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Evaluation of glycemic control, comorbidities, complications and mortality twenty-five-year follow-up at a diabetes outpatient clinic in Brazil

Avaliação do controle glicêmico, comorbidades, complicações e mortalidade acompanhamento de vinte e cinco anos em um ambulatório de diabetes no Brasil

Evaluación del control glucémico, comorbilidades, complicaciones y mortalidad seguimiento de veinticinco años en un ambulatorio de diabetes en Brasil

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ABSTRACT

Objective: The objective of this study is to evaluate glycemic control, comorbidities, diabetes-related complications, and mortality among people with DM followed-up at an outpatient clinic based at a Diabetes Association in Brazil. **Methods:** Sociodemographic, medical and mortality data were obtained from 1,173 patients with type 1 (T1DM) and type 2 diabetes (T2DM) who were evaluated once between 1996-2011 and whose vital status was checked in 2022. Data were analyzed using statistical tests to find out different characteristics between patients with DM1 and DM2. **Results:** 204 patients had T1DM (17.3%), 969 T2DM (82.6%) and 404 (34.4%) died during the study period (2.8% T1DM and 31.6% T2DM). Among T1DM, 82.3% had inadequate glycemic control, 61.2% had no associated comorbidity and presented varied causes of death. Regarding T2DM, 64.18% had inadequate glycemic control, had more comorbidities, higher rates of smoking and died more frequently due to cardiovascular diseases. **Conclusion:** Based on glycemic control, current care model provided needs to be rethought to provide more frequent clinical follow-up and structured education. Training health professionals, general practitioners and specialists is urgently needed as well as further long-term prospective studies in this topic.

Keywords: Diabetes association, Glycemic control, Comorbidities, Complications, Mortality.

RESUMO

Objetivo: Avaliar o controle glicêmico, comorbidades, complicações relacionadas ao diabetes e mortalidade entre pessoas com DM acompanhadas em ambulatório de uma Associação de Diabetes no Brasil. **Métodos:** Dados sociodemográficos, clínicos e de mortalidade foram obtidos de 1.173 pacientes com diabetes tipo 1 (DM1) e tipo 2 (DM2) que foram avaliados uma vez entre 1996-2011 e cujo estado vital foi verificado em 2022. Os dados foram analisados por meio de testes estatísticos para descobrir diferentes características entre pacientes com DM1 e DM2. **Resultados:** 204 pacientes tiveram DM1 (17,3%), 969 DM2 (82,6%) e 404 (34,4%) faleceram durante o período do estudo (2,8% DM1 e 31,6% DM2). Entre os DM1, 82,3% apresentavam controle glicêmico inadequado, 61,2% não tinham comorbidades associadas e apresentavam causas variadas de óbito. Em relação ao DM2, 64,18% apresentavam controle glicêmico inadequado,

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apresentavam mais comorbidades, maiores índices de tabagismo e morriam com maior frequência por doenças cardiovasculares. **Conclusão:** Baseado no controle glicêmico, o atual modelo de assistência prestado precisa ser repensado para proporcionar acompanhamento clínico mais frequente e educação estruturada. É urgente a necessidade de formação de profissionais de saúde, clínicos gerais e especialistas, bem como de mais estudos prospectivos de longo prazo neste tema.

Palavras-chave: Associação de diabetes, Controle glicêmico, Comorbidades, Complicações, Mortalidade.

RESUMEN

Objetivo: El objetivo de este estudio es evaluar el control glucémico, las comorbilidades, las complicaciones relacionadas con la diabetes y la mortalidad en personas con DM seguidas en un ambulatorio de una Asociación de Diabetes de Brasil. **Métodos:** Se obtuvieron datos sociodemográficos, médicos y de mortalidad de 1.173 pacientes con diabetes tipo 1 (DM1) y tipo 2 (DM2) que fueron evaluados una vez entre 1996-2011 y cuyo estado vital se verificó en 2022. Los datos se analizaron mediante pruebas estadísticas para Descubra las diferentes características entre los pacientes con DM1 y DM2. **Resultados:** 204 pacientes tenían DM1 (17,3%), 969 DM2 (82,6%) y 404 (34,4%) fallecieron durante el período de estudio (2,8% DM1 y 31,6% DM2). Entre los DM1, el 82,3% presentó control glucémico inadecuado, el 61,2% no tuvo comorbilidad asociada y presentó causas variadas de muerte. Respecto a la DM2, el 64,18% tenía un control glucémico inadecuado, tenía más comorbilidades, mayores tasas de tabaquismo y fallecía con mayor frecuencia por enfermedades cardiovasculares. **Conclusión:** Basado en el control glucémico, el modelo de atención actual brindado debe repensarse para brindar un seguimiento clínico más frecuente y una educación estructurada. Es urgente formar a profesionales de la salud, médicos generales y especialistas, así como realizar más estudios prospectivos a largo plazo en este tema.

