# PROFILE AND CLINICAL EVOLUTION OF PATIENTS WITH TYPE 1 DIABETES *MELLITUS*: A LONGITUDINAL STUDY AT A SECONDARY REFERENCE CENTER IN MINAS GERAIS

*PERFIL E EVOLUÇÃO CLÍNICA DOS PACIENTES COM DIABETES MELLITUS TIPO 1: ESTUDO LONGITUDINAL EM UM CENTRO DE REFERÊNCIA SECUNDÁRIA DE MINAS GERAIS*

*PERFIL Y EVOLUCIÓN CLÍNICA DE PACIENTES CON DIABETES MELLITUS TIPO 1: ESTUDIO LONGITUDINAL EN UN CENTRO DE REFERENCIA SECUNDARIA DEL ESTADO DE MINAS GERAIS*

Agma Leozina Viana Souza [1]
Aleida Nazareth Soares [1]
Tatiane Géa Horta [1]
Alexandra Dias Moreira [1]
Janice Sepúlveda Reis [1]

[1] Santa Casa de Misericórdia de Belo Horizonte, Instituto de Ensino e Pesquisa, Mestrado Profissional em Educação em Diabetes. Belo Horizonte, MG – Brazil.

Corresponding author: Janice Sepúlveda Reis. E-mail: janicesepulveda@gmail.com
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## ABSTRACT

The aim of this study was to evaluate the profile and clinical evolution of patients with type 1 Diabetes *Mellitus* (T1DM) at a Secondary Reference Center in Minas Gerais. This is a longitudinal study with 174 individuals with T1DM treated at a Secondary Reference Center in Minas Gerais between 2010 and 2015. The studied variables were: Socio-demographic characteristics, time with diabetes, treatment, comorbidities, glycated hemoglobin (A1c) and LDL cholesterol. Paired t-test and McNemar test were used for the annual comparisons of A1c and LDL-c, considering a significance level of 5%. The results showed that 5.7% of the patients were is use of continuous insulin infusion system, 61.5% of NPH and 32.8% of glargine; 47.1% of the patients used statin; 63.21% came to the service with A1c values above 8% and 27.0% above 10%. At the end of the first year of follow-up, this percentage decreased to 49.9%, with a greater reduction of those with A1c above 9%. There was a significant decrease in A1c averages (9.01 ± 2.46 in 2010 and 8.2 ± 1.74 in 2011, p <0.001), which remained unchanged on the following years. There was also a significant reduction of LDL-c over the entire follow-up period (p <0.005). We concluded that the multidisciplinary care of patients with T1DM contributed to the improvement of metabolic parameters on the first year of follow-up.
Keywords: Diabetes *Mellitus*, Type 1; Secondary Health Care; Medical Record.

## RESUMO

*Objetivou-se avaliar o perfil e a evolução clínica dos pacientes com diabetes* mellitus *tipo 1 (DM1) de um centro de referência secundária de Minas Gerais. Trata-se de estudo longitudinal com 174 pessoas com DM1 atendidos em um centro de referência secundária de Minas Gerais no período de 2010 a 2015. Avaliaram-se variáveis sociodemográficas, tempo de diabetes, tratamento, comorbidades, hemoglobina glicada (A1c) e LDL colesterol. Utilizou-se o teste T pareado e de McNemar para as comparações anuais da A1c e do LDL-c, com nível de significância inferior a 5%. Os resultados mostraram que 5,7% dos pacientes estavam em uso de sistema contínuo de infusão de insulinas, 61,5% de NPH e 32,8% de glargina; 47,1% dos pacientes usavam estatina; 63,21% chegaram ao serviço com valores de A1c acima de 8%, sendo 27,0% acima de 10%. Ao final do primeiro ano de acompanhamento, esse percentual reduziu-se para 49,9%, com maior redução dos que tinham A1c acima de 9%. Observou-se diminuição significativa nas médias de A1c (9,01±2.46 em 2010 e 8,2±1.74 em 2011; p<0,001), mantendo-se sem alterações nos demais anos. Apurou-se também significativa redução do LDL-c ao longo de todo o período de acompanhamento (p<0,005). Concluiu-se que o atendimento multidisciplinar dos pacientes com DM1 contribuiu para a melhora dos parâmetros metabólicos logo no primeiro ano de acompanhamento.*
*Palavras-chave: Diabetes Mellitus Tipo 1; Atenção Secundária à Saúde; Registros Médicos.*

