Nutritional profile and presence of risk factors and protection for non-communicable chronic diseases in diabetics

Francielli Aparecida Garcia da Costa[*] and Giana Zarbato Longo

*Centro Universitário de Maringá, Av. Gueder, 1610, 87050-390, Maringá, Paraná, Brazil. *Author for correspondence. E-mail: frangarcia.nutri@gmail.com*

ABSTRACT. This study aimed to delineate the nutritional profile and to investigate the presence and distribution of factors of risk and protection for Non-Communicable Diseases (NCD) in diabetic participants. For this, 54 individuals of both sexes participated in this study, aged 28 to 87 years who have been attended by a health center of the municipality of Maringá, Paraná State. It was measured the weight, height and waist circumference and applied two questionnaires related to risk factors and food frequency (FFQ) respectively. The study design is cross-sectional and the descriptive analysis was performed using the statistical software Epi info version 3.32 (2005). The results showed that the most relevant risk factors in the diabetic population in relation to NCD have been related to the overweight, lack of physical activity and self-reported hypertension. The protection factors were healthy diet and quitting of smoking. Based on nutritional assessment, the BMI (Body Mass Index) and waist circumference have been positively correlated with high significance. Health education is necessary for the prevention and health promotion of these individuals through the change of lifestyle.

Keywords: eating habits, risk and health protection factors, non-communicable chronic diseases, *Diabetes mellitus*.

Perfil nutricional e presença de fatores de risco e proteção para doenças crônicas não-transmissíveis em diabéticos

RESUMO. Este estudo teve como objetivo traçar o perfil nutricional e investigar a presença e a distribuição dos fatores de risco e de proteção para Doenças Crônicas Não-Transmissíveis (DCNT) em portadores de *Diabetes Mellitus* (DM). Participaram do estudo 54 indivíduos de ambos os sexos, com idade entre 28 a 87 anos, que frequentam um posto de saúde da cidade de Maringá, Estado do Paraná. Foram aferidos o peso, a estatura e a circunferência da cintura e aplicados dois questionários relacionados com fatores de risco e frequência alimentar (QFA), respectivamente. O delineamento da pesquisa é transversal e foi feita análise descritiva pelo programa estatístico Epi info, versão 3.32 (2005). Os resultados demonstraram que os fatores de risco mais relevantes encontrados na população diabética em relação às DCNT´s foram relacionados ao excesso de peso, falta de atividade física e hipertensão autorreferida Os fatores de proteção encontrados foram alimentação saudável e suspensão de tabagismo. Pela avaliação nutricional, o IMC (Índice de Massa Corpórea) e a Circunferência da Cintura tiveram correlação positiva e alta significância. A educação em saúde é necessária para que haja prevenção e promoção da saúde desses indivíduos por meio da mudança dos hábitos de vida.

Palavras-chave: hábitos alimentares, fatores de risco e proteção da saúde, doenças crônicas não-transmissíveis, *Diabetes mellitus*.

Introduction

Cardiovascular diseases (stroke, ischemic), cancer, chronic respiratory disease and *Diabetes mellitus* (DM) are considered non-communicable chronic diseases (NCD) (BRASIL, 2008).

In 2005, about 35 million people died from NCD worldwide, which is the double of deaths related to infectious diseases (WHO, 2005).

The increase in NCD is due to changing in dietary, epidemiological and demographic patterns observed in recent decades in Brazil. This is caused by urbanization and globalization, which resulted in significant changes in food, with increasing availability of processed foods (rich in fat, sugar and sodium), easy access to calorically dense and cheap foods (especially affecting low-income families), overall reduction in physical activity, increased morbidity and mortality, modification of age groups, excessive consumption of alcohol, smoking and stress (BRASIL, 2008; GENTIL, 2009; WHO, 2003b).

The DM stands out because it has been detected increasingly earlier, making necessary the research on distribution and prevalence of risk factors for NCD (OMS, 2002; SBD, 2007).

Diabetes is a condition defined by hyperglycemia that can lead to microvascular damages (retinopathy, nephropathy and neuropathy). It is associated with reduced life expectancy, especially in microvascular

complications, increasing the risk to develop macrovascular complications (ischemic heart disease, stroke and peripheral vascular disease), in addition to decreased quality of life (WHO, 2006).

Hyperglycemia is the result of defects in insulin action, secretion or both. The clinical classification includes four classes: type 1 DM, type 2 DM, other specific types, and gestational DM. There are still two categories considered as pre-diabetes: impaired fasting glucose and impaired glucose tolerance. These categories are not clinical, but risk factors for developing DM and cardiovascular diseases (WHO, 1999).