Palabras clave: Asociación diabetes, Control glucémico, Comorbilidades, Complicaciones, Mortalidad.

INTRODUCTION

Diabetes mellitus (DM) is a chronic disease whose overall prevalence according to the International Diabetes Federation (IDF, 2021) is 10.5% and is characterized by changes in protein, lipids and carbohydrate metabolism, with consequent elevation of blood glucose levels. DM can be classified into two main groups: type 1 diabetes mellitus (T1DM) and type 2 diabetes mellitus (T2DM) (BERTOLUCI MC, et al., 2022).

The disease represents an important public health issue and an increase in its prevalence in the coming years is expected according to the IDF projections. It is estimated that currently 537 million people between 20-79 years of age have DM around the world, and by 2045, more than 750 million people will have the disease, which corresponds to an overall prevalence of 12.2%.

Brazil ranks as the sixth country in the world, regarding the number of adults with DM, which represents 15.7 million people, with projections for 2045 of 23.3 million affected people. DM and its complications are associated with substantial direct and indirect costs. According to the IDF, the total DM-related costs in the world is of USD 966 billion, and in Brazil it is about USD 42.9 billion, representing the third largest expenditure with the disease worldwide (IDF, 2021).

The presence of long-term hyperglycemia is associated with impairment in several organs, tissues and systems, which contributes to the development of diabetes-related chronic complications and also increased morbidity and mortality. The most common diabetes-related chronic complications are neuropathy (DN), and its most devastating outcome – the diabetic foot, kidney disease (DRD) and retinopathy (DR) (BERTOLUCI MC, et al., 2022; ROSSING P, et al., 2022).

The IDF estimates that in 2021, approximately 6.7 million adults died due to DM or its related complications worldwide, which corresponds to 12.2% of all deaths. In Brazil, there were more than 214,000 deaths among people aged between 20 and 79 years due to the disease, which also represents 2.8% of deaths in people

younger than 60 years (IDF, 2021). The objective of this study is to evaluate glycemic control, the presence of comorbidities, diabetes-related chronic complications and mortality among people with DM that were followed-up at an outpatient clinic based at a Diabetes Association in Brazil.

METHODS

This was a retrospective descriptive observational study conducted through the access of the database of patients attended Bauru's Diabetics Association, from 01/04/1996 to 12/30/2011. This non-profit institution provides education and medical care for people with DM of all types, who seek medical attention and education, through spontaneous demand, coming usually from primary care level public clinics. All these patients received glucometers, reagent strips, syringes and insulins from the entity itself until 2004, when the Popular Pharmacy Program was set up (BRASIL, 2005), and began to provide all these devices.

Our sample included only patients with T1DM and T2DM who had their diagnosis performed according to clinical criteria recommended by the American Diabetes Association (ADA, 2021) and the Brazilian Diabetes Society (SBD) (BERTOLUCI MC, et al., 2022) at each respective year of diagnosis (1996-2011). Each patient was attended at least once by an endocrinologist during the study period. Patients whose data were not available or whose vital status was unknown until February 2022 were excluded.

Data were collected from one medical appointment records of each patient, and the date of this appointment was randomly chosen between 01/04/1996 to 12/30/2011. Comorbidity diagnoses were the only constantly updated data, throughout the years at the database, and were based on laboratory and clinical findings, and were used to define which comorbidity was present for each individual patient.

