



Framingham score in the evaluation of cardiovascular risk in diabetics

Escore de Framingham na avaliação do risco cardiovascular em diabéticos

Score de Framingham en la evaluación del riesgo cardiovascular en diabéticos

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One aimed to identify cardiovascular risk of diabetics registered by a family health team. Cross-sectional study, conducted in the city of Aracaju, in October and November 2012. Framingham score was used in 80 diabetics of both genders. The participants were between 30 to 74 years old, and the majority (70%) were women. By Framingham score, there was a higher proportion (45.8%) of high risk among men and 41.1% of women were at medium risk of triggering cardiovascular disease. No statistically significant differences were observed between genders and the levels of LDL-cholesterol and HDL-cholesterol. However, average cardiovascular risk among women and high risk among men was present, which points to the possibility of triggering cardiovascular changes among people with diabetes attended in Primary Health Care. Adopting health promotion strategies which allow for increased cardiovascular risk control in the assisted population is recommended.

Descriptors: Diabetes Mellitus; Cardiovascular Diseases; Diagnosis of Health Situation.

Objetivou-se identificar o risco cardiovascular de diabéticos cadastrados por uma Equipe de Saúde da Família. Estudo transversal, realizado em Aracaju, SE, Brasil, em outubro e novembro de 2012. Foi utilizado o escore de Framingham em 80 diabéticos de ambos os sexos. Os participantes tinham entre 30 a 74 anos, e a maioria (70%) era mulher. Pelo escore de Framingham houve maior proporção (45,8%) de risco alto entre os homens e 41,1% das mulheres apresentavam risco médio de desencadear as doenças cardiovasculares. Não foram observadas diferenças estatisticamente significativa entre os sexos e os níveis de LDL-colesterol e HDL-colesterol. Estiveram presentes, portanto, risco cardiovascular médio entre mulheres e risco alto entre os homens, o que permitiu apontar possibilidade do desencadeamento de alterações cardiovasculares entre pessoas com diabetes atendidas na Atenção Primária de Saúde. Urge adotar estratégias de promoção da saúde que possibilitem um aumento do controle do risco cardiovascular na população assistida.

Descritores: Diabetes Mellitus; Doenças Cardiovasculares; Diagnóstico da Situação de Saúde.

El objetivo fue identificar el riesgo cardiovascular de diabéticos registrados por un Equipo de Salud Familiar. Estudio transversal, realizado en Aracaju, SE, Brasil, en octubre y noviembre de 2012. Se utilizó el score de Framingham en 80 diabéticos de ambos los sexos. Los participantes tenían entre 30 y 74 años, y la mayoría (70%) era mujer. Por el score de Framingham, hubo mayor proporción (45,8%) de alto riesgo entre los hombres y 41,1% de las mujeres presentaban medio riesgo de desencadenar enfermedades cardiovasculares. No se observaron diferencias estadísticamente significativas entre sexos y los niveles de LDL-colesterol y HDL-colesterol. Estuvieron presentes riesgo cardiovascular promedio entre mujeres y alto riesgo entre los hombres, lo que permitió apuntar posibilidad de desencadenar cambios cardiovasculares entre personas con diabetes en Atención Primaria de Salud. Es preciso adoptar estrategias de promoción de salud que permitan aumento de control del riesgo cardiovascular en la población asistida.

Descriptores: Diabetes Mellitus; Enfermedades Cardiovasculares; Diagnóstico de la Situación de Salud.

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Introduction

Diabetes mellitus encompasses a group of metabolic disorders, characterized by chronic hyperglycaemia, with changes in the metabolism of carbohydrates, fats and proteins, resulting in deformities in the excretion and / or actuation of insulin. Chronic hyperglycaemia relating to diabetes *mellitus* is associated to the dysfunction, damage and failure of various organs, particularly eyes, kidneys, nervous system, heart and blood vessels⁽¹⁾.

The classic symptoms of diabetes are polyuria, polydipsia, polyphagia and unintentional weight loss. Several symptoms raise clinical suspicion such as fatigue, weakness, drowsiness, skin and vulvar itching, and recurrent infections. In certain cases, the diagnosis is made from chronic complications such as neuropathy, retinopathy or atherosclerotic cardiovascular disease. However, diabetes is asymptomatic⁽²⁾.

The bases for treatment are to maintain the glycemic index and insulin at normal values. This control is used for precaution of acute and chronic complications of the disease. Suitable glucose levels are not achieved by the majority of patients through drug treatment as they are overweight and are resistant to diet control⁽³⁾.