There are several complications generated by DM, highlighting cardiovascular and cerebrovascular diseases. The number of deaths recorded worldwide attributed to DM is about 800,000 deaths; a value underestimated by the deaths whose cause is a consequence of DM. in Brazil, the number of deaths from diabetes per 100,000 inhabitants represents 0.59% of deaths from 0 to 29 years, and 18.11% of deaths in individuals with 60 years or more. Among the main reasons for the increased number of diabetics is the increased age of population and changes in the lifestyle of migrant communities, especially in food pattern (SBD, 2007).

In this way, the present research is justified by the numerous factors associated with DM. The goals were to delineate the nutritional profile of diabetic individuals and to investigate the factors of risk and protection for Non-Communicable Diseases (NCD).

Material and methods

For data collection, the studied population was made up by 54 individuals with Diabetes Mellitus, within the age group classified as adult and elderly people. Between 28 and 59 years, they were considered as adults, and older than 60, as elderly, and the highest age was 87 years. The study was developed in a Municipal Health Center, in the city of Maringá, Paraná State.

The present research was presented to the Copec (Standing Research Ethics Committee) of the University Center of Maringá (Cesumar), and approved by the Opinion number 0041.0.299.000-09. For the approach of the participants, it was used the Statement of Consent where all the aspects of the research were clearly explained.

To collect the data, the following material was used: portable electronic anthropometric scale (Plenna), with a capacity of 150 kg, inelastic measuring tape with 150 cm length, and two questionnaires structured by the researcher.

To measure the body weight, the scale was placed on a flat surface, and with the individuals wearing light clothes, barefoot, in an upright position, with feet together and arms alongside the body.

Height was measured with a measuring tape attached to a vertical surface without baseboard, at a point 100 cm far from the ground. During the measurement, the participants should be barefoot and standing erect, with no adornment in the head, in Frankfurt position, with shoulders, buttocks and heels touching the wall and feet together, as recommended by the World Health Organization (WHO, 1995).

After taking the measurements, the Body Mass Index (BMI) was calculated (weight in kg divided by the square of height in meters). Adult individuals with BMI < 25 kg m^{-2} were classified as eutrophic, and with overweight those considered pre-obese and obese, respectively with BMI between 25 and 29.9 kg m^{-2} and BMI $\geq$ 30kg m^{-2} (WHO, 2009). Elderly individuals were classified according to the cutoffs recommended by the project Health, Welfare and Aging (WHO, 2001), considering eutrophy with BMI between 23 and 28 kg m^{-2}, and with overweight those pre-obese and obese, respectively with BMI between 28 and 30 kg m^{-2} and BMI $\geq$ 30 kg m^{-2}.

The waist circumference was taken by means of a measuring tape with the individual standing. The tape surrounded the natural line of smaller waist circumference, i.e., between the last rib and the iliac crest, and the reading was made at the time of expiration. For adults, it was considered suitable values (low risk for metabolic complications): $\leq$ 102 cm for men and $\leq$ 88 cm for women, and those at nutritional risk, above these values. For the elderly, suitable values (low risk for metabolic complications): $\leq$ 94 for men and < 80 cm for women, and those at nutritional risk, above these values (WHO, 2003a).

The first questionnaire was entitled risk factor for Non-communicable Chronic Diseases (NCD) (Appendix A). It was formed by 11 closed questions formed by the independent variables: gender, age (in years), education (in years), waist circumference (cm), smoking (smoker, former smoker and current smoker), physical activity (minutes week^{-1} of moderate or vigorous activity), self-reported hypertension (the individual reported to have the disease or not), and one dependent variable: Body Mass Index (BMI) (kg m^{-2}).

In order to determine the eating characteristics, we applied the second questionnaire called "QFF

(questionnaire of food frequency)" with 16 closed questions (Appendix B). The independent variables considered factors of protection for NCD were: consuming five or more times a week of fruit, vegetable, raw salad and beans. The independent variables considered as risk factors were: consumption of soft drinks more than three times a week and habit of consuming whole milk and visible fat from meats.

The two questionnaires were based on the questionnaire as an interview of Simtel Brasil (Monitoring System of Risk Factors for chronic diseases through telephone survey) (MONTEIRO et al., 2005b), which was selected by being the most consistent with the objective of the study and current in the area.