Clinical and sociodemographic data were collected for the characterization of patients such as: gender; age; ethnicity; type and duration of DM; socioeconomic status (defined by the average monthly family income in minimum Brazilian wages. One minimum wage was equivalent to about 250 International dollars); weight (kg); height (m); body mass index (BMI) defined by the division of weight (kg) by height in square meter (m2) and blood pressure (mmHg) measured with the patient at resting sitting state.

Current types of treatment, such as following a diet prescribed by a dietitian and the degree of adherence (defined as adequate if the patient reported following the diet at least 80% of the time) (DAVISON KA, et al., 2014); use of oral antidiabetic drugs (OAD), insulin, or insulin associated with OADs.

The results of laboratory tests, such as fasting glycemia, post prandial glycemia, glycated hemoglobin (HbA1c), total cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL), very-low-density lipoprotein (VLDL) and triglycerides, were also obtained from the random clinical visit recorded in the electronic database.

HbA1c was dosed by the high-performance liquid chromatography method (HPLC, Bio-Rad Laboratories, Hercules, California, USA), while fasting glycemia, post prandial glycemia, total cholesterol, HDL and triglycerides were measured by enzymatic methods (Enzymatic-Colorimetric Method (Trinder). LDL cholesterol was calculated using the Friedewald equation (FRIEDEWALD WT, et al. 1972).

Glycemic control was considered adequate if HbA1c was <7.5% (58mmol/mol) for patients up to 19 years of age, <7% (53mmol/mol) for adults up to 60 years, and < 8.5% (69mmol/mol) for people older than 60 years (PITITTO B, et al., 2022).

The presence of comorbidities was assessed and defined as: hypertension (a blood pressure ≥ 140 and/or 90 mmHg) (BARROSO WKS, et al., 2021); dyslipidemia (triglycerides ≥ 150 mg/dL and/or LDL ≥ 160mg/dL and/or HDL <40mg/dL for men and <50mg/dL for women, respectively) (FALUDI AA, et al., 2017); overweight (BMI ≥25 for adult people over 19 years of age and, a BMI ≥ 85th percentile according to age and gender, for children and adolescents up to 19 years); obesity (BMI ≥30 for adult people over 19 years of age and, a BMI ≥ 95th percentile according to age and gender, for children and adolescents up to 19 years) (WORLD HEALTH ORGANIZATION, 2000); smoking (use of at least 2 tobacco products per day) (GOMES MB, NEGRATO CA, 2016). The presence of comorbidity was constantly updated according to current guidelines.

The presence of diabetes-related chronic complications such as DN, DRD, DR and foot alterations (ulcerations and/or previous amputations and/or presence of deformities) was assessed and these data were also updated on the database. DN was defined by the presence of two or more altered neurological tests, after exclusion of other causes, following The Michigan Neuropathy Screening Instrument (MNSI) (LUNETTA M, et al., 1998).

DRD was classified in different stages, characterized by persistent kidney impairment for a period of three or more months, evaluated by urinary albumin excretion (UAE) > 30 mg/24h or an estimated glomerular filtration rate (eGFR) < 60 mL/min/1.73 m (ROSSING P, et al., 2022; RITZ E., 1999).

DR was diagnosed and classified as absent, non-proliferative or proliferative, according to retinal findings of indirect ophthalmoscopy and retinal biomicroscopy performed by a trained professional (PORTA M, BANDELLO F, 2002). Foot changes were defined according to the International Working Group on the Diabetic Foot criteria (IWGDF, 2001) and the diabetic foot was diagnosed by the presence of infection, ulceration and/or destruction of deep tissues associated with neurological abnormalities and various degrees of peripheral vascular disease (NETTEN JAAP J, et al., 2020).

Information regarding patients' vital status, time to death after the last clinical evaluation and duration of DM at death were also collected in February 2022. Data on the underlying causes of death of deceased patients were obtained from the Epidemiological Surveillance Service of the Municipality, after appropriate authorization. Based on the pathophysiology of the disease and the Code of the International Classification of Diseases, 10th Revision (ICD-10), 1993, the causes of death were grouped into eight major groups: neoplasms, DM as the primary cause, lung, cardiovascular, kidney, neurological, gastrointestinal or hepatic diseases and finally, other causes.