## RESUMEN

*Evaluar el perfil y la evolución clínica de los pacientes con diabetes* mellitus *tipo 1 (DM1) de un centro de referencia secundaria de Minas Gerais. Estudio longitudinal realizado con 174 pacientes en el período de 2010 a 2015. Se evaluaron variables sociodemográficas, tiempo de diabetes, tratamiento, comorbilidades, hemoglobina glucosa (A1c) y LDL colesterol. Se utilizó la prueba T pareado y de McNemar para las comparaciones anuales de la A1c y del LDL-c, con nivel de significancia inferior al 5%. 5,7% de los pacientes utilizaban continuamente la infusión de insulinas, 61,5% de NPH y 32,8% de glargina. El 47,1% de los pacientes usaba estatina; el 63,21% de los pacientes llegó al servicio con valores de A1c superior al 8% y, entre ellos, el 27,0% superior al 10%. Al final del primer año de seguimiento, este porcentaje se redujo al 49,9%, con mayor reducción entre aquéllos con A1c superior al 9%. Se pudo observar significativa disminución en los promedios de A1c (9,01 ± 2.46 en 2010 y 8,2 ± 1.74 en 2011, p <0,001), manteniéndose sin cambios en los demás años. Hubo reducción significativa del LDL-c a lo largo de todo el período (p <0,005). La atención multidisciplinaria de los pacientes con DM1 contribuyó a una mejora de los parámetros metabólicos ya en el primer año de seguimiento.*

**Palabras clave***: Diabetes Mellitus Tipo 1; Atención Secundaria a la Salud; Registros Médicos.*

## INTRODUCTION

Diabetes *Mellitus* (DM) is defined as a heterogeneous group of metabolic disorders characterized by hyperglycemia due to deficiency in production or in the action of insulin.[1] For the International Diabetes Federation (IDF), this is one of the world's biggest public health problems because of the high cost to the health system and the quality of life. It is estimated that there are currently 415 million people with diabetes and that 193 million have not yet been diagnosed. By 2040, the number of people with diabetes may increase to 642 million.[2]

Regarding its classification, DM involves four main categories: type 1 DM (T1DM), type 2 DM (T2DM), gestational DM and other specific types of diabetes. Among these, types 1 and 2 are the most prevalent. T1DM represents 7 to 12% of all diabetes cases worldwide; its incidence increases 3% per year and it affects more children and adolescents due to the autoimmune destruction of insulin-producing beta-pancreatic cells or due to idiopathic causes. On the other hand, T2DM is a result of progressive changes in insulin action, related to sedentary lifestyle, obesity and inadequate food consumption patterns; it is more common in adults. This classification directly affects the determination of the therapeutic plan.[1]

If untreated, DM is associated with several microvascular (retinopathy, nephropathy, neuropathy) and macrovascular complications (peripheral vascular disease, ischemic heart disease, acute myocardial infarction) responsible for disabilities and premature deaths.[3,4] In order to prevent these outcomes, adequate glycemic control is essential and its approach involves pharmacological and non-pharmacological measures, such as changes in lifestyle .[5]

The classic clinical trials Diabetes Control and Complications Trial (DCCT) and UK Prospective Diabetes Study (UKPDS) have shown the advantages of an intensive treatment regimen for glycemic control, reducing microvascular complications. This intensive regimen consists of the combination of fast or ultra-fast acting insulin and slow acting insulin in three or more applications per day. The conclusion of these studies led the American Diabetes Association (ADA) to recommend a glycemic goal of 7% of glycol-hemoglobin as a reference value for good control.[1,5,6]

However, achieving therapeutic goals may be a challenge in the case of T1DM or T2DM patients using insulin. As glucose levels vary throughout the day due to hypoglycemic therapies and daily activities, a safe and effective glycemic control depends on patients' self-monitoring.[7] Thus, the guidelines on diabetes recommend that this approach be performed by a multiprofessional team, in which the interaction of different sources of knowledge provides better answers to the patient's needs and reduction of complications.[6,8,9] In this sense, the scientific community acknowledges the crucial participation of cross-disciplinarity in the identification of patients at high risk and, especially, in health education.[10]

It is also worth noting that, for optimizing care, practitioners must know the characteristics of users with T1DM and monitor the effectiveness of interventions. However, there is little longitudinal research on this subject in Brazil and Latin America. Given this context, the present study aimed to evaluate the profile and clinical evolution of patients with T1DM in a secondary reference center in the state of Minas Gerais.