The study has a cross-sectional design. The data were tabulated in Microsoft Excel 2007. The database and the analysis and consistence were performed using the statistical software Epi info version 3.32 (2005). The analysis and data description were carried out by frequencies, proportions, means, standard deviations, presented in tables and graphs. The Pearson correlation was employed to verify the association between BMI and WC, considering $p \leq 0.05$.

Results and discussion

In total, 54 individuals were examined, 64% female and 35.2% male. The adult population represented 44.4 and 55.6% were elderly with mean age of 61 years (sd = 10.4). The education range 0 - 4 years was found in 54.9% of the studied population (sd = 3.4) (Table 1).

Table 1. Distribution of sociodemographic variables of diabetic individuals attended by a Health Center, municipality of Maringá, Paraná State, 2009.

Variable	n	%
Gender		
Female	35	64.8
Male	19	35.2
Age		
20 - 59	24	44.4
≥ 60	30	55.6
Years of education		
≥ 9	7	13.7
5 - 8	16	31.4
0 - 4	28	54.9

The intake of fruits was relevant with 68.5% in study population. Raw salads with 70.4%, considering that 64.8% consume them in the two large daily meals, lunch and dinner. The consumption of cooked vegetables had less prevalence of 35.2%, and among them, 63% consumed them at lunch and dinner.

The obtained data showed an important intake of fruits and vegetables by the population studied. Thus, these foods can work as a protection factors to their

health. Researches have reported that the consumption of fruits and vegetables (FV) act as a protection factor for the main non-communicable chronic diseases (NCD), like cardiovascular diseases and several types of cancer. Moreover, the adequate intake of these foods provides most part of micronutrients, fibers and a range of nutritionally essential factors. The consumption of foods with high concentrations of saturated fats, sugar and salt can be reduced by FV intake FLV (OPAS, 2003; WCRF, 1997; WHO, 2005).

The recommendations for consumption of fruits and vegetables have been translated into national campaigns for health promotion (WHO, 2003a), such as for example, in the campaign "5-ao-dia". Lock et al. (2005) affirm that these actions are minimal, and the promotion of policies related to this theme must be performed, focusing the change of behavior as a whole rather than individual (FREWER et al., 1996; KRIFLIK; YEATMAN, 2005).

Most interviewees (90.8%) reported the intake of beans five or more times a week. The beans also work as a protection factor for NCD. According to Geil and Anderson (1994), its consumption promotes preventive and therapeutic effects for heart diseases, diabetes, obesity and cancer.

The benefits of beans are numerous; it is source of proteins, complex carbohydrates, fiber and nutrients essential to the diet, has low fat and sodium, and no cholesterol (GEIL; ANDERSON, 1994). Furthermore, when compared to cereals (wheat, rice and corn) and several vegetables, beans are the vegetal food with the highest level of dietary fiber (ACEVEDO; BRESSANI, 1990; RIBEIRO et al., 2008).

The fractions that make up the dietary fiber exert important physiological effects on the organism. Soluble fiber reduces the absorption of glucose and serum cholesterol, while insoluble fiber accelerates intestinal transit time, helping to prevent gastrointestinal diseases (MOORE et al., 1998; VANDERHOOF, 1998).

Beans are one of the few foods with balanced content of soluble and insoluble fibers, so it can and should take part of the menus. Additionally, beans are the staple base of most Brazilians, especially in low-income classes, due to lower cost when compared, for example, to sources of animal protein (RIBEIRO et al., 2008).

It was observed a low intake of soft drinks, only 11.2% of participants reported that consume three or more times a week, with higher frequency on the weekends. This result reveals that these beverages, for most interviewees, are being avoided since they can be a risk factor for NCD (MONTEIRO et al., 2008).

In relation to the type of soft drink (diet/light, regular or both), most participants said to consume the diet kind. This is a positive point in the nutritional treatment of diabetics, because it is recommended to remove white sugar (sucrose, fructose and glucose) from the diet, and is indicated the use of sweeteners and diet products, which give sweetness to foods with little or no calories (BRASIL, 2009; FRANCO; CASTRO, 2002).

The use of artificial sweeteners, or foods containing them, allow alternative choices for DM patients, increasing the variety of foods, tolerance in planning the meals and in some cases improve the physiological acceptance of these patients (FRANCO; CASTRO, 2002).

The intake of whole milk was referred by 59.3%. Regarding the consumption of meat without removing visible fats, 18.9% reported consuming beef or pork with the fat, and 26.4% reported eat chicken with skin.