This project was approved by the Research Ethics Committee of Bauru's Dentistry School, under the number 4.270.779 CAAE 37022120.4.0000.5417, according to CNS Resolution 466/2012 and its complementary rules. In order to allow access to data contained in the database, in the medical records and its use, a statement was requested from the responsible chief of the clinic. The data were transported to Excel® spreadsheets and analyzed using descriptive statistics by SPSS® (version 20). Data normality was tested using the Shapiro Wilk test, which was negative.

To see the differences of the variables between patients with DM1 and DM2, different statistical tests were used. Student's t-test was used for quantitative variables; Mann Whitney test was used to assess the socioeconomic status and the number of coexisting comorbidities (qualitative ordinal variables), and the Chi-Square test was used for the other qualitative variables. P values < 0.05 were considered as significant. The data from baseline survey are presented in tables.

RESULTS

During the period between 1996-2011, 1,173 patients were evaluated at least once, of which 204 had T1DM (17.3%) and 969 T2DM (82.6%). Among them, 404 (34.4%) died by 02/03/2022 (2.8% with T1DM and 31.6% with T2DM). The sociodemographic characterization of the studied population is shown in **Table 1** and the clinical-laboratory-therapeutic and lifestyle characteristics of this population is shown in (**Table 2**). In **Table 1** there´re sociodemographic variables concerning age, gender, race and family income of all patients and of each type of DM patients.

Table 1 - Sociodemographic characterization of the studied population.

Variables	Patients (n=1,173)	T1DM (n=204)	T2DM (n=969)	*p* (value)
Average age (y)* (SD)	54.5 (±17.4)	27.7 (±14)	60 (±12.0)	0.000
Female** (%)	569 (48.5%)	114 (55.8%)	455 (46.9%)	0.020
Self-reported color-race (%)**				0.009
Yellow	71 (6.1%)	4 (1.9%)	68 (7%)	
White	980 (83.5%)	173 (84.8%)	807 (83.2%)	

Brown	81 (6.9%)	15 (7.3%)	66 (6.8%)	
Black	40 (3.4%)	12 (5.8%)	28 (2.8%)	
Family income (MW)(%)* **				
< 2	45 (3.8%)	18 (8.8%)	27 (2.7%)	
2-3	177 (15.1%)	35 (17.1%)	142 (14.6%)	
3-6	386 (32.9%)	67 (32.8%)	319 (32.9%)	0.005
6-10	337 (28.7%)	48 (23.5%)	289 (29.8%)	
10-15	134 (11.4%)	26 (12.7%)	108 (11.1%)	
15-25	83 (7.1%)	9 (4.4%)	74 (7.6%)	
> 25	11 (0.9%)	1 (0.4%)	10 (1%)	

Note: * Student-t test. ** Pearson's Chi-square, *** Mann-Whitney test, SD: standard deviation. MW: minimum wage; y (years).
Source: Catelli MMF, et al., 2024.

In **Table 2**, there´re clinical variables concerning duration of DM, glycemic control with laboratory findings, the therapy used and data about smoking habits of all patients and of each DM type patients.

Table 2 - Clinical, laboratory, DM therapeutics and lifestyle characteristics of the studied population.

	Patients (n=1,173)	**T1DM (n=204)**	**T2DM (n=969)**	***p* value**
Average diabetes duration (y) (SD)*	9.23 (±8.6)	10.2 (±10.2)	9 (±8.2)	0.07
Average fasting glycemia in mg/dL (SD)*	173.63 (± 83.1)	179.9 (±102.6)	172.4 (±78.9)	0.32
Average HbA1c % (SD)*	9.21 (± 2.1)	9.5 (±1.9)	9.1 (±2.1)	0.02
HbA1c values above target for age**	790 (67.3%)	168 (82.3%)	622 (64.18%)	0.000
Using only OADs (%)**	552 (47.0%)	-	552 (56.9%)	0.000
Using only insulin (%)**	108 (9.2%)	187 (91.6%)	79 (8.1%)	0.000
Using OADs + insulin (%)**	123 (10.5%)	17 (8.3%)	106 (10.9%)	0.269
Patients adherent to prescribed diet (%)**	1001 (85.3%)	186 (91.1%)	815 (84.1%)	0.002
Smoking**	147 (12.5%)	14 (6.8%)	133 (13.7%)	0.007

Note: *Student-t test, ** Pearson's Chi-square test, SD: standard deviation; HbA1c: glycated hemoglobina; OAD: oral antidiabetic drugs.
Source: Catelli MMF, et al., 2024.