Cardiovascular disease is the leading cause of morbidity and mortality in those with diabetes *mellitus*, more specifically coronary artery disease, cerebrovascular disease and peripheral arterial disease. Individuals with type 2 diabetes *mellitus* exhibit two to three times more frequent cases of cardiovascular disease, since macrovascular changes are equal to two times microvascular complications. This category is in large part related to risk factors such as obesity, dyslipidemia and hypertension⁽⁴⁾.

With Diabetes, vascular disorders are classified into two categories: microvascular, which is the main cause of death in subjects with type 1 diabetes, and macrovascular being the main cause in subjects with type 2. Microvascular impairment is associated to small vessels, capillaries and arterioles which ends up

attacking the kidneys, and induces diabetic nephropathy and changes in the systemic vascular system, among others⁽⁵⁻⁶⁾.

The involvement of large vessels (macrovascular involvement) is an accelerated form of atherosclerosis, responsible for the high incidence of cardiovascular disease, inducing the maximum mortality rates due to myocardial infarction, stroke and peripheral gangrene⁽⁵⁻⁶⁾.

The prevention of cardiovascular complications is a priority in terms of public health. For this reason, it is important to use tools that encourage preventive research and enable risk categorization of each individual⁽⁷⁾.

The Framingham risk score was developed in a large longitudinal population study by US researchers, being widely used around the world. It is based on numerical values, both positive and negative from zero, in accordance with the risk values attributed to the age, blood pressure, high density lipoprotein (HDL) cholesterol, low density lipoprotein (LDL) cholesterol, smoking and diabetes. Each score obtained corresponds to a percentage of the probability of occurrence of a cardiovascular event⁽⁷⁻⁸⁾.

From risk assessed by the score, diabetics can be estimated at low risk (less than 10%), medium (10% to 20%) and high (over 20%) for the development of cardiovascular disease within 10 years. This allows for time to take effective action to reduce the risks, which in turn can be done by modifying the diet, stop smoking, increase activity, and in cases of high risk the health team should prescribe certain drugs⁽⁸⁾.

In the entire adult population in Brazil, prior diagnosis of diabetes was 5.6%, and 5.2% for men. In the Northeast region, it was 5.5% in men and 6% among women. In Aracaju, adults with previously diagnosed diabetes ranged from 4.2% for males and 6.9% for females. In the state of Sergipe from January 2010 to September 2012, 3,736 hospitalizations were registered for diabetic complications⁽⁹⁻¹⁰⁾.

This study is justified because diabetes *mellitus* is a chronic disease of great impact on the public heal-

th system, to the individual and their family, plus there is high levels of morbidity and mortality, and high possibility of developing cardiovascular diseases.

The objectives of this research was to identify the cardiovascular risk of diabetics registered by a Family Health Team in the city of Aracaju; to characterize the demographic, socioeconomic and epidemiological profile; and use the Framingham score to identify the cardiovascular risks of these individuals.

Methods

This is a cross-sectional study with a quantitative approach, conducted at the Renato Lucas Lamarão Mazze Family Health Unit in the north of Aracaju, in the period from October to November 2012.

For composition of the study population, we considered the population of 100 registered diabetics, with a confidence level of 95% and maximum error tolerance of up to 5%; 80 individuals were estimated to participate in the research, and therefore 80 people with diabetes were studied.

The study included diabetics aged 30-74 years of both genders, registered by the health team. Users were excluded if they had cardiovascular disease and those who did not undergo a cholesterol test (LDL and HDL) in the last 12 months.

Data collection was performed using a structured questionnaire based on the Framingham risk score, being able to estimate the risk of developing cardiovascular disease in the next ten years. The data collection instrument presented the following as variables: age, gender, income, education, smoking, blood pressure levels and results of cholesterol tests. To calculate the risk of cardiovascular events, each variable had a value based on the sum of the points, cardiovascular risk was estimated at low (less than 10%), medium (10% to 20%) or high (more 20%). For data analysis, simple descriptive statistics were used.

The results were analyzed by simple and absolute frequency, and the Fisher's exact test was used with a significance level of 5% ($p \leq 0.05$) to evaluate the association between cardiovascular risk and other variables.

The project was authorized by the Aracaju Municipal Health Department and approved by the Research Ethics Committee of the Tiradentes University by document number 200912.

