Risk factors and complications in type 2 diabetes outpatients

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Summary

Objective: Our study investigated type 2 diabetes mellitus (T2DM) outpatients attending a university hospital in Montes Claros, MG, to estimate the prevalence of risk factors and their association with diabetes complications.

Method: This was a quantitative, documental, retrospective and analytical study. Medical records of 95 outpatients with T2DM treated in this hospital from 2011 to 2015 were analyzed. Data were collected according to a structured questionnaire surveying sociodemographic, anthropometric and biochemical data and clinical and lifestyle aspects. Regression analysis was used to evaluate the association between risk factor variables and complications.

Results: With a mean age of 54 years, the study population showed irregular blood glucose control, despite the use of hypoglycemic medication, and did not have a healthy lifestyle. The main complication reported was high blood pressure (HBP), occurring in 70.9% of patients. The prevalence of complications was positively associated with patients receiving insulin treatment (p=0.042) and multidisciplinary monitoring (p=0.050).

Conclusion: The associations identified reflect the condition of patients that were already treating diabetes and its complications, especially HBP. The characteristics of the study population indicate the need to improve clinical follow-up and increase motivation for healthy behaviors.

Keywords: diabetes mellitus type 2, diabetes complications, risk factors.

Introduction

In Brazil, socioeconomic transformations have led to an aging population. Some epidemiological changes that result from this phenomenon are a decline in the occurrence of infectious-parasitic diseases and the predominance of chronic non-communicable diseases such as type 2 diabetes mellitus (T2DM).[1,2]

The occurrence of T2DM in the Brazilian population has increased considerably in recent years, and this is currently one of the most prevalent chronic diseases in the country. This increase is probably related to habits of the modern world, such as the consumption of high-energy diets and sedentary lifestyle, as well as increased life expectancy, development of obesity and difficult access to health services. In addition, there are genetic factors that favor the disease, which makes some people more susceptible to it.[2,3]

Diabetes is a pathology that stands out for the potential of developing long-term complications.[4] At a macro-

vascular level, patients with diabetes may develop ischemic heart disease, cerebrovascular disease and peripheral vascular disease, which often lead to morbidity and mortality.[5,6] At a microvascular level, diabetes can lead to vision impairment (retinopathy), kidney disease (nephropathy) and neuronal damage (neuropathies), which are more common causes of irreversible blindness, chronic kidney disease and non-traumatic lower limb amputations.[6-8] This proves the severity of diabetes, as the reported complications affect different systems in the body and the sequelae can severely compromise the patients' quality of life.[2]

T2DM can be considered one of the chronic diseases of greater impact for the public health system. In addition to causing a high degree of morbidity and mortality, the metabolic control of diabetes and the treatment of its complications have a high cost for health services.[4,9] Considering the prognosis of individuals who develop physiological changes as a consequence of T2DM, our study

investigated patients with T2DM treated at a university hospital in Montes Claros, state of Minas Gerais, Brazil, in order to estimate the prevalence of risk factors and their association with diabetes complications. The knowledge of the local population is important to direct actions to prevent the undesirable consequences of this disease.

METHOD

This is a quantitative, documentary, retrospective and analytical study. Our study was developed at the outpatient clinic for patients with T2DM linked to the Clemente de Faria University Hospital, in Montes Claros, state of Minas Gerais, Brazil. The target population included all adult patients, of both genders, diagnosed with T2DM and treated at the outpatient clinic from 2011 to 2015. Cases of chronic complications (diabetic nephropathy and secondary hypertension), aged over 65 years, and presenting only one outpatient visit or incomplete data in the medical records were excluded. In all, the records of 95 patients were evaluated.

Data were collected directly from the patients' medical charts, according to a structured script. Data included sociodemographics (age, marital status and gender), as well as anthropometric and biochemical (weight, fasting blood glucose, HbA1c or glycohemoglobin, total cholesterol, LDL-cholesterol, HDL-cholesterol, triglycerides, systolic and diastolic blood pressure) information. Clinical (disease duration, heredity, type of treatment, professional monitoring and presence of complications) and lifestyle (alcoholism, smoking and eating habits) information were also collected. Morbidities identified as complications were those indicated in the medical record, properly diagnosed and resulting from diabetes, including cardiovascular diseases, hypertension, retinopathy and diabetic nephropathy.

Data were analyzed using Statistical Package for the Social Sciences for Windows®, software version 18.0. The results were described as mean±standard deviation (SD), or absolute numbers and percentage.

