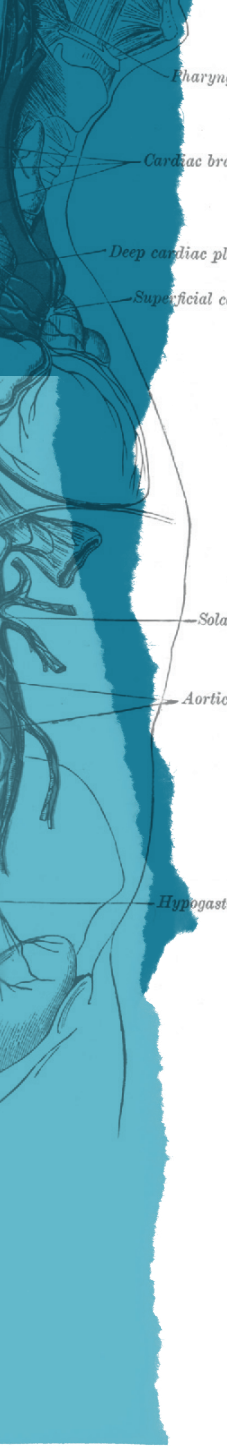

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Medication Prescription Patterns in a Type 2 Diabetes Disease Management Program, Medellín 2014-2019

Patrones de prescripción de medicamentos en un programa integral de diabetes tipo 2, Medellín 2014-2019

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ABSTRACT

Introduction: The availability of new drugs for diabetes has led to frequent modifications in management guidelines. New therapeutic options necessitate studies to identify whether these new technologies are being used by the indicated patients and whether they achieve the claimed effect.

Objective: To describe the medication prescription patterns of patients with type 2 diabetes (T2D) in a disease management program.

Methodology: This cross-sectional study included patients enrolled in a T2D management program in Medellín, Colombia. Sociodemographic and prescription data were extracted from clinical records.

Results: A total of 903 patients, (55% women) with a mean age of 66.0 (SD: 12.9) were analyzed. The average duration of living with T2D was 12.9 (SD: 9.3) years. Metformin was used at some point by 54% of patients, sulfonylureas by 11.8%, and DPP-4i by 21.8%. The use of rapid-acting insulin was 24.5% and that of basal insulin was 40.86%.

Conclusion: Metformin was the most prescribed drug, followed by basal insulin and rapid-acting insulin, whereas moderate amounts of sulfonylureas and DPP-4 inhibitors were used. These findings describe the current treatment patterns in the program and may guide the planning of pharmacotherapeutic interventions in the future.

Keywords: diabetes mellitus, type 2 diabetes, drug prescriptions, pharmacoepidemiology, metformin, hypoglycemic agents, cretins, insulin, disease management, Colombia.

RESUMEN

Introducción: La disponibilidad de nuevos fármacos para la diabetes ha ocasionado modificaciones frecuentes en las guías de manejo. Estas opciones terapéuticas emergentes requieren estudios que determinen si las tecnologías se están usando en los pacientes indicados y si logran los cambios que prometen.

Objetivo: Describir los patrones de prescripción de medicamentos en pacientes con diabetes mellitus tipo 2 (DM2) atendidos en un programa de manejo de la enfermedad.

Metodología: Estudio transversal que incluyó pacientes de un programa de manejo de DM2 en Medellín (Colombia). Los datos sociodemográficos y de prescripción se obtuvieron de las historias clínicas.

Resultados: Se analizaron 903 pacientes; 55 % eran mujeres, y la edad media fue de 66,0 años (DE: 12,9). El tiempo medio de evolución de la DM2 fue de 12,9 años (DE: 9,3). El 54 % había recibido

metformina en algún momento, el 11,8 % sulfonilureas y el 21,8 % inhibidores de la DPP-4. La insulina de acción rápida se utilizó en el 24,5 % y la insulina basal en el 40,86 % de los casos.

Conclusión: La metformina resultó ser el fármaco más prescrito, seguida de la insulina basal y la insulina de acción rápida, mientras que el uso de sulfonilureas y de inhibidores de la DPP-4 era moderado. Estos hallazgos describen los patrones de tratamiento vigentes en el programa y pueden orientar la planificación de futuras intervenciones farmacoterapéuticas.

