

Complications and the time of diagnosis of diabetes *mellitus* in primary care

Complicações e o tempo de diagnóstico do diabetes *mellitus* na atenção primária

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Keywords

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Descritores

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Abstract

Objective: To analyze the association between the time of disease and the onset of diabetes *mellitus* complications and to describe the characteristics of the diabetics' population of a mid-sized city located in the Midwest of the state of Minas Gerais.

Methods: Cross-sectional study conducted with 1320 patients with diabetes *mellitus*. The data were obtained from the registration system of Hypertensive and diabetic patients and the following variables were evaluated: sociodemographic characteristics, duration of disease and diabetes complications.

Results: Among patients who have the diagnosis of the disease for more than 10 years, the percentage of those that present complications 156 (32.2%) is higher than among those with the diagnosis of the disease for less than 10 years 45 (12.1%).

Conclusion: The results showed that the onset of diabetes-related complications might be associated with the duration of disease.

Resumo

Objetivo: Analisar a associação entre o tempo da doença e o aparecimento de complicações do diabetes *mellitus* e descrever as características da população de diabéticos de um município de médio porte do Centro Oeste mineiro.

Métodos: Estudo transversal realizado com 1320 usuários com diabetes *mellitus*. Os dados foram obtidos do sistema de cadastramento de Hipertensos e Diabéticos e foram avaliadas as variáveis: características sociodemográficas, duração da doença e complicações do diabetes.

Resultados: Entre os usuários que possuem o diagnóstico da doença há mais de 10 anos, o percentual daqueles que apresentam complicações 156 (32,2%) é maior do que entre os que possuem o diagnóstico da doença há menos de 10 anos 45 (12,1%).

Conclusão: Os resultados apontaram que a presença de complicações relacionadas ao diabetes pôde ser associada ao tempo de duração da doença.

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Introduction

Diabetes *mellitus* is a chronic condition that grows the most, especially in developing countries. The disease is highlighted for the severity of its complications, in addition to being considered a public health problem in terms of population growth and aging, greater urbanization, the increasing prevalence of obesity and sedentarism, as well as the increased survival rate from people with diabetes.⁽¹⁾ In Brazil, this reality is present with estimates that by 2025 approximately 11 million people will be diabetic, as in 2012, 10.3% of the population had diabetes *mellitus*.^(2,3)

In the diabetes prognosis, it is worth noting that the high morbidity and mortality compromises the quality of life, in addition to the high costs needed to perform the control of diabetes and treatment of acute and chronic complications.^(2,4)

Given this, diabetes *mellitus* must be investigated regarding acute and chronic complications and their association to the time of diagnosis. Acute complications include hypoglycemia, the hyperosmolar hyperglycemic state and diabetic ketoacidosis. On the other hand, chronic complications include retinopathy, nephropathy, ischemic heart disease, neuropathies, peripheral vascular and cerebrovascular disease. The most frequent degenerative diseases are acute myocardial infarction, peripheral arteriopathy, stroke and microangiopathy.^(5,6)

It is observed that complications of diabetes are increasing over the years and identifying these associations can be a strategy to outline measures to minimize the onset of early complications. Socio-demographic and clinical characteristics, along with this type of association can guide the management of care and educational programs for health professionals to monitor glucose levels of health services patients with diabetes.^(7,8)

In Brazil, the Ministry of health has created several diseases control programs that impact most of the population, and in the case of diabetes *mellitus*, the National Program of Hypertension and Diabetes *Mellitus* - Hiperdia was created in 2002, in an attempt to reorient pharmaceutical assistance for the continuous supply of medicines, as well as mon-

itoring the clinical conditions of the health services patients.

Based on data from Hiperdia, the aim of this study was to analyze the association between the disease and the onset of diabetes *mellitus* chronic complications and describe the population characteristics of diabetics from a mid-sized city located in the Midwest of the state of Minas Gerais.

Methods

Epidemiological study of transverse approach, developed with data from all 1,320 individuals who had a diagnosis of diabetes *mellitus* type 1 and 2 registered in the teams of the Family Health Strategy in urban area of a city located in the Midwest of the state of Minas Gerais in Brazil. The study, therefore, shows no probabilistic sample, as the entire population with diabetes was analyzed from the referred health units. The municipality has population of 213,016 inhabitants and 27% of this population is registered at the Family Health Strategy program.