Results

Individuals who suffer from diabetes were concentrated in the age group between 30-74 years of age (average of 54 years), where the largest proportion ($n=56$; 70%) were females; 75% ($n=60$) reported a family income of one to two minimum wages. As for education, 60.1% ($n=48$) had complete or incomplete elementary education. With regard to smoking, 8.8% ($n=7$) of subjects were smokers (Table 1).

Table 1 - Characterization of diabetic patients attended by the Family Health Unit Team ($n=80$)

| Patient characteristics | n (%) |
|----------------------------------|-----------|
| Age | |
| 30-39 | 7 (8.8) |
| 40-49 | 23 (28.9) |
| 50-59 | 17 (21.3) |
| ≥ 60 | 33 (41.0) |
| Gender | |
| Female | 56 (70.0) |
| Male | 24 (30.0) |
| Family Income (minimum wages) | |
| <1 | 5 (6.3) |
| 1-2 | 60 (75.0) |
| 3 | 12 (15.0) |
| >4 | 3 (3.7) |
| Scholarship | |
| None | 8 (10.0) |
| (in)complete Primary Education | 48 (60.1) |
| (in)complete Secondary Education | 22 (27.3) |
| (in)complete Superior Education | 2 (2.6) |
| Smokers | |
| Yes | 7 (8.8) |
| No | 73 (91.2) |

Regarding the reported amounts of LDL-cholesterol, there was no statistically significant difference between genders ($p=0.97$). However, the highest percentage difference was noted among women with levels ≥ 190 mg/dL greater than men (Table 2).

Table 2 - Distribution of LDL-cholesterol levels of diabetic patients attended by the Family Health Unit Team

| LDL-cholesterol (mg/dL) | Gender | | χ^2 (p value) |
|-------------------------|---------------|-----------------|--------------------|
| | Male n (%) | Female n (%) | |
| <100 | 2 (8.3) | 6 (10.7) | 0.77 (0.97) |
| 100-129 | 3 (12.5) | 8 (14.3) | |
| 130-159 | 7 (29.2) | 18 (32.1) | |
| 160-189 | 7 (29.2) | 16 (28.6) | |
| ≥ 190 | 5 (20.8) | 8 (14.3) | |

There was no significant difference ($p=0.68$) the values of HDL-cholesterol levels between the genders of people with diabetes, however, in women, the percentage of HDL-cholesterol levels 45 to 49 mg/dL had higher proportions (48.3%) (Table 3).

Table 3 - Distribution of HDL-cholesterol levels among gender of diabetics attended by the Family Health Unit Team

| LDL-cholesterol (mg/dL) | Gender | | χ^2 (p value) |
|-------------------------|---------------|-----------------|--------------------|
| | Male n (%) | Female n (%) | |
| <35 | 4 (16.7) | 11 (19.6) | 2.63 (0.68) |
| 35-44 | 9 (37.5) | 12 (21.4) | |
| 45-49 | 9 (37.5) | 27 (48.3) | |
| 50-59 | 2 (8.3) | 5 (8.9) | |
| ≥ 60 | - | 1 (1.8) | |

Significant differences regarding the blood pressure values measured between the genders were not observed ($p=0.73$). Proportionally, women showed higher values than men in four ranges: 120/80-99; 130-139/80-99; 140-159/80- ≥ 100 and $\geq 160/\geq 100$ mmHg (Table 4).

Table 4 - Distribution of blood pressure values of diabetics treated by the Family Health Unit Team

| Blood pressure (mmHg) | Gender | | χ^2 (p value) |
|------------------------|---------------|-----------------|--------------------|
| | Male n (%) | Female n (%) | |
| <120/80-99 | 7 (29.2) | 17 (30.4) | 2.24 (0.73) |
| 120-129/80-99 | 7 (29.2) | 15 (26.8) | |
| 130-139/80-99 | 5 (20.8) | 14 (25.0) | |
| 140-159/80- ≥ 100 | 3 (12.5) | 9 (16.0) | |
| $\geq 160/80-84$ | 2 (8.3) | - | |
| $\geq 160/\geq 100$ | - | 1 (1.8) | |

Through use of the Framingham score, there was a higher proportion of high risk among men: 45.8% ($n=11$). Females showed 41.1% ($n=23$) at a medium risk of triggering cardiovascular disease. There was no statistically significant difference ($p=0.17$) between the genders (Table 5).

