

# Clinical presentation and treatment of type 2 diabetes in young adults in a Colombian hospital

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## Abstract

**Introduction:** type 2 diabetes mellitus (T2DM) is the most common type of diabetes, generally occurring in adults. However, there are reports which describe it in adolescents and young adults.

**Objective:** to describe the clinical characteristics and treatment of type 2 diabetes in young adults in a Colombian hospital.

**Materials and methods:** a cross-sectional study from 2017 to 2019 which included young adult patients between 18 and 40 years old with T2DM who were seen at Hospital Santa Mónica in Dosquebradas, Colombia. The unit of analysis was the medical charts. Sociodemographic, clinical, pharmacological and metabolic control (HbA1c < 7.0%) variables were included. Descriptive analyses were performed, and binary logistic regression was applied ( $p < 0.05$ ).

**Results:** 124 patients were identified, 83 (70.0%) of whom met the inclusion criteria, with a mean age of  $33.7 \pm 5.3$  years. Some 28 patients were obese (33.7%). In addition, 21 patients (25.3%) had metabolic control. The most frequently used medications were metformin in 64 patients (77.1%), followed by insulin in 46 patients (55.4%). It was determined that 51 of these patients (61.4%) were compliant with treatment. No patients received triple therapy as a therapeutic strategy. Patients with diabetic retinopathy had a probable association with having the disease controlled at the time of the study ( $P=0.048$ , OR:0.130; 95%CI:0.017-0.987).

**Conclusions:** young adult patients have poor metabolic control and frequent use of insulins. (Acta Med Colomb 2021; 46. DOI: <https://doi.org/10.36104/amc.2021.1902>).

**Key words:** type 2 diabetes mellitus, young adult, insulin, pharmacological treatment, treatment compliance and adherence.

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## Introduction

Type 2 diabetes mellitus (T2DM) is a chronic disease which is caused by the pancreas being unable to produce sufficient insulin or by peripheral resistance to its action, leading to high blood glucose (1). Currently, diabetes may be divided into type 1 diabetes (T1DM), T2DM, gestational diabetes and specific types of diabetes (2). This hyperglycemia leads to complications in various target organs such as the heart, blood vessels, eyes, and kidneys, among others (2). Type 2 diabetes mellitus is the most common type of diabetes, usually occurring in adults; however, there are reports describing it in adolescents and young adults (3, 4).

Based on information from the International Diabetes Federation (IDF), in 2015, there were an estimated 415 million adults between 20-79 years old with T2DM worldwide, of whom 193 million were undiagnosed. In addition, in

South and Central America, there were approximately 29.6 million patients with T2DM, which are expected to reach 48.8 million in 2040 (4). The global prevalence in patients between 20 and 79 years old is 8.8%, and it is expected that in 2040 it will be 10.4% (4). In Colombia, there is an estimated 8.0% prevalence of T2DM, and approximately 30% of these people are unaware of their illness (4).

A large survey in China showed that the percentages of adults under the age of 40 with diabetes and prediabetes are around 5.7 and 44.0%, respectively (5). The global prevalence of early onset diabetes mellitus is known to have increased due to sedentary lifestyles, little physical activity and other unmodifiable factors such as female sex, age, and family history of the disease, among others (5). In addition, the evidence shows that T2DM in young people behaves more aggressively, which leads to the premature

development of complications, lower quality of life and cardiovascular effects at an earlier age, projecting T2DM in young people as a public health problem (6, 7).

There are no reports in Colombia characterizing the signs, symptoms, treatment and metabolic control of young patients with T2DM. Therefore, we proposed to characterize the clinical and therapeutic variables of young adults (18-40 years old) with T2DM in a secondary care hospital in the city of Dosquebradas, Colombia, from 2017 to 2019.

## Methods

This was a quantitative, observational, descriptive cross-sectional study which included young adult patients (understood to be those 18 to 40 years old) of either sex, with T2DM, who were seen at Hospital Santa Mónica in the city of Dosquebradas (Colombia), from January 1, 2017, to August 3, 2019. To be included, patients had to belong to and be active in the T2DM follow up program at the institution and have at least one measurement of glycosylated hemoglobin (HbA1c). Those who care for patients in the T2DM program are general practitioners dedicated exclusively to the program, covering all patients with a confirmed diagnosis of the disease, regardless of their metabolic status.