The data were obtained from the public System of registration of Hypertensive and diabetic patients in the country called Hiperdia and were collected in the Municipal Health Secretary with family health teams in the period from January to May, 2014.

Of the 27% of people enrolled in the Family Health Strategy program, the inclusion criteria was to have been diagnosed with diabetes *mellitus* type 1 and 2. Among the exclusion criteria, we excluded individuals from Health Centers and rural-area residents. As data have been personally certified by Community Health Agents, who are professionals in the family health teams and who know the peculiarities of diabetes cases, Health Centers were excluded due to the fact they do not have this professional and the teams of the rural areas by the difficulty of access by research team.

The data were organized into Excel worksheets, Microsoft Windows 2007 version, and analyzed with the support of the software R (version 3.0.3).

The evaluated variables were socio-demographic characteristics, duration of disease and onset of complications from people with a diagnosis of diabetes *mellitus*. To describe the profile of individuals of health services according to the variables studied, a table of relative frequencies (%) of categorical variables (gender, educational level, occupation, marital status, use of insulin, onset of diabetes complication and disease duration) was made. For the variable age, descriptive statistics were calculated as the measures of central tendency and variability. The time of disease was categorized in individuals who had the disease for more than ten years, with five to ten years and less than five years. In this respect, we compared the percentage of onset of chronic complications between the categories of time of exposure to the disease. Chronic conditions considered were: amputation, diabetic foot, nephropathy, diabetic retinopathy, acute myocardial infarction and cerebrovascular accidents.

The development of the study followed national and international standards of ethics in research involving human subjects.

Results

The study population was composed of 1,320 people with diabetes *mellitus* who lived in the city and who were registered at the Family Health Strategy program. The mean age was 58.0 years (± 13.4 SD). Most people had incomplete elementary school (758; 57.6%), and, with regard to marital status, 682 (69.4%) people lived with partners. Regarding occupation of these people, we observed that 403 (42.0%) participants were active, that is, had some remunerated activity (Table 1).

Considering the time of the disease, 372 (28.2%) individuals had been diabetic for less than 5 years, 464 (35.2%) people had been diabetic for 5-10 years and 484 (36.6%) people had been diabetic for over 10 years. Still about the disease, the number of people with some type of complication was 267 (20.2%) and 347 (26.3%) people using insulin. In table 2, it is also possible to observe that the percentage of elderly is different for each class

Table 1. Statistical characterization of socio-demographic variables of people with diabetes *mellitus*

| Variables | Mean \pm Standard-deviation (min and max) | n(%) |
|--|---|-----------|
| Gender | | |
| Female | | 805(61.4) |
| Male | | 515(38.6) |
| Age (year) | 58 \pm 13,4(5 and 94 years) | |
| Number of people with more than 60 years | | 567(43.0) |
| Education | | |
| Illiterate | | 155(11.8) |
| Literate | | 30(2.3) |
| Incomplete Elementary school | | 758(57.6) |
| Complete Elementary school | | 134(10.2) |
| Incomplete High school | | 58(4.4) |
| Complete High school | | 151(11.5) |
| Incomplete Higher education | | 1(0.1) |
| Complete Higher education | | 11(0.8) |
| Master's Degree | | 18(1.4) |
| Phd | | 0(0) |
| Marital status | | |
| People who live with partner | | 682(69.4) |
| Occupation | | |
| Active people | | 403(42.0) |

of time of disease, there are more elderly (55.8%) among those who have the disease for more than 10 years than among those who have the disease for less than 5 years (40.1%).