The survey data pointed out low intake of visible fat from meats and average intake of whole milk. According to Monteiro et al. (2005a), this consumption tends to grow more and more among Brazilians, as verified by a research that evaluated the distribution and evolution of foods in Brazil, from 1974 to 2003. In this study, the more economically developed regions and generally in urban area, there was an excessive consumption of fats in general, and saturated fats, among them animal-based foods, in addition to increased consumption of industrialized foods, highlighting soft drink and cookies, and excessive consumption of sugar.

There is an increasingly availability of tasty foods with high energy and relatively low cost promoted by food industry. The media and scientific discourse on food advertising are used, exerting changes in the food scenario. Although in poor countries, these trends are not applied to all social classes, the access to goods and the consumer desires alone, delimitate an inclination to this dietary profile (DREWNOWSKI, 2000; GARCIA, 2003).

Physical activity of the study population was evaluated as insufficient in 100%, that is, less than 150 minutes were practiced per week (MATSUDO et al., 2001), which are recommended for prevention of NCD. The sedentary lifestyle is increasingly common in Brazilian society. Several authors have shown the association between inactivity and cardiovascular diseases, cancer, diabetes and mental health. Other studies indicated that the physical inactivity in leisure is associated with hypertension and diabetes, and is more prevalent in women, elderly and people with low education (PITANGA; LESSA, 2005).

It is recommended for diabetics the regular practice of physical exercises. This practice added to an eating adequate for the diabetic and the pharmacological treatment is the main approach for treating disease. The regular physical activity for *Diabetes mellitus* (DM) and hypertension has beneficial effects on cardiovascular risk, metabolic control, and prevention of chronic complications of the diseases (ADA, 2003; UK PROSPECTIVE DIABETES STUDY GROUP, 1998).

Smoking was found in only 11.1% of population in general. The studied population may have presented this data because they have consulted health services more frequently than non-diabetic patients. Thus, this group has greater access to preventive actions of chronic complications of DM, including quitting smoking, as observed by Macfarlane et al. (2001).

Considering self-reported hypertension, the majority of people (74.1%) reported having this disease. The systemic hypertension (SH) defined as systolic blood pressure and/or diastolic blood pressure persistently high, usually above 140 - 90 mmHg, is a very common health problem (between 20 and 60%) in patients with diabetes mellitus, particularly in type 2. Its presence also implies a substantial increase in the cardiovascular risk (twice more than non-diabetic hypertensive) and may trigger or accelerate not only microvascular lesions of DM, particularly in the kidney and retina, as well as macrovascular, such as cerebrovascular accident (CVA), coronary heart disease (CHD) or peripheral arterial disease (PAD) (ALVARENGA, 2005).

The SH control in people with diabetes results in decreased damages to target organs. For this, lifestyle changes are needed for clinical improvement (PAIVA et al., 2006). A healthy diet, physical activity, glycemic control, blood pressure control, and dyslipidemia control bring satisfactory results in controlling these diseases (FURTADO; POLANCZYK, 2007).

In relation to the assessment of body weight in kg for both genders, female population had mean weight of 73 kg, and male, 83 kg.

In comparison with the Household Budget Survey from 2002-2003 and other studies already performed in the country, such as in 1974-1975 (National Survey of Household Expenditure) and in 1989 (National Survey on Health and Nutrition), it becomes clear that the obesity is increasing in men, and in women there is increase of about 50% between 1974-1975 and 1989, and relative stability between 1989 and 2002-2003 (REZENDE et al., 2006).

According to the evaluation of BMI, in adult population, it was found 91.7% with overweight. In elderly population, this number reduced to 60%. The majority of the population studied was overweight. In this way, the WHO (World Health Organization) considers as the root cause of overweight and obesity,

the imbalance between energy intake and expenditure. This weight gain may be associated with increased intake of high energy dense foods (rich in sugar and fat) and decrease in physical activity, also prevalent in the data collected, highlighting the role of nutrition with a variable determinant to the NCD (DIAS; CAMPOS, 2008; WHO, 2009).

Diabetics are more prone to excess weight, as shown by Gomes et al. (2006) that evaluated the prevalence of overweight and obesity in patients with type 2 DM. It was stressed that the chance of patients having excess weight is three times higher than in Brazilian population in general.

The lifestyle is directly related to the incidence of type 2 DM, and the presence of metabolic syndrome, obesity and physical inactivity increase the risk dramatically. Some studies have shown that people that consume a diet rich in whole grains and polyunsaturated fatty acids, associated with reduced consumption of trans fatty acids and foods with high glycemic index, have presented reduced risks for developing *diabetes mellitus* (MCLELLAN et al., 2007).