Statistical analysis of the association between independent factors and the dependent variable "presence of complications" was done using binary, univariate and multiple logistic regression models. For the multiple analysis, variables that presented a descriptive level below 20% were tested. Variables that presented statistical significance of up to 5% were maintained in the final model.

Our study is in accordance with the ethical precepts of Resolution 466/12 of the National Health Council and was approved by the Research Ethics Committee of the University of Montes Claros (Protocol of approval No. 473,558/2013).

RESULTS

The mean age of the 95 patients in our population was 54.21±12.77 years. Almost half were female (52.6%) and most were married (68.4%) (Table 1). According to clinical and lifestyle data, the patients had a median time since the diagnosis of T2DM of 11 years (ranging from one to 30 years). More than three-quarters of the population did not smoke (76.8%) and were not alcohol-dependent (78.9%). Only 23.6% reported consuming a regular diet, and nutritional monitoring was performed by only 17.8%. The use of oral and insulin hypoglycemic agents was reported by approximately half of the patients (Table 2).

TABLE 1 Sociodemographic characterization of patients with type 2 diabetes mellitus.

Variables	N (%)
Sex	
Male	45 (47.4)
Female	50 (52.6)
Age range (years)	
20-30	04 (4.2)
31-40	06 (6.3)
41-50	22 (23.2)
51-60	33 (34.7)
≥ 61	30 (31.6)
Marital status	
Married	54 (56.8)
Common-law partner	11 (11.6)
Single	15 (15.8)
Divorced	7 (7.5)
Widow(er)	3 (3.3)

TABLE 2 Clinical and lifestyle characterization of patients with type 2 diabetes mellitus.

Variables	N (%)
Time since diagnosis (years)	
≤ 5	24 (25.3)
6-10	19 (20.0)
11-15	25 (26.3)
16-20	13 (13.7)
21-25	5 (5.3)
≥ 26	9 (9.4)
Smoker	
No	67 (70.5)
Yes	28 (29.5)
Alcohol abuse	
No	71 (74.7)
Yes	24 (25.3)

(continues)

TABLE 2 (cont.) Clinical and lifestyle characterization of patients with type 2 diabetes mellitus.

Variables	N (%)
Family history of diabetes	
No	42 (44.2)
Yes	53 (55.8)
Insulin treatment	
No	53 (55.8)
Yes	42 (44.2)
Dietary control	
Regular	21 (23.6)
Irregular	68 (74.4)
Dietary guidance	
Yes	16 (17.8)
No	74 (82.2)
Multidisciplinary monitoring	
Yes	69 (72.6)
No	26 (27.4)

The mean and standard deviation of the metabolic parameters of patients with T2DM (weight, fasting blood glucose, HbA1c, total cholesterol, HDL-c, LDL-c, triglycerides) are presented in Table 3. The mean fasting blood glucose of the participants was 144.07 mg/dL, with a prevalence of 78% of altered glycemia. Also, 65% presented altered HbA1c results. Regarding lipid profile, 43.2% had total cholesterol levels above 200 mg/dL, 64% had triglycerides > 150 mg/dL, and 63% had low HDL-c.

TABLE 3 Physiological parameters of patients with type 2 diabetes mellitus.

Parameter	Mean±SD	Reference values for diabetics*
Weight (kg)	77.41±19.09	-
Fasting blood glucose (mg/dL)	144.07±60.46	< 110 mg/dL (goal for diabetics) < 130 mg/dL (tolerable for diabetics)
HbA1c (%)	7.81±1.78	Close to 7 (acceptable for diabetics)
Total cholesterol (mg/dL)	177.12±38.74	< 200 (normal)
HDL-c (mg/dL)	47.02±13.85	> 40 (adequate for men) > 50 (adequate for women)
LDL-c (mg/dL)	104.04±31.74	101 a 130 (normal)
Triglycerides (mg/dL)	162.12±85.04	< 150 (adequate)
Systolic blood pressure (mmHg)	134.87±17.90	< 140 (adequate for diabetics)
Diastolic blood pressure (mmHg)	80.63±8.18	< 90 (adequate for diabetics)

*According to the 2015/2016 Guidelines of the Brazilian Diabetes Society.[2]

The main complication among patients with T2DM was high blood pressure (HBP) (70.9%). The frequency of cardiovascular diseases (1.2%), diabetic retinopathy (5.3%) and diabetic nephropathy (6.3%) was low (Figure 1). In our study, considering HBP as the main complication among patients, our association analyses focused on the presence of this specific pathology.