Data concerning comorbidities and mortality found in the studied population, are shown in **Tables 3** and **4**, respectively. In **Table 3** there´re different comorbidities and de prevalence them in all patients and in each DM type patients.

Table 3 - Associated comorbidities in the studied population.

Variables	**Patients (n=1,173)**	**T1DM (n=204)**	**T2DM (n=969)**	***p* value**
Hypertension*	623 (53.1%)	35 (17.1%)	588 (60.6%)	0.000
Dyslipidemia*	788 (67.1%)	92 (45%)	696 (71.8%)	0.000
Obesity*	42 (3.5%)	12 (5.8%)	30 (3%)	0.803
Overweight*	643 (54.8%)	35 (17.1%)	608 (62.7%)	0.000
Diabetic retininopathy*	95 (8%)	14 (6.8%)	81 (8.3%)	0.471
Diabetic renal disease*	33 (2.8%)	7 (3.4%)	26 (2.6%)	0.560
Lower limb amputation*	14 (1.1%)	2 (0.9%)	12 (1.2%)	0.755
Feet deformities*	48 (4%)	4 (1.9%)	44 (4.5%)	0.101
Previous diabetic foot*	15 (1.2%)	1 (0.4%)	14 (1.4)	0.270
Associated comorbidities**				0.000

0	239 (20.3%)	125 (61.2%)	114 (11.7%)	
1	382 (32.5%)	54 (26.4%)	328 (33.8%)	
2	427 (36.4%)	17 (8.3%)	410 (42.3%)	
3 or +	125 (10.6%)	8 (3.9%)	117 (12.0%)	

Note: *Pearsons' Chi-square test, ** Mann-Whitney test.
Source: Catelli MMF, et al., 2024

In **Table 4**, there´re mortality variables concerning the age of death, the duration of DM in the period and underlying causes of death of all patients and of each DM type patients.

Table 4 - Mortality data in the studied population.

Variables	Patients (n=1,173)	T1DM (n=204)	T2DM (n=969)	*p* value
Decreased*	404 (34.4%)	78 (38.2%)	326 (33.6%)	0.210
Average age at death (y) **	73.8 (±13.8)	73 (± 16.5)	74 (±13.1)	0.558
Diabetes duration at death (y)**	21.7 (±10.3)	21.6 (± 9.7)	21.7 (±10.5)	0.937
Time between last evaluation and death (y)**	9.6 (±6.1)	10.4 (±7)	9.4 (±5)	0.240
Underlying causes of death*				0,000
Neoplasms	57 (4.9%)	2 (1%)	55 (5.7%)	
DM	70 (6%)	6 (2.9%)	74 (6.6%)	
Lung	52 (4.4%)	6 (2.9%)	46 (4.7%)	
Cardiovascular	108 (9.2%)	5 (2.5%)	103 (10.6%)	
Kidney	20 (1.7%)	4 (2%)	16 (1.7%)	
Neurological	10 (0.9%)	0 (0%)	10 (1%)	
Gastrointestinal or liver diseases	12 (1%)	0 (0%)	12 (1.2%)	
Other causes	31 (2.6%)	6 (2.9%)	25 (2.6%)	

Note: * Pearsons' Chi-square test, ** Student-t test; y: years.
Source: Catelli MMF, et al., 2024.

DISCUSSION

The sample of patients with T1DM was composed mainly by White people, women and with an average monthly family income of 3-6 Brazilian minimum wages (equivalent to 754,77 - 1509,55 International dollars). People with T1DM were younger than those with T2DM, the majority had an inadequate glycemic control (average HbA1c of 9.5%), and declared to be adherent to the prescribed diet. Regarding therapy, 74.5% used only insulin as DM treatment modality, had fewer associated comorbidities (61.2% did not have any) and presented varied causes of death.