By means of the BMI, most adults was overweight, for the elderly, there was a significant decline. According to Cervi et al. (2005), in middle age (50 to 65 years), this is a nutritional problem, mainly associated with chronic degenerative diseases. For those above 80 years, thinness and lean mass loss are the major problems. Aging implies changes in body composition as loss of bone, muscle, and body water and increased body fat redistribution (NAGAYA et. al., 1999).
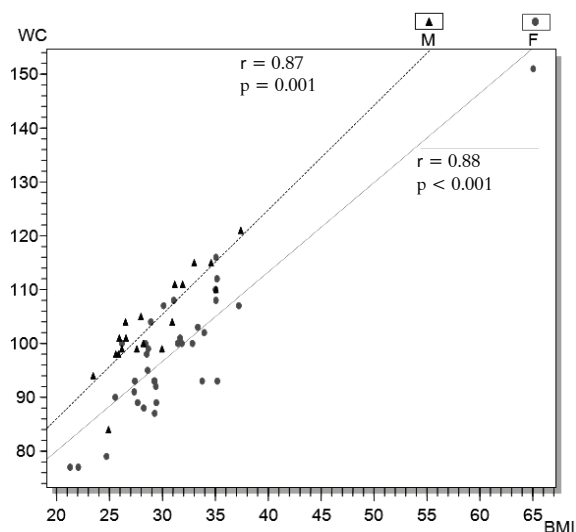

Figure 1. Correlation between BMI and WC according to the gender of diabetic individuals attended by a Health Center, Maringá, Paraná State, 2009.

The Figure 1 illustrates a positive and highly significant correlation between the BMI (Body Mass

Index) and WC (Waist Circumference) in men (r = 0.87; p = 0.001) and women (r = 0.88; p = 0.001).

As well as in the present study, the correlation between BMI and anthropometric indicators, in this case the waist circumference was positive in studies performed in developed countries with samples representative of adults of both sexes (NAVARRO; MARCHINI, 2000).

The obesity and particularly the abdominal fat location has great impact on cardiovascular diseases by being frequently associated with conditions like dyslipidemias, hypertension, insulin resistance and diabetes that favor the occurrence of cardiovascular events, particularly coronary. Regardless of the overweight, the abdominal fat is an important risk factor for these conditions (FERREIRA et. al., 2006).

Conclusion

Through the present study, it was identified that some factors of protection for NDC are present in the evaluated sample, such as the healthy eating and quitting smoking, but some risk factors were also present like the physical inactivity, overweight and hypertension.

The management of *Diabetes mellitus* should be performed in a hierarchical health system, its base being the primary level of care, especially for those from less privileged social class. It is of paramount importance the purpose to generate effective changes in prevention, treatment and health promotion.

With the development of interdisciplinary projects applied concurrently in several health centers, with several professionals involved, such as doctors, nurses, nutritionists, physical educators, among others, it is possible to encourage the population to prevent risk factors for non-communicable chronic diseases, by means of healthy eating, physical exercises, weight control and quitting smoking.

Acknowledgements

References

ACEVEDO, E.; BRESSANI, R. Contenido de fibra dietetica y digestibilidad del nitrogeno en alimentos centroamericanos: Guatemala. **Archivos Latinoamericanos de Nutricion**, v. 40, n. 3, p. 439-451, 1990.

ADA-American Diabetes Association. *Diabetes mellitus* and exercise. **Diabetes Care**, v. 26, n. 1, p. 64-68, 2003.

ALVARENGA, C. Hipertensão arterial na *Diabetes mellitus* tipo 2 - evidência para a abordagem terapêutica. **Revista Portuguesa de Clínica Geral**, v. 21, p. 597-604, 2005.

BRASIL. Ministério da Saúde. **Diretriz e recomendações para o cuidado integral de doenças crônicas não-transmissíveis**. Brasília: Ministério da Saúde, 2008. v. 8.

BRASIL. Angência Nacional de Vigilância Sanitária. **Legislação em Vigilância Sanitária**. Avaliable from: <http://www.e-legis.anvisa.gov.br/leisref/public/showAct. php?id=17213&word=>. Access on: Oct. 18, 2009.

CERVI, A.; FRANCESCHINI, S. C. C.; PRIORE, S. E. Análise crítica do uso de índice de massa corporal para idosos. **Revista Nutrição**, v. 18, n. 6, p. 765-775, 2005.

DIAS, J. C. R.; CAMPOS, J. A. D. B. Aspectos epidemiológicos da obesidade e sua relação com o *Diabetes mellitus*. Nutrire: **Revista da Sociedade Brasileira de Alimentação e Nutrição**, v. 33, n. 1, p. 103-115, 2008.