## METHOD

This is a longitudinal retrospective study performed at the *Centro de Especialidades Médicas (CEM)* of a large hospital in the city of Belo Horizonte, Minas Gerais, Brazil. The service provides secondary care and is a reference in the service to users of the *Sistema Único de Saúde (SUS)* forwarded from health centers in Belo Horizonte and other municipalities of Minas Gerais.[8]

The Endocrinology sector, one of the medical specialties integrated to this service, is composed of physicians, nurses, nutritionists, physical educators, physiotherapists, psychologists and podiatrists. The attendances are individual and collective, in view of the adequate glycemic control. The data collected are registered in medical records and kept filed in the service.

Of the 317 patients with T1DM being followed-up in the study period, those who had been absent from the service for

more than one year, those who had not attended a scheduled return visit (n = 93), those who had requested to quit the service (n = 9) and those who had been admitted during the year 2015 (n = 36) were excluded from the sample. Also, there were five deaths reported during that period. Thus, sociodemographic and clinical analyzes were performed for 174 patients who met the inclusion criteria for the study: having attended the consultations for at least one year; having diagnosis of T1DM registered in the medical record; and having agreed to participate in the study.

In the year 2015, participants were interviewed for the collection of sociodemographic data. The other information was collected retrospectively in the medical records referring to the consultations conducted between the years 2010 and 2015 with weekly frequency. General information on the diagnosis, treatment and complications of diabetes throughout the years of patient follow-up was included in this study. This information was collected from the records provided by physicians, nutritionists, nurses, physical educators and psychologists.

The study variables were divided into **socioeconomic** variables: age; sex (male, female); marital status (single, married, widowed or other); race or self-declared color (white, black, yellow, brown or indigenous); occupation (housewife, retired, medical leave, student, unemployed or other professions); schooling (illiterate/functionally illiterate, complete elementary school, incomplete elementary school, complete high school, incomplete high school, complete higher education, incomplete higher education), family income in minimum wages (MW) (less than 1 MW, 1 to 2 MW, 3 to 4 MW or more than 5 MW); **clinical data**: type of diabetes (T1DM or latent autoimmune diabetes in adults - LADA); time since diagnosis in years, time of initial diagnosis: refers to the time of diagnosis in years of admission to the outpatient clinic; type of treatment (intensive or conventional, ≥ 3 doses of insulin and ≤ 3 doses, respectively); use and types of short- or long-acting insulin analogues; use of insulin pump (yes, no); A1c value (initial value and annual mean); use of statin (yes, no), LDL cholesterol (highest annual value for LDL cholesterol - low density lipoproteins); **life habits**: carbohydrate counting (yes, no or stopped counting); physical activity (less than 150 minutes or 150 minutes or more - WHO, 2011); presence or absence of smoking, alcoholism or other chemical dependence; **complications of diabetes and comorbidities**: presence or absence of retinopathy, nephropathy, neuropathy, amputation, systemic arterial hypertension (SAH), myocardial infarction (AMI), stroke, hypothyroidism, celiac disease; **multidisciplinary follow-up and tests**: consultation with nutritionist (yes, no); consultation with physical educator (yes, no); consultation with nurse (yes, no); consultation with psychologist (yes, no); number of consultations with each professional; annual ophthalmologic evaluation (performed, not performed or not indicated - if less than five years of diagnosis); annual proteinuria, microalbuminuria, or albumin/creatinine ratio (test performed, not performed or not indicated); dialysis (yes, no).

For analysis of the data, descriptive analyzes were initially performed - frequencies for the categorical variables and mean, median, minimum, maximum and standard deviation for the quantitative variables.

Because it was a gold standard test for determination of therapeutic goals, A1c values received more attention in the study, including the initial A1c value and the mean value in the five years of follow-up in the service. To analyze the evolution of the initial glycemic control and year by year, A1c values were stratified into predetermined ranges (<7%, between 7 and 8%, between 8 and 9%, between 9 and 10% and> 10%). Annual values of LDL cholesterol were also demonstrated. Then, the paired T-test and McNemar test were used for the annual comparisons of these variables. A significance level of less than 5% was considered in all tests. The software used for analysis was the Statistical Package for the Social Sciences (SPSS) version 20.0.