Palabras clave: diabetes mellitus tipo 2, prescripciones de medicamentos, farmacoepidemiología, metformina, hipoglucemiantes, incretinas, insulina, manejo de la enfermedad, Colombia.

INTRODUCTION

In 2021, there were 529 million people living with diabetes worldwide, and the global age-standardized total diabetes prevalence was 6·1% (5.8–6.5) (1). Moreover, Type 2 diabetes (T2D) is the most common phenotype, accounting for 90–95% of all cases (1,2). At the regional level, the burden is expected to rise; by 2050, the prevalence of diabetes in Latin America and the Caribbean is projected to reach 11.3% (1). In Colombia, the prevalence of T2D in Bogotá is estimated to be 11.0% (3). National surveillance data from the High-Cost Account (Cuenta de Alto Costo, CAC) show that in 2023, the incidence of diabetes reached 2.48 cases per 1,000 inhabitants and the prevalence 3.82 cases per 100 inhabitants, an increase of 22.44% compared to the previous reporting period (4).

Therefore, effective pharmacotherapy is essential for achieving glycemic control and preventing diabetes-related complications. Currently, nine major classes of glucose-lowering agents are available: biguanides, sulfonylureas (S.U.), meglitinides, thiazolidinediones (TZDs), alpha-glucosidase inhibitors (AGIs), dipeptidyl peptidase-4 inhibitors (DPP-4i), sodium-glucose cotransporter-2 inhibitors (SGLT2i), insulins, and glucagon-like peptide 1 (GLP1) (5). The selection of these agents is guided by individual cardiovascular risk and the presence of micro-or macrovascular disease.

Since 2008, major changes in T2D treatment have been driven by the United States Food and Drug Administration's requirement for cardiovascular safety trials for all new antidiabetic drugs (6,7). These developments prompted substantive updates to the American Diabetes Association (ADA) guidelines; for instance, the 2018/2019 editions introduced an algorithmic approach that clarifies when and how to intensify therapy if glycemic targes, such as HbAc, are not achieved (8–10).

The continuous arrival of new agents has led to frequent revisions of treatment guidelines. Evaluations are needed to determine whether these technologies are being prescribed to appropriate patients and whether they deliver their promised benefits. Moreover, while novel therapies improve clinical outcomes, they also increase direct medical costs (11).

Colombia's healthcare system has expanded both insurance coverage and pharmaceutical benefits packages; however, recent evidence on prescribing patterns for T2D is scarce. This knowledge gap is even more pronounced in middle- and low-income countries, where up-to-date data are crucial for informing policies. To address this need, the present study describes medication prescription patterns among T2D patients enrolled in a disease management program in Medellín between 2014 and 2019.

METHODS

A cross-sectional study of patients with type 2 diabetes was performed, and data were collected between June 10, 2014, and March 30, 2019. This study was approved by the Ethics Committee of CES University (113-2017, project code 734).

The Clínica Integral de Diabetes (CLID) is a multidisciplinary diabetes management healthcare team based in Medellín, Colombia. Generally, patients with diabetes are referred to the CLID by primary care providers; once the patient is referred, an endocrinologist or an internal medicine doctor conducts an initial assessment, following the Colombian clinical practice guidelines and ADA standards for appropriate physical and laboratory examinations and specialist referrals (12). At each visit, the patients received medication instructions and their prescriptions were reviewed. In addition, the program was implemented in ambulatory care (13).

For the analysis, we considered 1,018 potentially eligible patients with type 2 diabetes; however, 115 patients were excluded because they did not receive the prescribed medication. A total of 903 patients were included in the analysis.

Demographic variables included sex, age, time spent in the program, duration of diabetes, and prescription of diabetes medications. Diabetes medications were classified into the following classes: Metformin, SGLT2i, SU, DPP4i, alpha-glucosidase inhibitor (AGI), insulin, and glucagon-like peptide 1 (GLP-1).