DREWNOWSKI, A. Nutrition transition and global dietary trends. **Nutrition Reviews**, v. 16, n. 7, p. 486-487, 2000.

FERREIRA, M. G.; VALENTE, J. G.; GONÇALVES-SILVA, R. M. V.; SICHIERI, R. Acurácia da circunferência da cintura e da relação cintura/quadril como preditores de dislipidemias em estudo transversal de doadores de sangue de Cuiabá, Mato Grosso, Brasil. **Caderno de Saúde Pública**, v. 22, n. 2, p. 307-314, 2006.

FRANCO, L. J.; CASTRO, A. G. P. Caracterização do Consumo de Adoçantes Alternativos e Produtos Dietéticos por Indivíduos Diabéticos. **Arquivos Brasileiros de Endocrinologia e Metabolismo**, v. 46, n. 3, p. 280-287, 2002.

FREWER, L. J.; HOWARD, C.; HEDDERLY, D.; SHEPERD, R. What determines trust in information about food related risks? Underlying psychological constructs. **Risk Analysis**, v. 16, n. 4, p. 473-486, 1996.

FURTADO, M. V.; POLANCZYK, C. A. Prevenção Cardiovascular em pacientes com Diabetes: Revisão baseada em evidências. **Arquivos Brasileiros de Endocrinologia e Metabolismo**, v. 57, n. 2, p. 312-318, 2007.

GARCIA, R. W. D. Reflexos da globalização na cultura alimentar: considerações sobre as mudanças na alimentação urbana. **Revista Nutrição**, v. 16, n. 4, p. 483-492, 2003.

GEIL, P. B.; ANDERSON, J. W. Nutrition and health implications of dry beans: a review. **Journal of the American College of Nutrition**, v. 13, n. 6, p. 549-558, 1994.

GENTIL, P. C. **Estratégia global alimentação saudável, atividade física e saúde**. 2009. Avaliable from: <http://www.hub.unb.br>. Access on: Oct. 20, 2009.

GOMES, M. B.; GIANELLA, N. D.; MENDONÇA, E.; TAMBASCIA, M. A.; FONSECA, R. M.; RÉA, R. R.; MACEDO, G.; MODESTO, F. J.; SCHMID, H.; BITTENCOURT, A. V.; CAVALCANTI, S.; RASSI, N.; FARIA, M.; PEDROSA, H.; DIB, S. A. Prevalência de sobrepeso e obesidade em pacientes com *Diabetes Mellitus* do Tipo 2 no Brasil: Estudo Multicêntrico Nacional. **Arquivos Brasileiros de Endocrinologia e Metabolismo**, v. 50, n. 1, p. 136-144, 2006.

KRIFLIK, L. S.; YEATMAN, H. Food scares and sustainability: a consumer perspective. **Health, Risk and Society**, v. 7, n. 1, p. 11-24, 2005.

LOCK, K.; POMERLEAU, J.; CAUSER, L.; ALTMANN, D. R.; MCKEE, M. The global burden of disease attributable to low consumption of fruit and vegetables: implications for the global strategy on diet. **Bull World Health Organization**, v. 83, n. 2, p. 100-108, 2005.

MACFARLANE, I.; GILL, G.; GROVE, T.; WALLYMAHMED, M. Trends in the smoking habits of young adults with diabetes. **Postgraduate Medical Journal**, v. 77, n. 909, p. 461-463, 2001.

MATSUDO, S.; ARAÚJO, T.; MATSUDO, V.; ANDRADE, D.; ANDRADE, E.; OLIVEIRA, L. C.; BRAGGION, G. Questionário Internacional de Atividade Física (IPAQ): estudo de validade e reprodutibilidade no Brasil. **Revista Brasileira de Atividade Física e Saúde**, v. 2, n. 6, p. 5-12, 2001.

MCLELLAN, K. C. P.; BARBALHO, S. M.; CATTALINI, M.; LERARIO, A. C. *Diabetes mellitus* do tipo 2, síndrome metabólica e modificação no estilo de vida. **Revista Nutrição Campinas**, v. 20, n. 5, p. 515-524, 2007.

MONTEIRO, C. A.; LEVY-COSTA, R. B.; SICHIERI, R.; PONTES, N. S. Disponibilidade domiciliar de alimentos no Brasil: distribuição e evolução (1974-2003) **Revista de Saúde Pública**, v. 39, n. 4, p. 530-540, 2005a.