The study was approved by the Ethics Committee of the National Information System on Research involving Human Beings (SISNEP) of Plataforma Brasil in agreement with the Ethics Committee of the Institute of Education and Research (IEP) of *Santa Casa de Belo Horizonte*, under the number 44367015.1.0000.5138 on May 15, 2015. The Informed Consent Form (ICF) was read, clarified and signed together with the patient or his/her legal representative for the proper authorization of the research.

## RESULTS

The sample consisted of 96 men (55.1%) and 78 women (44.9%); the majority of the participants were single (60.9%), formal workers (47.1%), with complete high school (35.1%), income between one and two minimum wages (69.6%) and mean age of 34 years (SD = 14). Regarding the origin, the study showed that 86 patients (49.5%) lived in Belo Horizonte, while the other 88 (50.5%) came from other municipalities (Table 1).

From the clinical point of view, the surveyed variables defined the following profile: 168 (96.5%) patients classified as T1DM and six (3.5%) as LADA. The mean time of diagnosis was 15.35 years and when reaching the outpatient clinic the patients had, on average, 9.5 years of diagnosis. Upon admission, more than half of the patients (54.6%) reported being on a conventional treatment regimen. Regarding the type of basal insulin, the highlight was for NPH, used by 107 (61.5%) patients, followed by glargine, used by 57 patients (32.8%) of the sample. A total of 145 patients (83.3%) used short-acting insulin analogues, while 29 patients (16.7%) were using regular insulin. Regarding the continuous infusion system (CIS), also known as an insulin pump, 10 patients (5.7%) used this type of treatment. Less than half of the study group, 87 subjects (47.1%), used some statin (Table 2).

Table 1 - Sociodemographic characterization of the patients attended in the Reference Center. Belo Horizonte, 2010-2015

| Variable | Mean ± SD/ n (%) n = 174 |
|---|---|
| Age (years) | 34 ± 14 |
| Sex | |
| Male | 96 (55.1) |
| Female | 78 (44.9) |
| Marital status | |
| Single | 106 (60.9) |
| Married | 51 (29.3) |
| Widowed | 3 (1.7) |
| Other | 14 (8.1) |
| Occupation | |
| Housewife | 17(9.8) |
| Retired | 21 (12.1) |
| Student | 37 (21.3) |
| Medical leave | 6 (3.4) |
| Unemployed | 11 (6.3) |
| Others | 82 (47.1) |
| Schooling | |
| Illiterate | 1 (0.6) |
| Complete Elementary School | 14 (8.0) |
| Incomplete Elementary School | 47 (27.0) |
| Complete High School | 61 (35.1) |
| Incomplete High School | 30 (17.2) |
| Complete Higher Education | 13 (7.5) |
| Incomplete Higher Education | 8 (4.6) |
| Family income (MW) | |
| Up to 1 | 10 (5.7) |
| 1-2 | 121 (69.6) |
| 3-4 | 33 (19.0) |
| ≥5 | 10 (5.7) |

Source: survey data.

Table 2 - Clinical characterization of patients attended at the Reference Center. Belo Horizonte, 2010-2015

| Variable | Mean ± SD / n (%) n = 174 | Minimum – maximum |
|---|---|---|
| Type of diabetes | | |
| T1DM | 168 (96.5) | |
| LADA | 6 (3.5) | |
| Time of diagnosis (years) | 15.35± 10.31 | 1-53 |
| Time of diagnosis at admission (years) | 9.5± 10 | <1-42 |
| Follow-up time (years) | 5±3 | <1-11 |

Continued...

Table 2 - Clinical characterization of patients attended at the Reference Center. Belo Horizonte, 2010-2015

| Variable | Mean ± SD / n (%) n = 174 | Minimum – maximum |
|---|---|---|
| Type of treatment at admission | | |
| Conventional | 95 (54.6) | |
| Intensive | 79 (45.4) | |
| Use of short-acting insulin analogues | | |
| Yes | 145 (83.3) | |
| No | 29 (16.7) | |
| Type of basal insulins | | |
| NPH | 107 (61.5) | |
| Glargine | 57 (32.8) | |
| CIS | 10 (5.7) | |
| Use of statins | | |
| Yes | 82 (47.1) | |
| No | 92 (52.9) | |

Source: survey data.

