Cardiovascular risk in Japanese-Brazilian subjects

Risco cardiovascular em nipobrasileiros

Patricia Moreira Gomes[1], Regina Célia Garcia de Andrade[2], Roberta Carvalho de Figueiredo[3], Ana Emília Pace[4], Amaury Lelis Dal Fabbro[3], Laércio Joel Franco[3], Milton César Foss[1], Maria Cristina Foss-Freitas[1]

[1] Department of Internal Medicine, School of Medicine of Ribeirao Preto, Universidade de Sao Paulo (FMRP-USP), Ribeirao Preto, SP, Brazil
[2] Ribeirao Preto Pharmacy School, USP, Ribeirao Preto, SP, Brazil
[3] Department of Social Medicine, FMRP-USP, Ribeirao Preto, SP, Brazil
[4] Ribeirao Preto Nursing School, Ribeirao Preto, SP, Brazil

ABSTRACT

Objective: To evaluate the prevalence of risk factors for cardiovascular disease in Japanese-Brazilian subjects. **Subjects and methods:** One hundred thirty-one residents of the Mombuca community were studied. Statistical analysis was based on the X^2 test, Fisher's Exact test, Student's t test, and ANOVA, at a 5% significance level. **Results:** The average age was 56.7 years-old; 76.3% had dyslipidemia, 24.4% pre-diabetes (PDM), 10.7% type 2 *diabetes mellitus* (T2DM), 46.6% hypertension, 52.7% abdominal obesity, and 35.8% metabolic syndrome (MS). There were significant correlations between HOMA-IR and MS diagnosis and obesity, while HOMA-β levels were decreased in T2DM and PDM. The ankle-brachial index was positive for peripheral artery disease in 22.3% of the individuals. Electrocardiograms did not show increased evidence of myocardial ischemia. **Conclusion:** Subjects of this community are exposed to major cardiovascular risk factors, namely high prevalence of MS diagnoses and increased HOMA-IR. Arq Bras Endocrinol Metab. 2012;56(9):608-13

Keywords
Metabolic syndrome; ankle-brachial index; HOMA; cardiovascular risk; Japanese-Brazilian subjects; Mombuca

RESUMO

Objetivo: Avaliar a presença de fatores de risco para doença cardiovascular em nipo-brasileiros. **Sujeitos e métodos:** Foram estudados 131 moradores de Mombuca. Utilizaram-se os testes do Qui-quadrado, Exato de Fisher, *t* de Student e ANOVA, com significância de 5%. **Resultados:** A média de idade foi de 56,7 anos; 76,3% tinham dislipidemia, 24,4% pré-diabetes (PDM), 10,7% diabetes melito tipo 2 (DM2), 46,6% hipertensão, 52,7% obesidade abdominal e 35,8% síndrome metabólica (SM). Houve correlação significativa do HOMA-IR com SM e obesidade, enquanto HOMA-β esteve reduzido na presença de DM2 e PDM. O índice tornozelo-braquial foi positivo para doença arterial periférica em 22,3% dos indivíduos. O eletrocardiograma não mostrou aumento de isquemia miocárdica. **Conclusão:** A comunidade está exposta aos fatores de risco maiores para doença cardiovascular, o que pode ser resumido pela alta prevalência de diagnóstico de SM e valores elevados de HOMA-IR. Arq Bras Endocrinol Metab. 2012;56(9):608-13

Descritores
Síndrome metabólica; índice tornozelo-braquial; HOMA; risco cardiovascular; nipo-brasileiros; Mombuca

Correspondence to:
Patricia Moreira Gomes
Departamento de Medicina, Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo
Av. Bandeirantes, 3900
14049-900 – Ribeirão Preto, SP, Brazil
dra.patricia.moreira@gmail.com

Received on Feb/6/2012
Accepted on Aug/23/2012

INTRODUCTION

There is considerable evidence that type 2 *diabetes mellitus* (T2DM) has become an important public health problem in Japanese-Brazilian subjects (1,2). The mortality rate for T2DM in Sao Paulo is twice as high among first-generation immigrants as that observed in Japan (1). Japanese people exposed to Western culture now are more affected by cardiovascular disease (CVD), and the disease is strongly associated with changes in the diet and level of physical activity (3).