MONTEIRO, C. A.; MOURA, E. C.; JAIME, P. C.; LUCCA, A.; FLORINDO, A. A.; FIGUEIREDO, I. C. R.; BERNAL, R.; SILVA, N. N. Monitoramento de fatores de risco para as doenças crônicas por entrevistas telefônicas. **Revista de Saúde Pública,** v. 39, p. 47-57, 2005b.

MONTEIRO, C. A.; MOURA, E. C.; JAIME, P. C.; CLARO, R. M. Validade de indicadores do consumo de alimentos e bebidas obtidos por inquérito telefônico. **Revista de Saúde Pública**, v. 42, n. 4, p. 582-589, 2008.

MOORE, M. A.; PARK, C. B.; TSUDA, H. Soluble and insoluble fiber influences on cancer development. **Critical Reviews in Oncology/Hematology**, v. 27, n. 3, p. 229-242, 1998.

NAGAYA, T.; YOSHIDA, H.; TAKAHASHI, K.; MATSUDA, Y.; KAWAI, M. Body mass index (weight/height2) or percentage body fat by bioelectrical impedance analysis: which variable better reflects serum lipid profile? **Internacional Journal of Obesity**, v. 23, n. 7, p. 771-779, 1999.

NAVARRO, A. M.; MARCHINI, J. S. Uso de medidas antropométricas para estimar gordura corporal em adultos. Nutrire: **Revista da Sociedade Brasileira de Alimentos**, v. 20, n. 19, p. 71-74, 2000.

OMS-Organización Mundial de la Salud. **Informe sobre la salud en el mundo**: reducir os riesgos y promover una vida sana. Genebra: Organización Mundial de la Salud, 2002.

OPAS-Organização Pan-Americana da Saúde. **Doenças crônico-degenerativas e obesidade**: estratégia mundial sobre alimentação saudável, atividade física e saúde. Brasília: Organização Pan-Americana da Saúde, 2003.

PAIVA, D. C. P.; BERSUSA, A. A. S.; ESCUDER, M. M. L. Avaliação da assistência ao paciente com diabetes e/ou hipertensão pelo Programa Saúde da Família do Município de Francisco Morato, São Paulo, Brasil. **Cadernos de Saúde Pública**, v. 22, n. 2, p. 377-385, 2006.

PITANGA, F. J. G.; LESSA, I. Prevalência e fatores associados ao sedentarismo no lazer em adultos. **Cadernos de Saúde Pública**, v. 21, n. 3, p. 870-877, 2005.

REZENDE, F. A. C.; ROSADO, L. E. F. P. L.; RIBEIRO, R. C. L.; VIDIGAL, F. C.; VASQUES, A. C. J.; BONARD, I. S.; CARVALHO, C. R. Índice de massa corporal e circunferência abdominal: associação com fatores de risco cardiovascular. **Arquivos Brasileiros de Cardiologia**, v. 87, n. 6, p. 728-734, 2006.

RIBEIRO, N. D.; ANTUNES, I. F.; POERSCH, N. L.; ROSA, S. S.; TEIXEIRA, M. G.; GOMES, A. L. S. Potencial de uso agrícola e nutricional de cultivares crioulas de feijão. **Ciência Rural**, v. 38, n. 3, p. 628-634, 2008.

SBD-Sociedade Brasileira de Diabetes. **Tratamento e acompanhamento do Diabetes mellitus**: Diretrizes da Sociedade brasileira de diabetes. 2007. Avaliable from: <http://www.diabetes.org.br>. Access on: Oct. 10, 2009.

UK PROSPECTIVE DIABETES STUDY GROUP. Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes (UKPDS 38). **British Medical Journal**, v. 7160, n. 317, p. 703-713, 1998.

VANDERHOOF, J. A. Immunonutrition: the role of carbohydrates. **Nutrition**, v. 14, n. 7/8, p. 595-598, 1998.

WCRF-World Cancer Research Fundation. American Institute for Cancer Research. **Food, nutrition and the prevention of cancer**: a global perspective. Washington, D.C.: American Institute for Cancer Research, 1997.

WHO-World Health Organization. **Physical status**: the use and interpretation of anthropometry. Geneva: WHO, 1995.

WHO-World Health Organization. **Definition, diagnosis and classification of Diabetes mellitus and its complications**. Geneva: WHO, 1999.

WHO-World Health Organization. Anales da 36ª Reunión del Comité Asesor de Investigaciones en salud. **Encuesta multicentrica**: salud, bien estar y envejecimiento (SABE) en América Latina y el Caribe. Washington, D.C.: World Health Organization, 2001.