Table 4 shows the result of bivariate regression analysis for factors associated with the presence of HBP in patients with T2DM. At the level of 0.20, the following variables were associated with HBP and were included in the multiple analyses: age, marital status, ethnicity, time since diagnosis, family history of diabetes, insulin treatment, dietary control, nutritional monitoring, multidisciplinary monitoring and HbA1c.

In the multiple analysis, insulin treatment (p=0.042) and multidisciplinary monitoring (p=0.050) were the variables positively associated with the presence of HBP in patients with T2DM. The estimated coefficients for these variables indicate that the adoption of insulin treatment and monitoring by a multidisciplinary team contribute to the increase of 2.88 and 0.335 units, respectively, in the risk of HBP (Table 5).

DISCUSSION

T2DM and its chronic complications have become increasingly common.[1,9,10] Thus, the importance of the survey carried out in our study, which contributes from a clinical point of view to the monitoring of diabetic patients.[11] Monitoring the patient helps to improve adherence to treatment, to detect difficulties in following it, and to guide health professionals to provide continuous support and achieve goals,[1,11] thus avoiding aggravation of chronic diseases such as T2DM.

The mean age of the diabetic patients in our study was 54 years, suggesting a relation between the increase in life expectancy and the presence of chronic pathologies in the population.[1] Considering that patients were not young, the importance of early T2DM screening should be emphasized, since the insidious character means that patients can be affected well before diagnosis.[12] Time since diagnosis is critical as it directly affects the development of comorbidities and the time of adherence to treatment. Thus, the longer the time to obtain a diagnosis, the lower the control of blood glucose and the greater the chance of developing complications.[1,13]

Our sample had a balanced ratio between men and women. We found that most of the patients had a partner, which can be a positive factor since structured families provide subsidies for patients with T2DM, thus contrib-
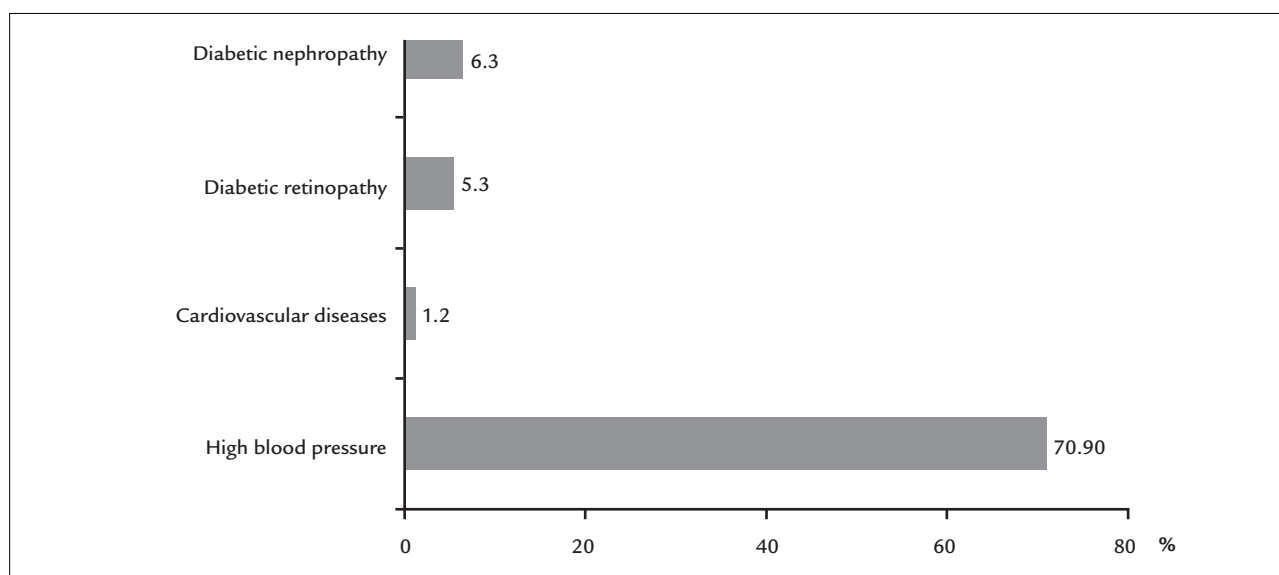
FIGURE 1 Frequencies of complications in patients with type 2 diabetes mellitus.

TABLE 4 Univariate analysis for the factors associated with the presence of high blood pressure in patients with type 2 diabetes mellitus.