In addition to T2DM, hypertension (HT), dyslipidemia, and obesity are well-established risk factors for CVD. The combination of these four diseases is known as metabolic syndrome (MS), a disorder related with

insulin resistance and central fat deposition. MS diagnosis has become increasingly important because of its strong association with greater cardiovascular risk.

The leading cause of peripheral arterial disease (PAD) is atherosclerosis. In the Framingham study, it was observed that the prevalence of PAD increases with age and with risk factors for CVD (4). Atherosclerotic disease of at least one coronary artery is identified in about 60 to 80% of patients with PAD of the lower limbs. The ankle brachial index (ABI) is able to diagnose PAD at all stages of the disease, except for individuals with non-compressible arteries, making the index an interesting and simple tool to identify individuals at risk for CVD.

In the Mombuca community, Guatapara, located in the state of Sao Paulo, Brazil, there is a population that migrated from Japan in 1962, living as a semi-rural community that has retained much of their traditional habits. This adult population is mostly composed by *Isseis* (people born in Japan and who migrated to Brazil) and, in smaller proportions, by *Niseis* (children of *Isseis*). Thus, considering the recent migration and maintenance of the Japanese tradition in a considerable degree, we aimed at determining the prevalence of CVD risk factors in the Japanese-Brazilian population of Mombuca/Guatapara.

SUBJECTS AND METHODS

The study was conducted in the community of Mombuca/Guatapara from April to December 2005, and included 131 individuals (69.2% *Isseis* and 30.8% *Niseis*), representing 66.8% of the adult population living in the community. In this group of patients, 54 (41.2%) were men and 77 were (58.8%) women, with a mean age of 57 ± 16 years. Clinical and laboratory evaluations were performed by trained professionals with adequate equipment. The Ethics Committee of the University Hospital of the School of Medicine of Ribeirao Preto-USP approved the study protocol, and all participants signed a written informed consent form to participate in the study.

Clinical history data was obtained by a standardized questionnaire. All participants were asked about their current and former health problems, and the diseases were classified using the International Classification of Diseases (ICD-10). Anthropometric evaluation was performed with the participants wearing light clothes and no shoes. The weight in kilograms was assessed in an electronic scale (Filizola®), and height, in centimeters, was measured with a portable stadiometer. Body mass index (BMI) was calculated by dividing weight (kg) by height (m) squared. Patients were categorized according to BMI values determined by the International Obesity Task Force (IOTF) for the Asian population: between 23 and 24.9 kg/m^2 for overweight, and ≥ 25 kg/m^2 for obesity (5).

Waist circumference was measured midway between the lower edge of the last rib and the iliac crest, and used to determine the abdominal obesity (AO). An automated device (OMRON®, Itapevi, Brazil) with the appropriate cuff was used to assess blood pressure (BP). Normal values were those recommended by the VI Brazilian Guidelines for Hypertension (2010) (6).

A fasting blood sample was obtained, and concentrations of triglycerides, HDL cholesterol, basal insulin, and glucose were assessed using automated techniques. For measures of triglycerides (TG), total cholesterol (TC), and HDL-cholesterol (HDL-C) we used an automated spectrophotometric method (Wiener lab, Rosario, Argentina). Values of LDL-cholesterol (LDL-C) were calculated using the Friedewald formula, except when TG values were ≥ 400 mg/dL. Glucose was measured by an enzymatic method (hexokinase), and the diagnosis of DM was made according to the criteria of the World Health Organization (WHO), 1999. Impaired fasting glucose (IFG) and impaired glucose tolerance (IGT) were grouped as pre-diabetes (PDM) (7).

