Quality and effectiveness of diabetes care for a group of patients in Colombia

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ABSTRACT

Objective.   *To assess quality and effectiveness of diabetes care in a sample of Colombian diabetes patients treated by the national social security health system (SGSSS).*

Methods.   *A retrospective study was conducted among 19 704 type 2 diabetes patients >30 years old who were SGSSS members, on pharmacological therapy, and treated at least twice by the SGSSS diabetes control program in one of nine cities from 1 July 2006 to 30 June 2007. A random sample of 406 was obtained. Using subjects' clinical history, the following factors were assessed: use of antidiabetic drugs and prescribed daily doses; use of antithrombotic therapies; additional medications; level and control of glycosylated hemoglobin (HbA_{1c}), blood pressure, and cholesterol; urine albumin level; retinal and foot condition; and changes in medical regimens at most recent clinic visit.*

Results.   *Annual risk factor testing rates were high (81.5%, HbA_{1c}; 100%, blood pressure; 76.8%, total cholesterol), and a large proportion of patients were at target levels for HbA_{1c} (42.9% ≤7.0%), blood pressure (66.2% <130/80 mmHg), and serum lipids (44.9% total cholesterol <200 mg/dL). However, only 6.9% were within recommended levels for all three risk factors. At most recent clinic visit, pharmaceutical regimens were adjusted for 39.7%, 58.2%, and 42.5% of patients above HbA_{1c}, blood pressure, and cholesterol target levels, respectively.*

Conclusion.   *Despite high testing rates, metabolic control was not effective. Low rates of medication adjustment among patients with measures outside target ranges suggest the need for changes in routine diabetes care to ensure therapeutic regimens are adjusted appropriately.*

Key words   Diabetes mellitus; effectiveness; quality of health care; Colombia.

Diabetes is among the illnesses that continue to increase in prevalence globally. There are currently about 19 million diabetic patients in Latin America alone, and worldwide prevalence fluctuates between 5% and 8% (1–3). Diabetes is associated with a high risk of cardiovascular

morbidity (especially hypertension and dyslipidemia) as well as microvascular complications such as blindness, renal insufficiency, neuropathy, and lower limb amputation—conditions that affect a patient's quality of life (4) and place an economic burden on society (5).

Quality of life can be improved and costs reduced through adequate control of glycemia and cardiovascular risk factors, as well as through education and programs targeting early recognition of complications by clinicians and patients (6). It is estimated that with each 1% of

reduction in glycosylated hemoglobin (HbA_{1c}) microvascular complications are reduced by 30% (7). Despite progress in treatment options, patients with type 2 diabetes continue to suffer from high rates of cardiovascular and microvascular complications, and a greater risk of premature death (4).

Diabetes mellitus treatment includes both pharmacological and non-pharmacological therapies. Non-pharmacological measures include a customized nutrition plan; reduction of risk factors such as dyslipidemia, hypertension, and

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smoking; and the adoption of healthy behaviors such as physical activity (8–10). Pharmacological treatments involve one or more classes of antidiabetics, such as biguanides, sulfonylurea, insulin, or thiazolidindiones (11).

A previous study found that the drugs most often used among Colombian patients treated by the national social security health system (SGSSS) were, in descending order, metformin, glibenclamide, insulin, and rosiglitazone. Out of 7 308 patients, 48.0% received monotherapy, and the remaining 52.0% used a combination of glibenclamide and metformin, metformin and insulin, or glibenclamide and insulin. Underutilization of antithrombotics such as cardiovascular prophylactic drugs was also observed. In addition, 74.4% of patients with type 2 diabetes were found to suffer from hypertension, and 45.5% suffered from dyslipidemia (12).

Quality-of-care criteria include the identification and management of risk factors, including high levels of blood pressure, HbA_{1c}, total/LDL (low-density lipoprotein) cholesterol, and urinary albumin, as well as symptoms, such as poor foot and retinal condition. Educating patients about smoking cessation as well as regular antithrombotic therapy and monitoring of glycemic levels are also critical for proper patient management (4, 13).

Determining the quality and effectiveness of diabetic patient management helps policy-makers identify appropriate quality improvement measures. This study aimed to evaluate routine antidiabetic care delivered by the national health system in a sample of Colombian type 2 diabetes patients by determining the percentage of patients who received medical attention from the SGSSS diabetes control program (e.g., blood pressure and total cholesterol measurement, retinal and foot examination, urine albumin screening, and antiplatelet therapy) and had normal-range (controlled) levels of HbA_{1c} (≤7.0%). The study also explored various factors associated with diabetes mellitus control, including age, overweight/obesity status, medications for comorbidities, and antidiabetic monotherapy or polytherapy.

MATERIALS AND METHODS

The retrospective study was conducted in a population of 19 704 men and women more than 30 years old with type 2 diabetes who were members of the SGSSS (beneficiaries of the national social security health insurance program), on pharmacological therapy, and received care from the SGSSS diabetes control program at least twice during the 12-month period from 1 July 2006 to 30 June 2007, in nine Colombian cities: Bogotá, Barranquilla, Bucaramanga, Cali, Cartagena, Ibague, Manizales, Medellín, and Pereira. These cities were chosen for study because they are the most populous in the country and collectively provided information on 3.2 million SGSSS members.

Based on the formula described by Duffau (14), the minimum sample size was defined as 406 patients, which yielded a weighted proportion of 27.0% of patients with controlled type 2 diabetes and a permissible error rate of 5% (15). The statistics program SPSS version 15.0 for Windows (SPSS, Inc., Chicago, IL, USA) was used to select 406 subjects in a randomized manner from a database of the above-mentioned sample of 19 704 diabetic patients.