The exclusion criteria were patients who did not have a clearly defined T2DM diagnosis in the clinical chart or those with type 1 diabetes, as well as pregnant women with gestational diabetes.

The unit of analysis was the patients' clinical charts, from which the data were obtained. A data collection tool was created in the Epi Info 7.0 program with single choice options to limit information bias. The variables included in the study were:

- **Sociodemographic:** sex, educational level, age (in years).
- **Clinical:** obesity, glycosylated hemoglobin (HbA1C), comorbidities, T2DM complications (description in the medical chart of the presence or absence of a confirmed diagnosis of disease complications).
- **Treatment:** oral antidiabetic medications (name, dose in mg/day), insulins (name of the insulin, dose in IU/day), sulfonylureas (name, dose in mg/day), DPP4 inhibitors (name, dose in mg/day), GLP-1 analogues (name, dose in  $\mu\text{g}/\text{día}$ ).

Patients with metabolic control were those whose HbA1c was less than 7.0 mg/dL. In addition, patients compliant with treatment were those whose physician specifically noted in the medical chart whether they adhered to treatment according to the Morisky Green criteria (8) for evaluating medication compliance.

The SPSS version 23 program for Windows (IBM, USA) was used for data analysis. Descriptive statistics, such as average, standard deviation, minimum and maximum values, confidence intervals for continuous variables and percentages for categorical variables, were used. Chi-square tests

were run to compare categorical variables; p values, OR and confidence intervals were included. A binary logistic regression model was applied, with the dependent variable being whether the patient had metabolic control (yes/no), and the independent variables being those which were statistically significantly associated in the bivariate analyses. The level of statistical significance was set at  $p < 0.05$ . A p less than 0.05 was established for information bias and confounding bias, being stricter than the Hosmer Lemeshow criterion to reduce overestimation of the results, and an appropriate analysis for categorical variables was employed.

This study was endorsed by the Research Ethics Committee of the Fundación Universitaria Autónoma de las Américas in the category of no-risk research. Approval was also obtained from the Scientific and Patient Safety Committee at the hospital. Likewise, the principles established by the Declaration of Helsinki (9) were followed.

## Results

A total of 124 patients were found during the study period, 83 (70%) of whom met the inclusion criteria. There were 59 women (71.1%). Fifty-seven patients were in the 31 to 40-year-old age group (68.7%). The population's sociodemographic characteristics are described in Table 1.

### Clinical characteristics

There were 11 patients (13.3%) with diabetic nephropathy; in addition, five patients had diabetic retinopathy (6.0%), three had diabetic neuropathy (3.6%) and diabetic foot was reported in two patients (2.4%). At the first follow up visit, 21 patients (25.3%) had an HbA1c less than 7%, while at the second follow up visit, 45 patients had an HbA1c reported (52.9%) and, of these, 17 had metabolic control (37.7%). The main clinical characteristics of the population are described in Table 2.

### Treatment

Regarding the adherence of each patient to treatment, as described by the physicians, 51 were reported to be adherent (61.4%). Recommendations to change to healthy lifestyles were found in the medical charts of 73 patients (87.9%), as part of the nonpharmacological treatment. Treatment was also found to include the concomitant use of biguanides and insulin in 34 patients (40.9%), biguanides and sulfonylureas in four patients (4.8%), and biguanides and GLP-1 analogues or DPP4 inhibitors in one and two patients, respectively (1.2 and 2.4%), along with four cases of concomitant use of insulin and sulfonylureas (4.8%). No patients had triple therapy as a therapeutic strategy. The use of medications for treating T2DM is described in Table 3.

In addition, it was more likely for patients with HbA1c  $>9\%$  to be prescribed insulin ( $p=0.001$ ; OR:5.571, 95%CI: 2.033-15.271), both long-acting ( $P=0.002$ ; OR:4.083, 95%CI: 1.608-10.372) as well as short-acting ( $P=0.009$ ; OR:3.415, 95%CI: 1.345-8.675). There was no association

between using or not using oral hypoglycemic agents and the patients' HbA1c levels.

### Multivariate

A binary logistic regression of having or not having metabolic control against the significantly associated variables on the bivariate analyses showed that patients with diabetic retinopathy had a probable association with having disease control at the time of the study. The results of the binary logistic regression are described in Table 4.