Table 3 shows the annual glycemic control (n = 174), including the initial A1c value and the mean value during the first five years of service follow-up. The initial A1c shows that most patients (n = 110; 63.21%) arrived at the outpatient clinic with values above 8%, that is, metabolically decompensated, while 47 (27.01%) arrived with A1c> 10%, in this case, at higher risk of an acute complication of diabetes. At the end of the first year of follow-up there was a significant reduction in A1c (9.01 ± 2.46 vs. 8.2 ± 1.74), being 49.9% (A1c> 8%) and 14.58% (A1c> 10%). From the third year of follow-up, the highest percentages of A1c remained between 7 and 8%. Therefore, there was a significant reduction (p <0.001) in A1c levels at the end of the first year of follow-up in secondary care, which remained over the next four years of follow-up. It is also observed that there was a significant decrease in LDL-C values from the second year of follow-up (Table 4).

In relation to complications and comorbidities, hypertension had a higher percentage (43.7%), followed by hypothyroidism, with 16.7% of people affected. Regarding microvascular complications, the most prominent was diabetic retinopathy (37.4%), followed by nephropathy, with 29.3% of patients affected, of which 7.5% were on dialysis. On the other hand, neuropathy showed 24.1% of patients with loss of protective sensitivity, 2.9% of whom suffered amputation. Regarding the use of chemical substances, it was verified that 10.3% of the patients declared making casual or routine use of alcoholic beverages, while 4.6% declared themselves as smokers (Figure 1).

Table 3 - Evolution of A1c during the first 5 years of follow-up in the Reference Center. Belo Horizonte, 2011-2015

| Year | Initial | p-value | 1 | p-value | 2 | p-value | 3 | p- value | 4 | p- value | 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| N | 174 | | 144 | | 148 | | 130 | | 108 | | 94 |
| A1c (%) | 9.01±2.46 | <0.001 | 8.2±1.74 | 0.129 | 8.31±1.85 | 0.298 | 8.25±1.6 | 0.409 | 8.12±1.46 | 0.306 | 8±1.25 |
| Minimum | 4.7 | | 4.2 | | 5.41 | | 5.9 | | 5.6 | | 6.1 |
| Maximum | 20.5 | | 14.4 | | 15.4 | | 16 | | 14.05 | | 12.6 |
| <7% | 30 (17.24) | <0.001 | 39 (27.08) | 0.282 | 41 (27.7) | 0.257 | 25 (19.23) | 0.854 | 20 (18.51) | 0.648 | 20 (21.27) |
| 7-8% | 34 (19.54) | | 33 (22.91) | | 35 (23.64) | | 43 (33.07) | | 38 (35.18) | | 29 (30.85) |
| 8-9% | 29 (16.66) | | 35(24.30) | | 31 (20.94) | | 32 (24.61) | | 24 (22.22) | | 29 (30.85) |
| 9-10% | 34 (19.54) | | 16 (11.11) | | 18 (12.16) | | 15 (11.53) | | 14 (12.96) | | 9 (9.57) |
| >10% | 47 (27.01) | | 21 (14.58) | | 23 (15.54) | | 15 (11.53) | | 12 (11.11) | | 7 (7.44) |

Note: Values expressed as mean ± SD or n (%).
Source: survey data.

Table 4 - Evolution of LDL cholesterol during the first 5 years of follow-up in the Reference Center. Belo Horizonte, 2011-2015

| Year | 1 | p-value | 2 | p-value | 3 | p-value | 4 | p-value | 5 |
|---|---|---|---|---|---|---|---|---|---|
| N | 155 | | 127 | | 117 | | 93 | | 80 |
| LDL (mg/dl) | 111.43 ±35.87 | <0.001 | 105.15 ±32.17 | <0.001 | 101.79 ±31.4 | <0.001 | 101.23±32.19 | 0.041 | 99.77 ±29.95 |
| Minimum | 29 | | 50 | | 48 | | 38 | | 49.8 |
| Maximum | 261 | | 257 | | 232 | | 220 | | 252 |