Basal insulin was measured by radioimmunoassay (Coat-a-Count insulin, Siemens Healthcare Diagnostics, Los Angeles, CA USA). The HOMA-beta was calculated by the formula: [20xBasal Insulin (µU/mL)] / [fasting glucose (mmol/L) - 3.5], with reference values from 167 to 175, and the HOMA-IR by the formula: [fasting glucose (mmol/L) x Basal Insulin (µU/mL)] / [22.5], with normal values below 2.71 (8).

MS was evaluated by the criteria of International Diabetes Federation (IDF)/2009, which proposes different values of CA according to the ethnicity of the individual. In this study, we used the CA values determined for the Japanese population, in which values of ≥ 90 cm for men and ≥ 80 cm for women are considered high (9).

Participants were submitted to electrocardiogram (ECG) at rest, using a portable HEARTWARE ECG98 Panel v2.0.1.1, and ankle-brachial index (ABI) was measured using a portable 8-MHz Doppler and pressure cuffs of appropriate size positioned at arm and calf. To calculate ABI, we divided the highest values of sys-

tolic blood pressure of each leg (posterior tibial artery or dorsalis pedis artery) by each lower limb (brachial artery). Peripheral artery disease (PAD) was diagnosed when ABI was less than 0.9 in any hemibody.

For statistical analysis, data were expressed as means and standard deviations for continuous variables, and absolute numbers and percentages for categorical variables. Continuous variables were compared by Student's t-test or ANOVA, and categorical variables by χ^2 test or Fisher's Exact test. HOMA indices were compared with the following variables, using Fisher's exact test: blood glucose (normal, pre-diabetes, and *diabetes mellitus*), presence of DM, MS, overweight, and obesity. The level of significance was 0.05. Data were analyzed using the SAS® 9.1 software.

RESULTS

Of the 131 (66.8%) individuals included in the study, only seven individuals had a diagnosis of angina/myocardial infarction or stroke.

The average age of the population showed no significant difference between genders, being 57.8 years for females and 55.2 years for males (Table 1). However, women presented significantly higher levels of LDL-C (p = 0.03) and HDL-C (p = 0.02), and a greater number of individuals who never smoked (p = 0.001), while men had higher systolic BP (p = 0.028) and diastolic BP (p = 0.006), and more smokers (p < 0.001) or former smokers (p = 0.001). There was no difference between genders regarding any other parameter evaluated (Table 1).