## Discussion

This study documented the clinical characteristics of, and treatment prescribed for, young adults with T2DM at a secondary care hospital in Colombia. These data can provide better guidance on potential gaps in this population's medical treatment, showing a possible approach in this group of patients which differs from that recommended by the clinical practice guidelines.

As reported in the literature, being a woman, and especially being a young patient, is considered to be a risk factor for T2DM (10). One study reported that this disease ranges from 60 to 80% for this population (11), similar to what is described in the current study. This should lead to a reassessment of the strategies for early detection of women at high risk for diabetes; one of these could be actively seeking prediabetes in young women.

The known risk factors for developing T2DM also include obesity, smoking, metabolic syndrome and arterial hypertension (12). These were frequently found in the current study's population; for smoking, the proportion of patients who were smokers exceeded the national figure (Colombia = 12.8%), and was even greater than the departmental percentage (Risaralda = 17.3%) (13). The proportion of patients with arterial hypertension was greater than that reported in other populations, including neighboring cities, in studies of the general population (14).

The foregoing shows that the study patients had risk factors that should be addressed, seeking to not only control T2DM, but also reduce its related complications. Healthcare professionals should be reminded that the first step in T2DM treatment is lifestyle changes, which were frequent in this report; therefore, the search for reasons to explain the poor metabolic control and frequent use of insulins should be explored in future studies, including follow up of adherence to these non-pharmacological measures.

The proportion of obesity was greater than that of the general Colombian population (16.5%) (15), as one out of three patients was obese, adding elements to the description of a population with multiple risk factors for the disease. In young patients, an unhealthy lifestyle, or poor adherence or a different response to appropriate treatment may be the reason for the frequent use of insulins, which is related to an earlier onset of complications (16). Lifestyle changes are the main characteristic for treating and achieving better

**Table 1.** Sociodemographic characteristics of 83 patients under the age of 40 with T2DM.

Variables	Frequency	Percentage
<b>Sex</b>		
Male	24	28.9
<b>Educational level</b>		
No studies	23	27.7
Primary	45	54.2
High School	4	4.8
Technical	3	3.6
University	8	9.6
<b>Age (mean/SD) years</b>	33.7/5.3	
Smoking	16	19.2
<i>SD: standard deviation.</i>		

**Table 2.** Clinical characteristics of 83 patients under the age of 40 with T2DM.

Variable	N	%
<b>Obesity</b>		
BMI > 30	28	33.7
BMI (mean/SD) kg/m <sup>2</sup>	28.0/6.3	
HbA1c (mean/SD) %	8.9/2.9	
Follow up HbA1c (mean/SD) %	8.6/2.6	
<b>Comorbidities</b>		
Hypertension	36	43.4
Dyslipidemia	18	21.7
Hypothyroidism	15	18.1
Coronary disease	5	6.0
Cerebrovascular accident	1	1.2
Others	11	13.2
<i>N: number of observations. BMI: body mass index. SD: standard deviation. Kg: kilogram. M<sup>2</sup>: square meter. HbA1c: glycosylated hemoglobin.</i>		

long-term outcomes in this population (10).

In addition, it is important to mention that the concept of metabolic syndrome applied to adults (a collection of at least three risk factors: obesity, hyperglycemia, dyslipidemia and HTN, elements which are related to insulin resistance), is not completely adapted to young people, especially children, which results in a lack of consensus regarding the definition in this population (17). However, the identification of risk factors for the diseases included in metabolic syndrome is appropriate at early ages, keeping the risk factors described in adults with variations in their cut-off points (18, 19). There are also screening tools which have already been validated in Colombia, such as FINDRISC, which includes various parameters such as abdominal girth and BMI, among others, to assess the probability of developing T2DM and in which, if risk is found, nonpharmacological interventions play a primary role (20). However, it is important to remember that this tool was validated in people over the age of 18.

**Table 3.** Drugs used to treat 83 patients under the age of 40 with T2DM.

Variable	N	%
<i>Biguanides</i>		
Metformin	64	77.1
Dose (mean/SD) mg	1,645.1/736.0	
<i>Insulins</i>		
<i>Basal</i>	46	55.4
<i>Basal</i>	37	44.0
Dose (mean/SD) IU	15.4/6.9	
Glargine	32	38.0
Degludec	2	2.3
NPH	2	2.3
Detemir	1	1.1
<i>Prandial</i>		
Dose (mean/SD) IU	22.3/11.3	
Glulisine	22	26.1
Aspart	4	4.7
Cristallines	1	1.1
<i>Sulfonylureas</i>		
Glibenclamide	4	4.8
<i>DPP4 inhibitors</i>		
Sitagliptin	2	2.4
GLP1 analogues	1	1.2

*N*: number of observations *SD*: standard deviation. *Mg*: milligrams. *IU*: international units. *NPH*: neutral protamine Hagedorn. *DPP4*: dipeptidyl peptidase-4. *GLP1*: glucagon-like peptide 1.