The CLID also has an electronic diabetes management system. The database contains demographic information, health status, treatment, laboratory tests, and behavioral factors for each pa-

tient and collects this information over time. Therefore, the entire population was used, and atypical or missing data were reviewed and recovered from clinical records to avoid selection bias. This information was reviewed by Uriel Palacios-Barahona. Patients were excluded if they had no record of prescribed diabetes medication. No information was collected on the use of medications or adherence to medications for the management of other comorbidities.

A descriptive analysis was performed, and absolute and relative frequency measures were used for qualitative variables, and central tendency and dispersion measures were used for quantitative variables. In addition, an exploratory analysis of the prevalence according to sex was performed on the prescription patterns of antihyperglycemic agents. The prevalence ratio (PR) was measured using the chi-square test with a 95% confidence interval (95% CI). Statistical significance was set at $p < 0.05$. The analysis was performed using Stata 16 software (14).

RESULTS

We analyzed data from 903 patients with type 2 diabetes. Their mean age was 66.0 years (SD: 12.9), mean duration of diabetes was 12.9 years (SD 9.3), and mean time enrolled in the program was 3.2 years (SD: 1.1). Overall, 54% of the patients received metformin at some point, 40.9% received basal insulin, and 31.1% received GLP-1 receptor agonists. However, Metformin was the most frequently prescribed agent at the time of analysis (17.8%), followed by basal insulin (4.9%) (Table).

Table. Frequency of medication prescription in patients with type 2 diabetes

	Monotherapy a	Total prescriptionb					
	Total	Total	Women	Men	PRc	95%CI	p-value
Medicament	n (%)	n (%)	n (%)	n (%)			
Metformin	138(17.8)	550 (54.0)	307 (54.5)	243 (53.4)	1.05	(0.82-1.34)	0.72
Basal Insulin	38(4.9)	416 (40.9)	224 (39.8)	192 (42.2)	0.91	(0.70-1.16)	0.44
GLP1	16(2.1)	317 (31.1)	170 (30.2)	147 (32.3)	0.91	(0.69-1.18)	0.47
SGLT2i	34(4.4)	261 (25.6)	127 (22.6)	134 (29.5)	0.70	(0.53-0.93)	0.01

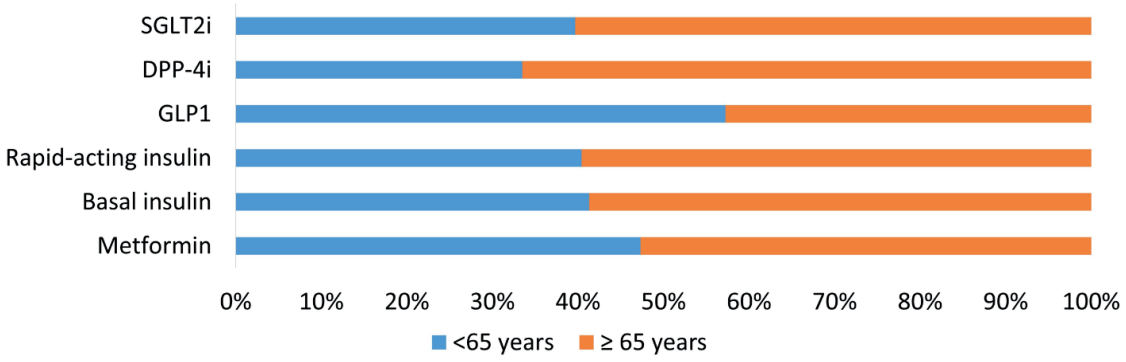
Continue...

	Monotherapy a	Total prescriptionb					
Rapid insulin	0 (0.0)	252 (24.8)	144 (25.6)	108 (23.7)	1.10	(0.83-1.47)	0.50
DPP-4i	2(0.3)	222 (21.8)	128 (22.7)	94 (20.7)	1.13	(0.84-1.53)	0.43
Sulfonylurea	16(2.1)	120 (11.8)	63 (11.2)	57 (12.5)	0.88	(0.60-1.29)	0.51

Note. a. Percentage of patients prescribed medication only. b. Percentage of patients who received this medication at any time during the study. c. Men were used as the reference group.