Table 1. Clinical and laboratory characteristics of the studied population

	Total n = 131	Women n = 76	Men n = 55	p value
Age (years)	56.7 ± 15.9	57.8 ± 16.1	55.2 ± 15.8	0.45
Fasting blood glucose (mg/dL)	92.5 ± 16.3	91.5 ± 17.5	93.7 ± 14.6	0.36
2h GTT 75g (mg/dL)	121.8 ± 56.1	128.5 ± 61.8	112.2 ± 46.9	0.09
Total cholesterol (mg/dL)	203.2 ± 39.6	209.0 ± 41.9	195.2 ± 34.7	0.05
LDL cholesterol (mg/dL)	126.1 ± 36.5	131.6 ± 40.3	116.1 ± 32.8	0.03*
HDL cholesterol (mg/dL)	49.4 ± 13.2	51.8 ± 14.1	49.4 ± 13.2	0.02*
Triglycerides (mg/dL)	144.9 ± 87.1	133.1 ± 70.2	162.5 ± 104.7	0.08
Isolated hypercholesterolemia – n (%)	8 (6.1%)	8 (10.5%)	0	0.02*
Isolated hypertrygliceridemia – n (%)	35 (26.7%)	20 (26.3%)	15 (27.2%)	1.0
Mixed dyslipidemia – n (%)	9 (6.8%)	4 (5.3%)	5 (9.1%)	0.49
Low HDL – n (%)	58 (44.3%)	42 (55.2%)	16 (29.1%)	0.004*
Weight (kg)	61.6 ± 14.3	55.2 ± 10.2	70.6 ± 14.5	< 0.001*
Height (m)	1.57 ± 0.09	1.51 ± 0.07	1.66 ± 0.06	< 0.001*
BMI (kg/m^2)	24.7 ± 4.1	24.1 ± 4.0	25.5 ± 4.0	0.06
Waist circumference (cm)	85.4 ± 10.8	82.9 ± 11.0	88.7 ± 10.0	0.018*
Systolic blood pressure (mmHg)	134.7 ± 24.9	130.9 ± 25.3	140.9 ± 24.9	0.028*
Diastolic blood pressure (mmHg)	79.0 ± 12.6	76.5 ± 13.3	82.6 ± 10.6	0.006*
Hypertension – n (%)	61 (46.6%)	32 (52.4%)	29 (47.6%)	0.22
Glucose profile – n (%)				
Normal	85 (64.9)	46 (54.1)	39 (45.9)	0.21
Pre-diabetes	32 (24.4)	20 (62.5)	12 (37.5)	0.55
T2DM	14 (10.7)	10 (71.4)	4 (28.6)	0.28
Microalbuminuria (mg/dL)	44.5 ± 97.0	41.8 ± 87.9	46.4 ± 103.7	0.79
Metabolic syndrome – n (%)	47 (35.8%)	30 (63.8)	17 (36.2)	0.31
Smoking – n (%)				
Current	10 (7.6)	1 (10.0)	9 (90.0)	< 0.001*
Former	23 (17.6)	6 (26.1)	17 (73.9)	0.001*
Nonsmoker	98 (74.8)	69 (70.4)	29 (29.6)	0.001*

Data shown as mean (±SD); * p < 0.05.

The prevalence of overweight and obesity were respectively 29.6% and 46.3% among men, and 15.6% and 39% among women. Abdominal obesity, evaluated by the abdominal circumference, was significantly more frequent among men (Table 2).

Table 2. Classification of individuals by gender according to BMI and abdominal obesity

Gender	Male	Female	p value
Overweight	16 (29.6)	12 (15.6)	0.08
Obesity	25 (46.3)	30 (39.0)	0.47
Abdominal obesity	30 (55.6)	16 (20.8)	0.01*

Data shown as mean (% of total); * $p < 0.05$.

A total of 100 (76.3%) ECG examinations were analyzed by a cardiologist and the findings were divided into two categories: 1) nonspecific (n = 74): reports that were described as normal, disorders of ventricular re-polarization, low amplitude QRS interval and changes in conduction inferior parietal were grouped in this category; 2) specific changes (n = 26): blockade, ischemia and arrhythmia. The groups were similar ($p > 0.05$) for any of the variables studied (Table 3). ABI was positive for PAD in 22.3% of the 131 patients evaluated; however, there was no correlation with ECG alterations.

We observed significant lower values for HOMA-β in T2DM ($p = 0.03$), and increased HOMA-IR in obese patients ($p = 0.01$) and in patients with MS diagnosis ($p = 0.02$). When data was analyzed according to gender, we observed increased HOMA-IR values in women with MS diagnosis ($p = 0.004$), while men had lower HOMA-β in patients with higher blood glucose ($p = 0.003$) or T2DM diagnosis ($p = 0.002$). We also found increased HOMA-IR in overweight men ($p = 0.01$) (data not shown). When HOMA values were analyzed in normal glucose (N), PDM and T2DM individuals, we did not observe significant differences in the values of the HOMA-IR among the groups, but we did find lower values of HOMA-β in the PDM and T2DM groups (Table 4).