Villavicencio, a Colombian city, was noted to have a greater proportion of patients under the age of 50 with metabolic control (55.8%) than this study's population (21). However, a report in Asia showed similar percentages (22). It is important to mention that little data has been produced on metabolic control in people under the age of 40; the details of disease control in these age groups must be identified in order to develop both diagnostic and therapeutic strategies for achieving metabolic control.

The use of insulins is recommended as one of the last links in T2DM treatment, as beta cell function in the pancreas becomes compromised, although the last consensuses by the American Association of Clinical Endocrinologists, American College of Endocrinology, American Diabetes Association and European Association for the Study of Diabetes, state that it is indicated for first-line treatment if the HbA1c  $\geq 9\%$ , since some studies have shown that intensive short-term insulin therapy in patients with a recent diagnosis of T2DM and an HbA1c  $\geq 9\%$  has a positive effect on its pathophysiological mechanisms (23). This could justify the high use of insulin in this study's population, seen in patients with an HbA1c  $> 9\%$ ; however, this should be personalized and treatment with oral hypoglycemics prioritized over insulin treatment (20).

While various T2DM treatment guidelines indicate that these patients may be treated with metformin and insulins,

**Table 4.** Binary logistic regression for the variable of metabolic control.

Variable	P	OR	95% C.I.	
			Lower	Upper
Sex	0.070	0.350	0.112	1.089
Adherent to treatment	0.078	0.309	0.084	1.140
Retinopathy	0.048	0.130	0.017	0.987
Insulins	0.090	2.669	0.858	8.298
Constant	0.200	3.868		

*P*: probability value. *OR*: odds ratio. *C.I.*: confidence interval.

the American Diabetes Association guidelines recommend using insulins as first-line treatment in patients with an HbA1c  $>10\%$ , patients on triple therapy without metabolic control, patients with increased catabolism or ketoacidosis or in those who have variants of mixed T1DM and T2DM, among others, but it is clear that age is not included as a factor for beginning insulin (24).

Furthermore, the prescription of more analogue than conventional insulins is notable, which is justified when there are adverse reactions such as hypoglycemia or lack of glycemic control (among others) with conventional insulins, as, beyond these considerations, there is no evidence of greater efficacy or cost-effectiveness in the use of analogues over conventional insulins (25 - 31).

Likewise, it should be remembered that in the last few years, sulfonylureas, especially glibenclamide, have been relegated by other antidiabetics to third-line medications (2, 20). Although sulfonylureas have a good impact on the reduction of HbA1c (1.5% 2%), they cause multiple adverse reactions such as hypoglycemia, along with reports of significant impacts on smooth muscle and the myocardium (sulfonylurea receptors 2A and 2B), and are also contraindicated in kidney disease (32, 33). If this drug group is used, glimepiride or gliclazide should be selected, due to a lower rate of adverse reactions to these drugs and their pharmacodynamic differences with glibenclamide (2, 20).

The limitations of this study include the fact that the data came from clinical charts which may have had writing errors or expressions that do not allow the attending physician's intention to be adequately interpreted. Also, it was not possible to determine who diagnosed the T2DM complications which were described in the medical charts. In addition, it should be noted that a second HbA1c was not taken into account as an inclusion criterion; therefore, its change between office visits or the possible impact of the prescribed treatments could not be assessed in the whole population. We should also mention the number of patients included, which is small and limits the reach and generalization of the results. However, after conducting the literature search, we can affirm that it is the first study characterizing a population under the age of 40 with T2DM in Colombia, with a two-year

retrospective observation, which is a strength of this paper.

In conclusion, we report that patients with T2DM under the age of 40 have poor metabolic control, scant ordering of nonpharmacological measures and frequent use of insulins, despite the fact that their treatment does not differ from that of the older population, based on the recommendations of various clinical guidelines. New studies should be performed in the young Colombian population, exploring the differences in available treatments and the impact these may have on metabolic control and the patients' prognosis.

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