Atherosclerosis 2007; 195:160-6.
25. Lakka HM, Laaksonen DE, Lakka TA, Niskanen LK, Kumpusalo E, Tuomilehto J, et al. The metabolic syndrome and total and cardiovascular disease mortality in middle-aged men. JAMA 2002; 288:2709-16.
26. Williamson DF, Pamuk E, Thun M, Flanders D, Byers T, Heath C. Prospective study of intentional weight loss and mortality in never-smoking overweight US white women aged 40–64 years. Am J Epidemiol 1995; 141:1128-41.

27. Goldstein DJ. Beneficial health effects of modest weight loss. Int J Obes Relat Metab Disord 1992; 16:397-415.
28. Pratley RE, Hagberg JM, Dengel DR, Rogus EM, Muller DC, Goldberg AP. Aerobic exercise training-induced reductions in abdominal fat and glucose stimulated insulin responses in middle-age and older men. J Am Geriatr Soc 2000; 48:1055-61.
29. Treuth M, Hunter GR, Kekes-Szabo, Weinsier RL, Goran MI, Berland L. Reduction in intra-abdominal adipose tissue after strength training in older women. J Appl Physiol 1995; 78:1425-31.
30. Costa MB, Ferreira SRG, Franco LJ, Gimeno SGA, Iunes M. Dietary patterns in an at risk population for glucose intolerance. J Epidemiol 2000; 10: 111-7.
31. Silva SMC, Mura JD. Tratado de alimentação, nutrição & dietoterapia. São Paulo: Editora Roca; 2007.
32. Fraser GE. Associations between diet and cancer, ischemic heart disease, and all-cause mortality in non-Hispanic white California Seventh-day Adventists. Am J Clin Nutr 1999; 70(3 Suppl): 532S-8S.
33. Gu K, Cowie CC, Harris MI. Diabetes and decline in heart disease mortality in US adults. JAMA 1999; 281:1291-7.

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