Table 3. Clinical characteristics of the population according to electrocardiogram findings

	Nonspecific changes	Specific changes	p value*
Number (n)	74	26	
Gender			0.49
Male	30 (40.5)	13 (50.0)	
Female	44 (59.5)	13 (50.0)	
Diabetes			0.58
No	49 (66.2)	17 (65.4)	
Pre-diabetes	18 (24.3)	8 (30.8)	
Yes	7 (9.5)	1 (3.8)	
Isolated hypercholesterolemia	5 (6.7)	0 (0.0)	0.32
Isolated hypertrygliceridemia	20 (27.0)	5 (19.2)	0.59
Mixed dyslipidemia	7 (9.5)	1 (3.8)	0.67
Low HDL	31 (41.9)	8 (30.8)	0.35
Weight			0.71
Normal	41 (55.4)	17 (65.4)	
Overweight	27 (36.5)	8 (30.8)	
Obesity	6 (8.1)	1 (3.8)	
Hypertension	28 (37.8)	14 (53.8)	0.17
ABI	16 (21.6)	7 (26.9)	0.59
Metabolic syndrome	23 (31.1)	8 (30.8)	1.0
Smoking			0,53
Nonsmoker	58 (78.4)	18 (69.2)	
Former	12 (16.2)	6 (23.1)	
Current	4 (5.4)	2 (7.7)	

Data shown as n (%); * $p < 0.05$ – Fisher's Exact Test.

Table 4. HOMA-IR and HOMA-β value analysis in normal glycemic, pre-diabetes (PDM) and type 2 *diabetes mellitus* (T2DM) groups

HOMA	General	Normal blood glucose	PDM	T2DM
HOMA-IR	9.7 (9.3)	9.1 (8.4)	6.4 (7.6)	12.9 (14.4)
HOMA-β	633.7 (703.7)	733.7 (697.5)*,&	661.1 (711.4)	513.3 (1061.0)

Data shown as mean (±SD); *: $p < 0.01$ compared to T2DM; &: $p = 0.04$ compared to PDM.

DISCUSSION

In this study, the majority of the population (68.7%) consisted of adult individuals born in Japan (*Issei*), characterizing a community that was formed recently. Women made up most of the group, which can be attributed to the fact that men move out of the community to work or study, and even the recent wave of immigration back to Japan.

Obesity is not commonly observed among Japanese migrants in the Americas (10), but the absence of a high BMI does not exclude the occurrence of increased visceral fat deposition. Visceral obesity causes a reduction in glucose utilization mediated by insulin, and is clearly related with insulin resistance.

According to the National Nutrition Survey in Japan (2004), the prevalence of obesity (BMI > 25 kg/m²) in Japanese men and women is 30% and 28%, respectively (11). These values are lower than those shown in this study, in which the prevalence of overweight and obesi-

ty were respectively 29.6% and 46.3% among men, and 15.6% and 39% among women. Our data are similar to those reported in the Japanese-Brazilian subjects from Bauru, Sao Paulo/Brazil, where the prevalence of overweight (BMI > 25 kg/m^2) was 40.2% (12).

Similarly, our population showed mean abdominal circumference values close to those found in the Japanese-Brazilian subjects in Bauru (12), but inferior to Asian-American men in Seattle, United States (10). Anyhow, the average values of the abdominal circumference in the population of Mombuca were higher than those of Japanese living in Japan, both men and women (13).

Moreover, AO was significantly more frequent among men than women. Our results differ from the data on Japanese-Brazilian subjects from Bauru (1). Additionally, in Bauru, the prevalence of AO was greater than the overall prevalence of obesity, while in Mombuca we observed the opposite. In this study, the prevalence of overall obesity (41.9%) was greater than the prevalence of AO (35.7%), supporting other studies that suggest combined analysis of BMI and fat distribution increases the predictive power for CVD and metabolic disorders (14).

Mild or moderate elevations of serum triglycerides and lower serum levels of HDL cholesterol are observed in overweight and obese individuals. However, serum levels of LDL cholesterol may or may not be increased (15). In Mombuca, averages for total cholesterol or fractions and triglycerides were within the normal range.