Note: Values expressed as mean ± SD or n (%).
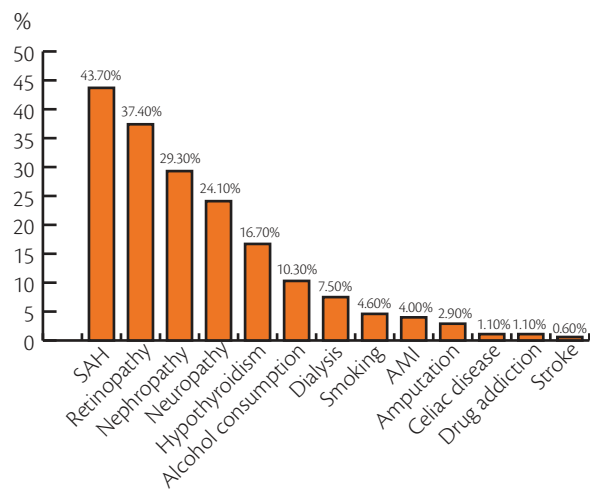Source: survey data.



Figure 1 - Chronic complications, associated autoimmune diseases, and alcohol, tobacco, and drug use among active patients until their last visit in 2015 (n = 174) in the Reference Center. Belo Horizonte, 2010-2015. Source: survey data.

Other studied variables were carbohydrate counting and physical activity. According to the medical records, 49 individuals (28.2%) were counting carbohydrates, while 111 (63.8%) had never adhered to it and 14 (8%) had abandoned this practice. Regarding physical activity, 54.6% declared themselves active (data not presented).

In this study, 67 patients (38.5%) had no comorbidities or complications. Of these, four were in continuous infusion sys-

tem, known as an insulin pump, all of whom have a diagnosis time of more than five years. Of the remaining patients in the group, i.e., 63 patients with no comorbidities or complications, 44 had a diagnosis time of more than five years and only 19 had less than five years of diagnosis (data not presented).

Based on the assumption of interdisciplinary work, it was found that all patients had attended consultations with the endocrinologist and almost all (98.7%) with a nutritionist. For the other professionals, there was less demand for care (data not presented).

An important disparity is perceived when analyzing patients' access to professionals before arriving at the outpatient clinic. No more than 9% patients reported having attended consultation with an endocrinologist, 8.6% with a nutritionist, only one with a nurse and with a psychologist and no patient had attended consultations with a physical educator (data not presented).

## DISCUSSION

In the present study, it was possible to verify the effectiveness of the actions performed in the outpatient clinic in relation to glycemia and LDL cholesterol control in people with diabetes in the analyzed period. The results also revealed significant variations in the sample profile, which is already observed in the day-to-day care, due to the great heterogeneity of the assisted population, and signaled to the potentialities and fragilities of the service before the current care model.

Regarding the schooling of the patients, there was prevalence of the high school level. This finding favors the process of health education, advocated by many authors as essential for the development of autonomy and management of self-care.[1,11-15] In contrast, low schooling, including functional illiteracy, are predictors of low autonomy and consequent impairment for achieving goals. In this study, a smaller number of patients fit within this profile, however, educational actions should be intensified in this group of people.

Reinforcing this condition, the IDF (2015) states that every child and adolescent has the right to basic education and diabetes education, extended to family members and caregivers.[2] In this direction, the diabetes outpatient clinic offers individualized, person-centered educational and care activities adapted to each individual's needs in order to improve glycemic control, reducing the chances of complications. However, such activities are not centered on the level of education of the patient, which may influence the level of learning.

Although this study did not aim to relate family income to glycemic control, it identified that more than 75% of the sample analyzed reported family income of up to two minimum wages, in addition to an average of three people per family. Studies focused on this aspect demonstrated that the lower the financial condition, the worse the glycemic control.[15-16]

Regarding life habits, alcohol consumption and smoking were present in 10.3% and 4.6% of the sample, respectively. These findings called attention to the need to approach these conditions in order to avoid negative outcomes for glycemic control. It should be noted that the percentages of smoking were lower than those found in previous studies.[16-17] However, the possibility of information bias cannot be ruled out, since these variables were self-reported.