Sociodemographics and lifestyle	HBP	
	N (%)	p-value
Sex		
Male	25 (43.1)	0.297
Female	33 (56.9)	
Age range (years)		
20 to 45	8 (13.8)	0.108
≥ 46	50 (86.2)	
Marital status		
Married/common-law	27 (60.0)	0.066
Single/divorced/widow(er)	18 (40.0)	
Smoker		
No	37 (71.2)	0.955
Yes	15 (28.8)	
Alcohol abuse		
No	42 (82.4)	0.061
Yes	9 (17.6)	
Clinical		
Time since diagnosis (years)		
≤ 10	22 (38.6)	0.022
> 10	35 (61.4)	
Family history of diabetes		
No	29 (50.0)	0.155
Yes	29 (50.0)	
Insulin treatment		
No	25 (43.1)	0.002
Yes	33 (56.9)	

(*continues*)

TABLE 4 (cont.) Univariate analysis for the factors associated with the presence of high blood pressure in patients with type 2 diabetes mellitus.

Sociodemographics and lifestyle	HBP	
	N (%)	p-value
Dietary control		
Regular	10 (18.5)	0.161
Irregular	44 (81.5)	
Dietary guidance		
Yes	7 (12.7)	0.116
No	48 (87.3)	
Multidisciplinary monitoring		
Yes	47 (81.0)	0.021
No	11 (19.0)	
Metabolic		
Fasting blood glucose		
Yes	10 (18.2)	0.589
No	45 (81.8)	
HbA1c		
Yes	24 (41.4)	0.026
No	34 (58.7)	
Total cholesterol		
Yes	31 (53.4)	0.403
No	27 (46.6)	
HDL-c		
Yes	34 (58.6)	0.251
No	24 (41.4)	
LDL-c		
Yes	24 (25.3)	0.341
No	34 (74.7)	
Triglycerides		
Yes	18 (31.0)	0.226
No	40 (69.0)	
Systolic blood pressure		
Yes	39 (67.2)	0.554
No	19 (32.8)	
Diastolic blood pressure		
Yes	37 (63.8)	0.515
No	21 (36.2)	

HBP: high blood pressure.

TABLE 5 Multiple logistic regression analysis for factors associated with the presence of high blood pressure in patients with type 2 diabetes mellitus.

Variables	OR (adjusted)	95CI	p-value
Insulin treatment			
No	1		
Yes	2.88	1.03-8.00	0.042
Multidisciplinary monitoring			
Yes	1		0.050
No	0.335	0.11-1.00	

OR: odds ratio; 95CI: 95% confidence interval.

uting to adherence to treatment.[14] As for family history, 50% of the patients had first-degree relatives with diabetes, proving a genetic basis for the disease, although their prevalence on the environmental factors cannot be affirmed. Although the etiology of T2DM is not fully elucidated, it is known to have a multifactorial composition.[2] Therefore, it is important to investigate the patient's social history and, if possible, to make the family a pillar of care that involves lifestyle change.[14]

Regarding lifestyle, most patients were non-smokers and non alcohol-dependent, which is a satisfactory result, since the association between smoking and limb amputations in diabetic patients is well known.[15] Most did not maintain dietary control and did not follow the guidance of a dietitian. Studies indicate that healthy eating is one of the most difficult practices, in contrast to drug therapy, which, as found in our study, generally has good adherence.[11,15] Non-adherence to diabetes treatment is a problem of known magnitude on the international and national scene that contributes to the low effectiveness of treatment and complications in the medium and long term and, consequently, to an increase in the demand for highly complex health services.[11] It is evident, therefore, that primary care should greatly improve its activities of receiving these patients for multiprofessional treatment.

In our study, 92.6% of diabetic patients had glycemic indexes greater than 91 mg/dL, and the mean in the population was high, reaching 144 mg/dL. Glycated hemoglobin levels were also high, averaging 7.8%. These data indicate that glycemic control was not performed as recommended by the Brazilian Society of Diabetes Mellitus (SBD, in the Portuguese acronym), which establishes the maximum value of 100 mg/dL for fasting blood glucose. There is, therefore, the need for treatment of our population, since adequate metabolic control either prevents the onset of chronic complications or delays their progression, particularly those of microangiopathic nature.[2]

Measures to prevent hypertension and dyslipidemia should be part of the treatment of patients with T2DM because they increase the risk of developing cardiovascular diseases, directly impacting morbidity and mortality rates.[16] In our study, these parameters were altered, which requires attention to indicate the risk of developing a cardiovascular problem. Mortality due to cardiovascular disease progressively increases in a linear, continuous and independent manner with blood pressure values above 115/75 mmHg.[17]