Table 2. Percentage distribution of people with diabetes *mellitus* according to the time of disease, using insulin and onset of complications

| Variables | n(%) | Percentage of elderly |
|-----------------------------------|-----------|-----------------------|
| Time at diagnosis (years) | | |
| < 5 years | 372(28.2) | 40.1 |
| ≥ 5 and ≤ 10 years | 464(35.2) | 39.2 |
| > 10 years | 484(36.6) | 55.8 |
| Using insulin | | |
| People who use insulin | 347(26.3) | 41.2 |
| Diabetes-related complications | | |
| People who have any complications | 267(20.2) | 61.8 |

The results also showed that the onset of diabetes-related complications might be associated with the time at disease diagnosis, given that, among patients who had the disease for more than 10 years, the percentage of those who presented complications (32.2%; 156) was greater than the percentage of complications among those who had had the disease for less than five years (12.1%; 45) and between five and ten years (14.2%; 66), as shown in table 3.

Table 3. Distribution of people regarding onset of diabetes *mellitus* complications and time at diagnosis in percentages

| Time at diagnosis (years) | Onset of diabetes complication | | Total |
|---------------------------|--------------------------------|-----------|-------|
| | No | Yes | |
| < 5 years | 327(87.9) | 45(12.1) | 372 |
| ≥ 5 and ≤ 10 years | 398(85.8) | 66(14.2) | 464 |
| > 10 years | 328(67.8) | 156(32.2) | 484 |
| Total | 1053(79.8) | 267(20.2) | 1320 |

Discussion

The limits of the results of this research are related to cross-sectional design that does not allow us to establish cause and effect associations, but points to the need to maximize activities involved in preventing complications of diabetes *mellitus*. The source of the data allowed the access to 100% of people with diabetes registered in the Family Health Strategy of the urban municipality, which excluded the need for sampling, in addition to strengthening the findings.

The registered data on chronic diseases such as diabetes, when properly filled, allow the primary health care units to organize the continuity of care and monitoring of risk factors. This organization and clinical interventions, such as educational programs for the population at risk and for the population already diagnosed with diabetes can modify the national and international panorama of epidemic growth contributing to the quality of life of individuals.^(6,7)

The demographic profile found in the study presents most people registered as being female, with low educational level and aged over 50 years. A national survey of more than 75,000 adults from a study that compares the inequities in health between Brazil and England presents the same profile, which strengthens and generalizes the sociodemographic characteristics found in this research.⁽⁹⁾

It is important to emphasize that diabetes *mellitus*, as well as other chronic diseases, has increased its prevalence in people above 50 years old and has grown significantly, being the chronic non-communicable disease with the fastest increase, mainly in developing countries.^(3,4) This fact demonstrates the process of aging and unhealthy habits adopt-

ed by the Brazilian population, such as inadequate diet and sedentary lifestyle. These reasons characterize the demographic transition and the need of health professionals to elaborate strategic planning and programs of specific care to Comorbidities and socio-demographic characteristics of the population, giving the individual ways of promoting metabolic control.^(5,10)

In this study, 42% of people with diabetes developed some type of work or occupation and were considered active and 69% had partner. These variables are complex of being associated with the chance of developing diabetes or its complications. Study conducted in Ethiopia with 422 people without diabetes showed that only increasing age (above 60 years) was related to the onset of diabetes diagnosis. The other aspects as education, marital status and occupation did not show statistical association with the diagnosis of diabetes.⁽¹¹⁾ Some studies identified that people are more likely to develop diabetes when they increase waist circumference, sedentary lifestyle, present no consumption of fruits and/or vegetables, use antihypertensive medications, have previous history of high glucose, are aged over 45 years and have low levels of education.^(7,9) These findings corroborate the diabetes cases found in this study, as well as alert to the intervention actions by the public at risk, for prevention of early onset of diabetes, as well as the prevention of complications for individuals after diagnosis.

The low educational level of people with diabetes found in this study is considered by some authors as determinant for individuals who require a careful elaborated plan on the reeducation of eating habits, physical activity and pharmacological treatment.⁽¹²⁾ Randomized study performed in a German Center of Diabetes identified that among socioeconomic aspects, a low level of education can interfere with the learning effect of diabetes-related care.⁽¹³⁾ The low level of education can make it difficult for individuals to understand essential care for the control of the disease and prevention of complications.^(12,14) The higher the educational level of the person, the greater are the possibilities of access and utilization of health services and information, and in many cases, protective factors against diabetes.⁽¹⁴⁾