In contrast, patients with T2DM were older, also predominantly White, male, and reported being more adherent to diet than those with T1DM, and had also an average monthly family income of 3-6 minimum wages (International dollars 754,77 - 1509,55). The most frequently used therapy was OADs.

They had more associated comorbidities (hypertension, dyslipidemia, overweight), had higher rates of smoking habits and death due to cardiovascular diseases (CVD). Despite the rate of inadequate glycemic control being lower than that found in people with T1DM, it was still found in 64.18% of patients (average HbA1c of 9.1%).

Most people in our sample, both with T1DM (82.3%) and T2DM (64.18%), had HbA1c above the therapeutic targets for their respective ages. These values were slightly lower than those found in another Brazilian study (MENDES AB, et al., 2010), which evaluated 6,671 adults with DM in secondary and tertiary care level centers and found that that 76% of them had inadequate glycemic control (HbA1c >7 %), being 90% in T1DM and 73% in T2DM. Interestingly, there was no difference comparing specialist and non-specialist care in terms of HbA1c.

In our study, the most prevalent comorbidities related to DM were dyslipidemia (45% in patients with T1DM and 71.8% in those with T2DM), overweight (17.1% in T1DM and 62.7% in T2DM) and hypertension (17.1% % in T1DM and 60.6% in T2DM), all of them were found to be more prevalent in people with T2DM (p=0.000). It was also found that most people with T1DM (61.2%) did not have any other associated comorbidity, while most of those with T2DM (54.3%) had two or more.

A study carried out in Germany (VAN DEN BOOM L, et al, 2022), which analyzed the prevalence of comorbidities in people with T1DM, found that 18.2% of patients did not have any comorbidity associated with DM, while the average of other associated comorbidities was approximately three, being the most prevalent hypertension (31.2%), dyslipidemia (26.4%) and back pain (20.4%).

Regarding T2DM, a Danish study (POUPLIER S, et al., 2018), which evaluated the prevalence of comorbidities after 16 years of diagnosis, identified the presence of two or more associated comorbidities in 47.6% of the sample, while the absence of other comorbidities was found in only 19.6% of patients. Another study (IGLAY K, et al., 2016) found data that were similar to ours, being hypertension, overweight and dyslipidemia the most frequently associated comorbidities with T2DM, with a prevalence of 82.1%, 78.2% and 77.2%, respectively.

From the general perspective of DM, a Brazilian study (RZEWUSKA M, et al., 2013) which evaluated the prevalence of comorbidities in the Brazilian adult background population, using data from the National Health Survey (NHS), showed that among individuals who self-declared as having DM of any type, only 18.1% had only DM, and 55.2% reported to have two or more associated comorbidities, which was close to the mean of the total population of this study, in which 20.3% had no associated comorbidity and 47% had at least two.

Dyslipidemia was the most prevalent comorbidity found in our sample, mostly among people with T2DM (71.8%). Patients with T2DM exhibited frequently more than one type of dyslipidemia, characterized by high levels of triglycerides and low concentrations of HDL, an atherogenic profile that constitutes a risk factor for CVD and commonly associated with worse outcomes (RZEWUSKA M, et al., 2013; NORDESTGAARD BG, et al., 2007). In line with this, our study also showed a higher mortality rate from CVD among people with T2DM (10.6%).

Obesity increases the risk of CVD, worsening the prognosis of DM and being frequently associated with worse outcomes (BERTOLUCI MC, et al., 2022). Most people with T2DM (62.7%) in our sample were overweight, while among those with T1DM this value was much lower (17.1%). In a national study, conducted in a University Hospital located in Rio de Janeiro (MORAES CMD et al., 2003), the prevalence of overweight, obesity and/or risk of overweight in the group of people with T1DM was of 21.2%. On the other hand, another national multicenter study (GOMES MB, et al., 2006) found a 75% prevalence of overweight and obesity in people with T2DM, a much higher value than that found in the present study.