Source: own elaboration.

Sex-based comparisons revealed similar prescription frequencies across drug classes, except for SGLT2 inhibitors, which were prescribed less often to women (PR: 0.70; 95% CI 0.53–0.93; Table). In the age-stratified analysis, GLP-1 receptor agonists were the only medications that were more frequently prescribed to patients younger than 65 years (Figure 1).

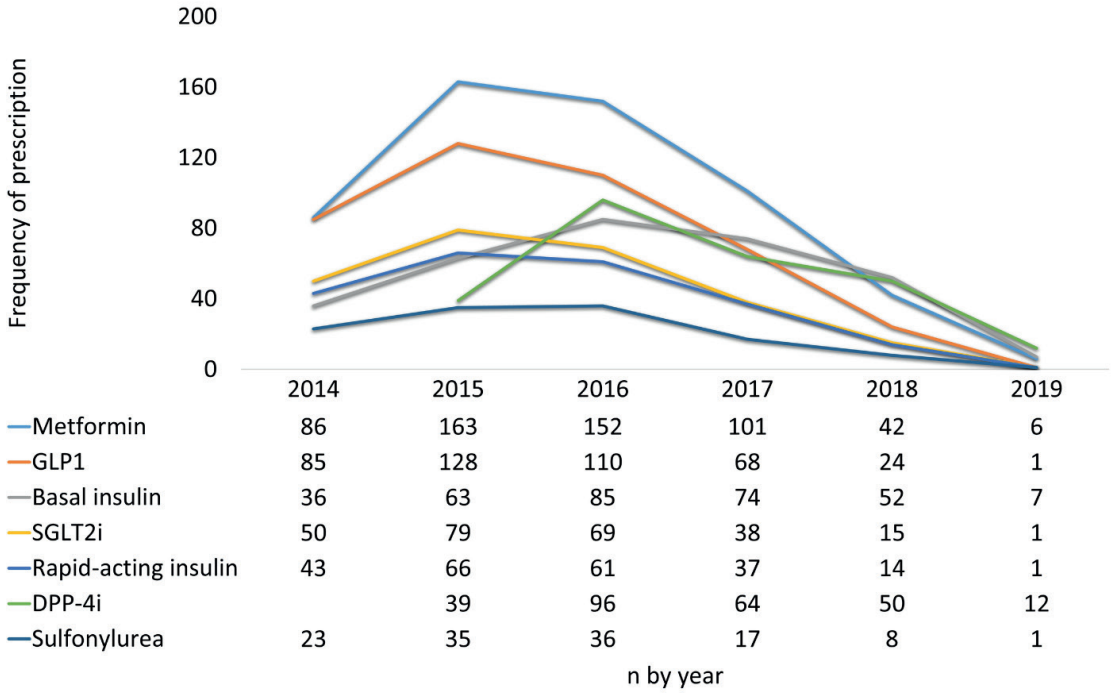


Source: own elaboration.

Figure 1. Proportion of antidiabetic drug prescriptions by class, stratified by age (< 65 vs. ≥ 65 years), in patients with type 2 diabetes enrolled in a disease management program, Medellín (Colombia), 2014–2019

During the study period, 2,137 antidiabetic prescriptions were recorded. Metformin was the most frequently prescribed agent (25.7%), followed by basal insulin (19.5%), GLP-1 receptor agonists (14.8%), SGLT2 inhibitors (12.2%), rapid-acting insulin (11.8%), DPP-4 inhibitors (10.4%), and sulfonylureas (5.6%). Prescriptions for GLP-1 receptor agonists increased markedly in 2015, whereas those for SGLT2 inhibitors increased in 2016; consequently, by 2018, both classes were

prescribed more often than insulin (Figure 2). Consistently, sulfonylureas had the lowest usage rates throughout the study period. Figure 2 shows fewer prescriptions in 2019 because the study was closed in March, 2019; thus, there were fewer patients with prescriptions.



Source: own elaboration.