HBP was the main complication described in our population. The Brazilian Society of Diabetes states that T2DM, hypertension and renal function are closely related. HBP can be both a cause and a consequence of kidney disease, and the combination of the two presents a high risk for cardiovascular disease. Thus, appropriate treatment of HBP helps to prevent cardiovascular disease, minimizes the progression of renal disease and diabetic retinopathy. Care involves practices such as regular physical activity, low-sodium diet, decreased consumption of alcoholic beverages and correct intake of prescribed antihypertensive medication.[2]

The combination of complications with the variables insulin use and multidisciplinary monitoring refers to the advanced stage of the disease since patients with T2DM are more susceptible to chronic complications. Thus, T2DM progression time may lead to more risks for the development of microvascular complications in general.[18] It should also be kept in mind that the pathophysiological process of aging alone can cause atherosclerosis, farsightedness and immune changes that may increase the prevalence of complications.[18]

Broadly speaking, the results do not allow the establishment of cause and effect relations but indicate that patients with T2DM in our study, many with HBP, had irregular glycemic control, used hypoglycemic agents but did not make dietary adjustments. These factors directly compromise the quality of life of diabetic individuals and make the pathology difficult to control. Therefore, measures that show patients the severity of diabetes and the possible consequences of a lack of adequate treatment should be adopted in our population.

Since there is no cure for diabetes, its best treatment is primary prevention, encouraging the at-risk population to have healthy lifestyle habits and performing periodic screening. Responsibility for health promotion should not be limited to health professionals. Public policies that need to be implemented include those aimed at improving access to health services, empowering patients to understand the disease and learn self-care skills.[19,20] As for secondary prevention, it is important to monitor and encourage behavioral changes, because even when insulin is used, glycemic control may be unsatisfactory if the individual does not adopt a healthy lifestyle.[2]

A last aspect to be considered refers to the limitations of our study. Some data from the medical records were incomplete or absent, lacking the necessary information to complete the questionnaires. In addition, anamnesis and clinical examination were not standardized, making it difficult to monitor clinical alterations. Finally, there was no specific periodicity for patients attending medical appointments, and in some cases the amount of follow-up data was too low or non-existent. These difficulties led to the exclusion of several medical records, thus reducing the sample.

Conclusion

We identified as the main complication in the diabetic population included in our study the incidence of HBP. In addition, we have shown that the main associated risk factors were, in general, insulin use and multidisciplinary team monitoring. The joint occurrence of these factors may indicate an advanced stage of the disease and greater exposure to chronic complications.

The studied population also showed irregular glycemic control, despite the use of hypoglycemic medication, and irregular diet. Thus, we suggest primary prevention actions for this population, such as strict monitoring of blood glucose and blood pressure, multiprofessional follow-up, adherence to drug therapy, physical exercise and dietary monitoring, in addition to the active participation of the family in the treatment of the disease and a stronger bond with the health unit.

Resumo

Fatores de risco e complicações em pacientes de ambulatório com diabetes tipo 2

Objetivo: O estudo investigou pacientes com diabetes tipo 2 (DM2) atendidos em um hospital universitário de Montes Claros (MG) a fim de estimar a prevalência de fatores de risco e sua associação com complicações da diabetes.

Método: Pesquisa quantitativa, documental, retrospectiva e analítica. Foram analisadas as fichas médicas de 95 adultos portadores de DM2 atendidos no ambulatório do hospital entre 2011 e 2015. Os dados foram coletados de acordo com um questionário estruturado incluindo variáveis sociodemográficas, antropométricas e bioquímicas e aspectos clínicos e de estilo de vida. As análises de associação entre variáveis de fatores de risco e presença de complicações foram feitas por meio da regressão logística.

Resultados: Com média de 54 anos de idade, a população estudada tinha controle glicêmico irregular, fazia uso de hipoglicemiantes e não adotava um estilo de vida saudável. A principal complicação reportada foi hipertensão arterial, presente em 70,9% dos casos. A prevalência de complicações associou-se positivamente com adoção de tratamento insulínico (p=0,042) e acompanhamento multidisciplinar (p=0,050).

Conclusão: As associações encontradas refletem a condição de pacientes que já tratam a diabetes e suas complicações, principalmente a hipertensão arterial. Características da população indicam a necessidade de melhoria do acompanhamento clínico e o incentivo à adoção de hábitos comportamentais saudáveis.

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