WHO-World Health Organization. **Diet, nutrition and the prevention of chronic diseases**. Geneva: WHO, 2003a.

WHO-World Health Organization: **Shaping the future**. Geneva: WHO, 2003b.

WHO-World Health Organization. **Preventing Chronic Diseases a vital investments**. Geneva: WHO, 2005.

WHO-World Health Organization. **Definition and diagnosis of Diabetes mellitus and intermediate hyperglycemia**. Geneva: WHO, 2006.

WHO-World Health Organization. **Obesity and overweight**. 2003. Available from: <http://www.who.int/mediacentre/factsheets/fs311/en/print.html>. Access on: Ouc. 10, 2009.

APPENDIX A

Risk factors for non-communicable chronic diseases (ncd).

Number of the questionnaire: _____

1 Gender	Male ( ) Female ( )
2 Age (in full years)	Age |__ __|
3 Years of education	|__ __|
4 Weight (Kg)	Weight |__ __|
5 Height (cm)	Height |__ __|
6 Waist circumference (cm)	Waist |__ __|
7 Reported Hypertension	Yes ( ) No ( )
8 Smoker	Smoker ( ) Non-smoker ( ) Former-smoker ( ) Current smoker ( )
9 How many days of the last week have you walked at least 10 continuous minutes at home or at work, as a means of transport to go from one place to another, for leisure, pleasure, or as form of exercise?	Days a week |__ __|
10 How may days of the last week have you performed MODERATE activities at least 10 continuous minutes, such as for example, light bike riding, swimming, dancing, light aerobics, recreational volleyball, carrying light weights, doing chores in the house, yard or garden like sweeping, vacuuming, gardening, or any activity that increased moderately your breathing or heartbeat (PLEASE, DO NOT INCLUDE WALK)	Days a week |__ __|
11 How many days of the last week have you performed VIGOROUS activites at least 10 continuous minutes, such as for example, jogging, aerobics, soccer, cycling fast on the bike, playing basketball, doing heavy chores in the house, yard, or digging in the garden, carrying heavy loads, or any activity that increased GREATLY your breathing or heartbeat.	Days a week |__ __|

APPENDIX B

Questionnaire of food frequency (qff).

1 How many days a week do you usually eat fruit?	( ) every day ( ) 5 to 6 days ( ) 1 to 4 days ( ) almost never or never
2 In these days, how many times do you eat fruit?	( ) Once a day ( ) Twice a day ( ) three or more times a day ( ) None of the above
3 How many days a week do you eat raw salad, as for example: lettuce, tomato, cucumber?	( ) every day ( ) 5 to 6 days ( ) 1 to 4 days ( ) never or almost never
4 In these days, you eat raw salads:	( ) at lunch ( ) at dinner ( ) at lunch and dinner. ( ) None of the above
5 How many days a week do you eat cooked vegetables, like collard green, carrot, chayote, eggplant, and zucchini, except potato or cassava? emana o(a) sr (a) costuma comer verduras e legumes cozidos, como couve, cenoura, chuchu, berinjela,abobrinha, sem contar batata ou mandioca?	( ) every day ( ) 5 to 6 days ( ) 1 to 4 days ( ) never or almost never
6 In these days, you eat cooked vegetables: (read the alternatives)	( ) at lunch ( ) at dinner ( ) at lunch and dinner. ( ) None of the above
7 How many days a week do you eat beans?	( ) every day (including Saturday and Sunday) ( ) 5 to 6 days ( ) 3 to 4 days ( ) 1 to 2 days ( ) almost never ( )never
8 How many days a week do you take soft drink?	( ) every day ( ) 5 to 6 days ( ) 3 to 4 days ( ) 1 to 2 days ( ) almost never ( ) never
9 What kind?	( ) regular ( ) diet/light ( ) both ( ) None of the above
10 How many cups/cans do you usually take per day? (note the number)	|_ _|
11 Do you usually take milk? (except soy milk)	( ) yes ( ) no
12 When you take milk, what type of milk do you usually take?	( ) whole ( ) skimmed or semi-skimmed ( ) both ( ) do not know ( ) None of the above
13 Do you usually eat beef or pork?	( ) yes ( ) no
14 When you eat beef or pork with fat, you usually	( ) Always remove the excessive fat ( ) Eat with the fat ( ) Do not eat red meat with too much fat
15 Do you usually eat chicken?	( ) yes ( ) no
16 When you eat chicken with skin, you usually	( ) Always remove the skin ( ) Eat with the skin ( ) Do not eat chicken with skin ( ) None of the above