Figure 2. Treatment prescription patterns in patients with type 2 diabetes in a disease management program in Medellín (Colombia), 2014-2019

DISCUSSION

This study provides information on changes in medication patterns that occur with new health technologies under real-life conditions. Notably, we observed that the most prescribed medications during the study period were metformin, basal insulin, and GLP1 receptor agonists. First, this examination revealed consistency in the use of metformin as a first-line treatment according to diabetes guidelines (12,15). Second, the use of basal insulin indicates clinical deterioration in the population. Third, the incorporation of new technologies in diabetes treatment, such as DPP-4i, GLP1, and SGLT2i, was observed.

Previous studies in Colombia showed that the prescription frequency of metformin and sulfonylureas in outpatients varied from 48.2 to 84.9% and 13 to 64.9%, respectively (16–20). Comparatively, insulin prescription fluctuates between 18% and 54% for DPP-4i (16,21) from 7% to 28% (6), and for GLP2 at 2% (16). Comparing these figures with ours, we observed an increased frequency of new drugs, such as DPP-4i, SGLT2i, and GLP1, due to the healthcare system providing new drugs to patients. In particular, the use of GLP1 may be justified because this population has a high prevalence of obesity (13). Likewise, when reviewing the distribution of drug prescriptions according to sex, we observed a significant difference in the lower prescription of SGLT2i, probably due to the higher risk of urinary tract infections in women (22,23).

The American Diabetes Association has emphasized that treatment goals should be individualized according to age, comorbidities, life expectancy, hypoglycemia, renal function, and duration of diabetes (12). In essence, metformin is the drug of choice in the absence of contraindications. As a result, increased use of metformin and decreased use of sulfonylureas have been observed in different studies around the world (7,24,25). Similarly, metformin use increased from 74.7% in 2007 to 90.8% in 2012, whereas the use of sulfonylureas decreased in five European countries and the United States (26,27). Analogously, our study indicated that metformin was the drug of choice, whereas the prescription pattern for sulfonylureas decreased. Conversely, there were increases in the prescription of GLP1 (2014: 10.65%, 2018: 32.7%, in relative terms), SGLT2 (2014: 11.54%, 2017: 13.59%, 2018: 9.43%, in relative terms), and DPP-4i (2014: 12.72%, 2017: 10.05%, 2018: 8.81%) with a decrease in 2018. Ultimately, these prescription patterns occur in countries such as the United States, where there has been an increase in the prescription of new technologies (28–30).

Although age was one of the variables analyzed when prescribing treatment, we did not observe significant changes in prescribing patterns among those under 65 years of age compared with those over 65 years of age, and differences according to sex were only identified in the use of iGLT2. In the Colombian healthcare system, all drugs are available for prescription; some are available as part of the healthcare plan, but those not included can be prescribed and charged to the Ministry of Health. Consequently, studies on the cost of disease treatment and cost-effectiveness are essential because only efficacy and effectiveness indicators are insufficient, considering the economic burden that countries face when implementing new technologies. Moreover, technologies that offer additional reasons to justify the inclusion of drugs in drug lists are required. Additionally, future research should determine the treatment duration for each drug until the start of second-line treatment, as this is an indicator of treatment effectiveness.

Among the study's limitations, we were unable to characterize concomitant (co-)medications; only the overall prescription frequencies could be retrieved from the database. Furthermore, many patients had initiated therapy at other institutions before enrolment; therefore, the frequencies reported here do not reflect prescriptions issued solely at our center. In addition, the data analyzed are not representative of Medellín or Colombia as a whole because they were drawn from a single specialized diabetes care center. Finally, we did not examine the association between medication regimens and glycated hemoglobin levels, and our analysis captured prescriptions rather than actual medication use and adherence.

In conclusion, metformin was the most prescribed drug, followed by basal insulin and rapid-acting insulin, whereas moderate amounts of sulfonylureas and DPP-4 inhibitors were used. These findings describe the current treatment patterns in the program and may guide the planning of pharmacotherapeutic interventions.

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Conflicts of Interest: The authors declare no conflicts of interest.

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