In the clinical evaluation, the present study showed that there was a significant reduction of glycemic and lipid levels from the first year of follow-up. This event reinforced the role of secondary care as a specialized reference for the follow-up of patients with T1DM. On the other hand, it showed the fragility of the service network, especially of primary care, since more than half of the patients (63%) arrived at the outpatient clinic metabolically decompensated, with an inadequate therapeutic regimen (54.6%) and an average diagnosis time of 9.5 years. It is worth mentioning that the decision for intensive treatment is well supported by classic studies and by the American and Brazilian societies of diabetes.[1,3-4,14,18] These patients were carefully evaluated at the outpatient clinic and received new therapeutic management. Likewise, the option for insulin analogues followed the recommendations of the SBD, considering the cost-benefit of this therapy.[19] Therefore, the reduction of A1c values, verified from the first year, certainly evidenced a relation with the therapeutic conduct and the commitment of the interdisciplinary team, whose focus is centered on the patient and on diabetes control actions.

Still in relation to the network, many patients (50.5%) came from other municipalities, a fact that can be interpreted as a difficulty of access to specialized services, which also contributes to absenteeism and discontinuity of treatment.

Regarding the screening of chronic complications, the diabetes outpatient clinic follows the SBD and ADA guidelines for case investigation and follow-up.[1,14] In this study, diabetic retinopathy was the most prevalent complication, with 37.4%, followed by nephropathy, with 29.3%. Hypertension was the most frequent comorbidity, occurring in 43.7% of the patients. Compared with the study by Rodrigues *et al.*, There was a discrepancy in the prevalences, with the highest percentage for retinopathy (45%), followed by nephropathy (34.5%) and hypertension (33%).[15] According to ADA and SBD guidelines, good metabolic control of diabetes prevents the onset or delays the progression of chronic complications.[1,14] It is worth emphasizing that the investigation of micro or macrovascular complications should not be postponed after the fifth year of diagnosis.[20] Efforts to prevent chronic complications are routinely made, however, the lack of counter-reference interfered with the quality of the recorded data .

The evaluation of the clinical profile highlighted the use of the continuous infusion system, emphasizing that the group of patients under this treatment presented the best glycemic levels recorded and more adherence to physical activity and carbohydrate counting. As a consequence, they had a lower prevalence of chronic complications.

When investigating the consultations performed by the multiprofessional team, it was found that all patients were attended by an endocrinologist and almost all of them by a nutritionist. We can infer that this panorama was due to the historical and sociocultural context of the assistance to people with diabetes, with emphasis on the drug and dietary treatment, centralizing the assistance procedures in these professionals. For the other categories, Psychology, Nursing and Physical Education, the offer of care was also significant, however, psychologists recognized the insufficiency of records as a critical point of care. According to the Code of Ethics of Psychologists, it is possible for these professionals to register in the medical record only information relevant to the service, preserving the patient's privacy.[21]

The nursing consultation sought to maintain the objectives of teaching, correcting and evaluating insulin application techniques and glycemic monitoring. As it demands more time from professionals, the offer of vacancies for this service was lower. The solution to this was to create two attendance lines: one for checking the main self-care items, being applicable in individual or collective care; and another for the first consultation, always done individually.

Despite the efforts, it was evident the need to empower professionals to perform the consultation of patients with diabetes, respecting and valuing the respective specificities of each category. A previous multicenter study to estimate the prevalence of inadequate glycemic control among diabetic patients seen at health centers found that patients followed by a multiprofessional team composed by endocrinologist, nutritionist and nurse had better glycemic levels.[17] Complementing this information, the World Health Organization says that among the factors promoting longevity and quality of life, 53% are related to lifestyle, 20% to the environment, 17% to genetics and 10% to medical care.[13] This statement should be understood by professionals as an incentive to their practice, and by patients and their families, as an opportunity to access the service.

A strength of this study was the work of the multidisciplinary team members that, together with the service managers, contributed to the performance of this research. Data recording and characterization of the public reference service of the State of Minas Gerais for the care of patients with T1DM was crucial for the understanding of the structure of the service, evaluation of quality markers and design of new strategies.

In addition, we highlight the important contribution of these findings to the literature, since the longitudinal follow-ups of individuals with diabetes in Brazil, with a description of their characteristics and clinical evolution, are scarce. The follow-up of these patients could directly impact health education practices and stimulate the work of the multidisciplinary team.

## CONCLUSION

The present study showed that there was a significant reduction of glycemic and lipid levels from the first year of follow-up. The treatment of patients with the continuous insulin infusion system was highlighted, emphasizing that this group presented the best glycemic levels recorded, more adherence to physical activity and to carbohydrate counting.

These results evidence the contribution of the secondary service to the qualification of care as well as the need of epidemiological studies with the objective of broadening the scientific focus on diabetes *mellitus*.

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