In addition to the properly use of the medication, the control of diabetes and the prevention of its early onset, there is a need for changes in lifestyle that mostly involves eating habits and physical activity, in addition to other factors, such as stress, self-esteem, psychological attitudes and empowerment to self-care.⁽¹⁵⁾

A compiled of five randomized controlled trials evaluated the effectiveness of interventions in lifestyle of Asian population without diabetes *mellitus* and in other six studies evaluated the effectiveness of drugs, including metformin, α -glycosidase and glitazone inhibitors. The results were satisfactory in the sense that lifestyle interventions (risk reduction of 29-71%) and metformin (risk reduction of 26-52%) appeared to be as effective, if not more effective, in Asian populations with the reduction in the risk for developing diabetes *mellitus*.⁽¹⁶⁾ In behavioral self-management interventions, it is necessary to involve the target communities and incorporate a solid understanding for a drastic change in lifestyle of a lifetime, in alternative health, psychosocial stressors, in support systems, in literacy, education and food preferences and attitudes towards physical activity.⁽⁴⁾

As much as clinical trials clearly demonstrate the feasibility of interventions on lifestyle and medication for the prevention of diabetes, the prospect is disappointing about the challenges of successfully implementing these interventions routinely in health services.⁽¹⁶⁾

Considering in isolation the association between time at disease diagnosis with onset of diabetes complications in the population studied, it was possible to affirm that they are related to each other, and the longer is the onset of the disease, the greater the possibility of occurrence of complications.

A cohort of 6 years in California with more than 70,000 elderly people above 60 years compared separately and then associated age and time of disease with the onset of chronic complications. In this evaluation of individuals with type 2 diabetes, they found that age and time of diabetes were independent predictors of clinical course of diabetes. In addition, their interaction (that is, the duration and the age) was significant to the stage of kidney

disease, eye disease, lower limb amputation, stroke, heart failure and mortality, although not for hyperglycemia.⁽¹⁷⁾

In diabetes *mellitus*, the onset of complications worsens in people who do not perform self-care activities related to the correct dietary habits, physical activity and the proper use of medicines when needed.^(5,6)

The first study that compared diabetic microvascular complications at diagnosis in patients detected by a targeted screening for risk of developing diabetes with newly diagnosed patients in general practice as diabetics (up to 2 years of diagnosis) was developed in 1998 in the Netherlands. As a result, differences between the prevalence of complications between the two groups has not been identified.⁽¹⁸⁾

In this study, the association between time of disease diagnosis and onset of complications can be mediated by age, since the percentage of elderly people among those who have the disease for longer (over 10 years) is greater than that between those who have the disease for less than five years. Thus, the higher percentage of complications among those who have the disease for longer can happen due to the greater presence of elderly people in this category.

It is important to remember that the onset of complications observed in people who have had the disease for longer is related to the number of years lived, which can be affected not only by clinical exposure, but also by the treatment they received throughout life. For example, older patients of a sample with time of diabetes diagnosis for more than 10 years may have received their initial treatments during the early 1990 and therefore, early treatment may have been less intense. This statement is distinct in different countries of the world. In Brazil, for example, it is still complex to affirm that the management in public health in this decade of 2010, which attends the vast majority of cases, occurs in such a way as to provide the control of complications.

Identifying people who, over time, fail to perform self-care to keep track of diabetes can be a strategy to outline measures to minimize the onset of disease complications. The strategies that improve care and the involvement of peo-

ple with behavioral changes is as important as understanding the reasons of non-involvement and thus, motivating them with measures that increase feelings of trust and safety towards the health professional.

Conclusion

The results showed that the presence of diabetes-related complications might be associated with the time of disease diagnosis.

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Collaborations

Cortez DN collaborated with the design and elaboration of the project, data collection, analysis and interpretation of data, writing the study and critical reviewing relevant intellectual content. Torres HC contributed to the design and elaboration of the project, critical reviewing relevant intellectual content and final approval of the version to be published. Souza DAS collaborated with data collection, analysis and interpretation of data, writing the study and critical reviewing relevant intellectual content. Macedo MML participated in data collection, writing the study and reviewing relevant intellectual content. Reis IA contributed to the design and elaboration of the project, analysis and interpretation of data, and critical reviewing relevant intellectual content.

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