The prevalence of smoking in our total sample was 12.5%, while the average found a few years ago by the Brazilian Study of Surveillance of Risk and Protective Factors for Chronic Diseases by Telephone Survey (VIGITEL) conducted in all the country's capitals was of 14.8% (BRASIL, 2012). In the fourth WHO (2021) smoking report, which presents smoking rates since the year 2000 and provides projections up to 2025, the global prevalence of smoking in 2000 was 32.7%, 29.5% in 2005 and 26.7% % in 2010.

Therefore, the prevalence of smoking in this present study was lower than the global and Brazilian rates at the respective timeframes. Furthermore, we found a significant difference between the groups, being smoking more frequently found among people with T2DM (13.7%) than among those with T1DM (6.8%). Smoking is an important modifiable risk factor for the development of T2DM, impacts negatively on the disease control and contributes to the appearance of diabetes-related chronic complications (ŚLIWIŃSKA-MOSSOŃ M and MILNEROWICZ H, 2017).

Most people in our sample had hypertension, which was more frequently found among patients with T2DM (60.6%) compared to those with T1DM (17.1%). The prevalence of hypertension is higher in people with DM (FERRANNINI E, CUSHMAN WC, 2012; SOWERS JR, 2003), but the prevalence and the association between the two diseases vary according to DM type. In T1DM, the prevalence of hypertension shows a vast geographic

variation, presenting a heterogeneity among the studied populations, mainly in relation to age group. On the other hand, in T2DM, the prevalence of hypertension can be as high as 80% (JIA G, SOWERS JR., 2021). The coexistence of hypertension and DM is worrisome, as it increases the risk of vascular complications and predisposes patients to heart failure, cerebrovascular events, coronary artery disease, peripheral arterial insufficiency, DRD and DR (FARIA AN, et al., 2002).

The alterations found in the feet of people with DM present significant repercussions since it is the most frequent cause of non-traumatic lower limb amputations (IWGDF, 2001). It is known that 14% to 20% of patients with ulcers will undergo amputations and that 40% of ulcers relapse in the first year and 65% in five years in people with DM which implies continuous follow-up (ARMSTRONG DG, et al., 2017). In our study, in general, it was found 1.1%, of amputations, 4.0% of foot deformities and a previous history of diabetic foot in 1.2%.

As for mortality, it is known that CVD are the main cause of death and disability in people with DM (IDF, 2016), and cardiovascular complications and mortality rates in people with diabetes have increased over time in low- and middle-income contries (ALI MK, et al., 2022). This is consistent with our findings, in which 9.2% of the patients died as a result of these complications (2 .5% among people with T1DM and 10.6% among those with T2DM). Other frequent causes of mortality were: DM among 6.0%, neoplasms in 4.9% and pulmonary complications in 4.4%.

This study has strengths and also some limitations. We can consider as strengths the size of our sample and the fact that these patients were evaluated over a long period, by the same professional. Furthermore, to the best of our knowledge, there are no other Associations of people with DM in our country, with the availability of such an extensive and reliable database.

As a limitation of the study, we can point out that the classification of T1DM was not based on the detection of autoantibodies or measurement of C-peptide levels, similarly to other epidemiological studies (CHATURVEDI N, et al., 2001; TOLONEN N, et al., 2008; MILLER KM, et al., 2015). However, we believe that there was no bias in the DM types pointed out in our study since the epidemiological classification of DM has been shown to be highly reliable (EEG-OLOFSSON K, et al., 2010). On the other hand, with regard to lifestyle habits, although all patients were advised to avoid alcohol abuse and to practice regular physical activities, there was no record of these items in our database.

CONCLUSION

Our study showed that most people with T1DM had inadequate glycemic control, fewer associated comorbidities, and presented varied causes of death. The majority of people with T2DM had also inadequate glycemic control, but with more associated comorbidities (hypertension, dyslipidemia, overweight) being CVD the main cause of death. In conclusion, although the Bauru's Diabetics Association, a non-profit institution based in the interior of Brazil, maintains commendable support for patients with DM, the current provided care model needs to be rethought to provide more frequent clinical follow-up and deliver structured education for patients, family members and awareness to society as a whole. The training of health professionals, general practitioners and specialists needs to be urgently instituted with the support of local health public sectors. Future studies are needed to evaluate, in the long term, the impact of these changes on the morbidity and mortality of the Brazilian population with DM.

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