Several studies have shown that residents of Japanese descent outside of Japan are more susceptible to T2DM, dyslipidemia, ischemic heart diseases, and cerebrovascular diseases (12,16,17). The term metabolic syndrome is accepted by the international medical community as a tool capable of identifying individuals with multiple risk factors for CVD and *diabetes mellitus* (18). We observed a prevalence of 10.7% of T2DM, 46.6% of hypertension, and 35.8% of metabolic syndrome, showing that there is a significant portion of individuals exposed to well-established cardiovascular disease risk factors. The highest incidence of these diseases can occur due to greater genetic susceptibility which, along with changes in lifestyle, lead to deterioration of glucose metabolism, lipids, increased blood pressure, and obesity (1,19,20).

Epidemiological studies that used ECG showed the importance of left ventricular hypertrophy and abnormal Q waves to predict CVD (21-23). In fact, in the Japanese community of Bauru, Q waves, representing myocardial necrosis, were frequent in the ECGs. Our data showed no specific differences in age, fasting blood glucose, lipids, changes in blood pressure and BMI according ECGs findings. This could be explained by the fact that the population is still made up of adults with an average age of less than 60 years, and that the population still retains many of the habits brought from Japan, as well as their work in agriculture. Also, ECG is not very sensitive to predict and diagnose cardiovascular disease.

We did not observe any correlation between ECGs findings and ABI results, either, what may suggest that ABI was not an adequate tool to evaluate atherosclerosis in this population. Perhaps this correlation was not possible because of the small number of individuals studied, and because the evaluation of ABI was not performed by the same researcher. However, it is known that the prevalence of PAD depends on the age of the population studied and the presence of other risk factors or other atherosclerotic events, such as coronary artery disease or cerebrovascular disease. Anyhow, in accordance with other studies, we found a correlation between HOMA-IR and MS (24), reflecting high risk for atherosclerotic disease in this population. We also found that HOMA-β decreases progressively depending on the evolution of glucose abnormalities.

Thus, we conclude that the Japanese-Brazilian subjects from Mombuca/Guatapara are exposed to major cardiovascular risk factors, namely high prevalence of MS diagnoses and increased HOMA-IR values. Although ECG and ABI were not able to identify individuals at risk for CVD at the time of the study, these tools should still be used. Further studies are necessary to evaluate the use of more sensitive techniques to assess cardiovascular disease in this population.

Acknowledgements: we are grateful to patients participating in this study and to Sebastiao L. Brandao Filho for technical assistance. This study received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Disclosure: no potential conflict of interest relevant to this article was reported.

REFERENCES

1. Gimeno SL, Ferreira SRG, Franco LJ, Hirai AT, Matsumura LK, Moisés RS. Prevalence and 7-year incidence of type 2 diabetes mellitus in a Japanese-Brazilian population: an alarming public health problem. Diabetologia. 2002;45:1635-38.