Table 5 - Distribution of the values of cardiovascular risk in diabetic men and women attended by the Family Health Unit Team

| Cardiovascular risk (%) | Gender | | χ^2 (p value) |
|---------------------------|---------------|-----------------|--------------------|
| | Male n (%) | Female n (%) | |
| Low risk (less than 10%) | 3 (12.5) | 17 (30.4) | 3.58 (0.17) |
| Medium risk (10 a 20%) | 10 (41.7) | 23 (41.1) | |
| High risk (more than 20%) | 11 (45.8) | 16 (28.5) | |

Discussion

Diabetes *mellitus* is responsible for several changes in people's lives and is a prevalent public health problem that is costly as both a social and economic issue. It is a disease of large magnitude that makes

up a set of chronic diseases and is characterized by the destruction of beta cells in the pancreas leading to a deficiency of insulin secretion. Diabetes *mellitus* and cardiovascular disease are derived from the same genetic element and the same environmental antecedents, with insulin resistance a major and possible precedent^(2,11-12).

The age range found in the study demonstrates the occurrence of diabetes in individuals of older ages, with females being the highest percentage. This is related to the fact that the female population frequent health services more often and regularly, resulting in a larger number of women diagnosed⁽¹³⁾.

Generally, individual males seek less health care services. This is alarming, because in addition to precluding an early diagnosis, males end up developing vulnerability to cardiovascular complications due to lack of adequate treatment, both medical and non-medical, which contributes an increase in the mortality rate in these individuals. With regard to morbidity rate, women have higher rates than men generally because they have more than one health problem and are more attentive in the search for related health services⁽¹⁴⁾.

Low income has evidenced a direct influence on disease control since the family remuneration is a factor that contributes to the onset of cardiovascular complications. That's because socioeconomic inequality is favorable to poor quality of life, limiting opportunities of access to goods and services, and leading to deterioration in health. The low education found in the search impedes understanding of therapeutic regimens, making it difficult to learn new habits to improve health conditions, being important information in educational planning for diabetes *mellitus*⁽¹⁵⁻¹⁶⁾.

Regarding smoking, this study demonstrated a low population rate of smokers, which was a positive factor with respect to cardiovascular disease because smoking is a risk factor and action strategies against smoking must be part of health services⁽¹⁷⁾.

In this study, males showed high LDL-cholesterol and blood pressure. Women presented HDL-

-cholesterol values slightly higher than men⁽¹⁸⁾. High blood pressure causes damage to the walls of blood vessels, which in turn triggers an inflammatory process in which there is the formation of fibrous tissue, and LDL-cholesterol promotes lipid accumulation in blood vessels. The combination of these factors contributes to the formation of atherosclerosis, obstructing the passage of blood and resulting in cardiovascular disease.

Research shows that men present a high risk of developing cardiovascular disease. This indicates the need for assistive interventions, as well as preventive and educational practices of primary care. The educational health practices are related to better knowledge and attitude such as changes in lifestyle and introduction to drug therapy aiming to prevent complications and enabling better living with the disease. The goals of education are to improve metabolic control, preventing acute and chronic complications and improve the overall quality of life⁽¹⁹⁾.

Living with diabetes *mellitus* means adjusting to changes in lifestyle by performing self-care; these are actions that people adopt in order to improve their own health, without formal medical supervision and accomplished by changes in eating patterns, quitting smoking and improved physical activity. The implementation of care and procedures for glycemic control (performed by insulin administration), for a diet plan and physical activities allows for prevention and reduces acute and chronic complications⁽²⁰⁻²¹⁾.

Conclusion

According to the Framingham score, there was medium cardiovascular risk among women and high risk among men, which can indicate a risk of cardiovascular disorders among people with diabetes treated by primary health care centers. However, statistically significant differences were observed between men and women with diabetes related to LDL-cholesterol, HDL-cholesterol and blood pressure.

Although it is shown that smoking increases

cardiovascular risk, in this study only 8.8% (n=7) of subjects were smokers.

Therefore, strategies should be adopted to improve the individual and collective educational activities to promote health in the Family Health Unit, making it possible to control diabetes. Early detection measures of potential health problems should also be instituted and established by the health team, along with permanent educational actions such as diabetic groups.

The development of research in a restricted area is one of the limitations of the study, in addition to the small number of people as subjects to make comparisons between some intervals of LDL-cholesterol, HDL-cholesterol and blood pressure. New research on the topic is needed to expand the evaluation to users of other units of Primary Municipal Health Care.

Collaborations

Larré MC contributed to the work design, analysis, data interpretation, article writing and final approval of the version to be published. Almeida ECS contributed to the work design, data collection, data interpretation, article writing and final approval of the version to be published.

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