2. Andrade RCG, Figueiredo RC, Foss-Freitas MC, Pace AE, Dal Fabbro AL, Franco LJ, et al. Prevalence of diabetes mellitus in the Japanese-Brazilian community of Mombuca, Guatapara, SP. Arq Bras Endocrinol Metab. 2011;55(2):127-33.
3. Fujimoto WY, Leonetti DL, Kinyoun JL, Newell-Morris L, Shuman WP, Stolov WC, et al. Prevalence of diabetes mellitus and impaired glucose tolerance among second generation Japanese American men. Diabetes. 1987;36:721-9.
4. Murabito JM, D'Agostino RB, Silbershatz H, Wilson WF. Intermittent claudication. A risk profile from The Framingham Heart Study. Circulation. 1997;96:44-9.
5. Arai H, Yamamoto A, Matsuzawa Y, Saito Y, Yamada N, Oikawa S, et al. Prevalence of metabolic syndrome in the general Japanese population in 2000. J Atheroscler Thromb. 2006;13(4):202-8.
6. VI Diretrizes Brasileiras sobre Hipertensão. Sociedade Brasileira de Cardiologia 2010.
7. Alberti KG, Zimmet PZ. Definition, diagnosis and classification of diabetes mellitus and its complications. Part 1. Diagnosis and classification of diabetes mellitus, provisional report of a WHO consultation. Diabet Med. 1998;15:539-53.
8. Geloneze B, Rodovalho-Geloneze S, Parisi C, Pícolo M, Repetto EM, Tambascia MA. Standardization of insulin tolerance test in Brazilian population. Diabetes Res Clin Pract. 2000;50(Suppl 1):S102.
9. International Diabetes Federation. Available from: www.idf.org/metabolic_syndrome.
10. Fujimoto WY, Bergstrom RW, Boyko EJ, Kinyoun JL, Leonetti DL, Newell-Morris LL, et al. Diabetes e diabetes risk factors in second and third-generation Japanese-Americans in Seattle. Diabetes Res Clin Pract. 1994;24(Suppl):S43-52.
11. Ministry of Health, Labor and Welfare, Japan. The National Nutrition Survey in Japan. Dai-ichi Shuppan, Tokyo; 2004.
12. Grupo de Estudos do Diabetes na Comunidade Nipo-Brasileira (JBDSG). Diabetes mellitus e doenças associadas em nipo-brasileiros. São Paulo: Green Forest do Brasil Editora; 2004. p. 133.
13. Arai H, Yamamoto A, Matsuzawa Y, Saito Y, Yamada N, Pikawa S, et al. Prevalence of metabolic syndrome in the general Japanese population in 2000. J Atheroscler Thromb. 2006;13(4):202-8.
14. Egger G. The case for using waist to hip ratio measurements in the routine medical checks. Med J Aust. 1992;156:280-5.
15. Katzel LI, Krauss RM, Goldberg AP. Relations of plasma TG and HDL-c concentrations to body composition and plasma insulin levels are altered in men with small LDL particles. Arterioscler Thromb Vasc Biol. 1994;14:1121-8.
16. Fujimoto WY, Bergstrom RW, Boyko EJ, Chen K, Kahn SE, Leonetti DL, et al. Type II diabetes and the metabolic syndrome in Japanese-Americans. Diabetes Res Clin Pract. 2000;50(Suppl):S73-6.
17. Fujimoto WY, Bergstrom RW, Boyko EJ, Chen KW, Kahn SE, Leonetti DL, et al. Preventing diabetes--applying pathophysiological and epidemiological evidence. Br J Nutr. 2000;84(Suppl):S173-6.
18. World Health Organization. WHO issues new healthy life expectancy rankings, Japan number one in new 'healthy life' System, 2000. Available from: http://www.who.int/inf-pr-2000/en/pr2000--life-html.
19. Franco LJ. Diabetes in Japanese-Brazilians – Influence of the acculturation process. Diabetes Res Clin Pract. 1996;34:S51-7.
20. Franco LJ, Gimeno SGA, Ferreira SRG, Iunes M. Incremento na mortalidade associada à presença de diabetes mellitus em nipo-brasileiros. Rev Saúde Pública. 1998;2:118-24.
21. Westerhout CM, Lauer MS, James S, Fu Y, Wallentin L, Armstrong PW; GUSTO IV ACS Investigators. Electrocardiographic left ventricular hypertrophy in GUSTO IV ACS: an important risk marker of mortality in women. Eur Heart J. 2007;28:2064-9.
22. Menotti A, Seccareccia F. Electrocardiographic Minnesota code findings predicting short-term mortality in asymptomatic subjects. The Italian RIFLE Pooling Project (Risk Factors and Life Expectancy). G Ital Cardiol. 1997;27:40-9.
23. Horibe H, Kasagi F, Kagaya M, Masutani Y, Okayama A, Ueshima H; NIPPON TATA80 Research Group; Working Group of Electrocardiography Coding for the National Survey of Circulatory Disorders, 1980. J Epidemiol. 2005;15:125-34.
24. Rosenbaum P, Gimeno SGA, Franco LJ, Ferreira SRG. Analysis of criteria for metabolic syndrome in a population – Based study of Japanese-Brazilians. Diabetes, Obesity and Metabolism. 2005;352-9.