Two doctors were trained to gather data from the clinical histories of the patients. If the information for a patient was incomplete, the patient was replaced with another patient of the same gender and in the same age group. Survey variables included the following:

- *Socio-demographic*: age; sex; marital status (single, including those who were separated, divorced, or widowed, versus in a partnership, defined as marriage or a civil union); education level (low, including illiterates and those with primary schooling, or high, defined as secondary schooling); city of residence; and type of SGSSS membership (subscriber or dependent);
- *Anthropometric*: weight, size, and body mass index (BMI);
- *Comorbidity/risk factor*: HbA_{1c} >7.0%, overweight/obesity, arterial hypertension, dyslipidemia, smoking, and age (man >55 or woman >65 years);
- *Antidiabetic drug* (use and prescription, with defined daily doses (DDDs)): biguanides (metformin); sulfonylureas (glibenclamide, gliclazide); insulins; and thiazolidindiones (rosiglitazone);
- *Quality of care*: HbA_{1c}, total cholesterol, systolic arterial pressure (SAP), and diastolic arterial pressure (DAP) measurements during the 12-month period (July 2006 to June 2007); docu-

mentation of clinical history of foot and retinal exams, urine albumin exam, and antithrombotic therapy at last medical appointment; and evaluation of medication change when presenting with levels above therapeutic goals for diabetes, hypertension, and dyslipidemia;
- *Comorbidity medication*: antihypertensive drugs (diuretics, beta blockers, angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARBs), and calcium channel blockers (CCBs); antiplatelet therapies (acetyl salicylic acid, clopidogrel, and cilostazol); and lipid-lowering drugs (statines, fibrates, cholestyramine).

Controlled patients were defined as those with HbA_{1c} values ≤7.0% (16). Standards for effective management for other risk factors included blood pressure under 130/80 mmHg, total cholesterol under 200 mg/dL, and urine albumin under 30 mg/day (4, 9, 17).

The protocol was submitted for scientific and bioethics review by both the bioethical committee of the Universidad Tecnológica de Pereira and the SGSSS.

The data were stored, processed, and analyzed with the statistical program SPSS 15.0 for Windows. The Student´s *t*-test and analysis of variance (ANOVA) were used for the comparison of quantitative variables, and the chi-square test was used to establish associations between variables by subgroup (controlled patients versus uncontrolled patients). Models of binary logistic regression were applied using HbA_{1c} levels (controlled, ≤7.0%; uncontrolled, >7.0%) as the dependent variable, and variables significantly associated with the dependent variable in the bivariate analysis as covariables. Statistical significance was set at $P < 0.05$ (confidence interval (CI) 95%).

RESULTS

The characteristics of the population analyzed are shown in Table 1. In a sample of 406 patients with type 2 diabetes in nine Colombian cities, there was a predominance of females, persons over 60 years old, and persons with low levels of schooling, and 98.8% had two or more risk factors (HbA_{1c} >7.0%, plus one other risk factor).

Antidiabetic drug use among the 406 patients sampled included monotherapy with metformin (77, or 19.2%); gliben-

TABLE 1. Socio-demographic, pharmacologic, and risk factor characteristics of 406 type 2 diabetes patients treated by the Colombian social security health system (SGSSS) diabetes control program across nine cities,[a] July 2006–June 2007

Characteristic	
Socio-demographic	
Age (mean ± SD,[b] years)	62.4 ± 11.6
Sex (female/male,%)	55.0/45.0
Marital status (single/in a partnership,%)[c]	20.1/79.9
Education (low/high,%)[d]	82.4/17.6
Type of SGSSS membership (subscriber/dependent,%)[e]	45.5/54.5
Number of risk factors (HbA$_{1c}$[f] > 7.0%, overweight/	1 (1.2),[g] 2 (6.9),[h]
obesity, arterial hypertension, smoking, dyslipidemia,	3 (26.4),[h] 4 (37.7),[h]
age (man > 55 or women > 65 years)) (%)	5 (24.6),[h] 6 (3.2)[h]
Anthropometric risk factor	
Weight (mean ± SD, kg)	72.6 ± 13.1
BMI[i] (mean ± SD, kg/m^2)	28.4 ± 4.6
Overweight (BMI: 25–29.9) (%)	44.0
Obesity (BMI: >30) (%)	30.2
Other risk factor	
Arterial hypertension (%)	80.6
Smoking (%)	12.3
Dyslipidemia (%)	60.0
Age	
> 55 years (men, %)	72.0
> 65 years (women, %)	45.0
HbA$_{1c}$ (mean ± SD,%)[j]	(7.7 ± 1.9)
Pharmacologic	
Antidiabetic monotherapy (% using)	45.8
Metformin (DDD[k] ± SD, % of DDD)	(80.2 ± 34.3)
Glibenclamide (DDD ± SD, % of DDD)	(102.5 ± 50.9)
Insulin (DDD ± SD, % of DDD)	(72.1 ± 44.0)
Antidiabetic drugs (% using)	
Metformin	71.5
Glibenclamide	58.2
Insulin	28.5
Other	0.2
Comorbidity drugs (% using)	92.1
Antiplatelets (aspirin)	66.1
Antihypertensives	
ACE[l] inhibitors or ARBs[m]	68.2
Diuretics	37.2
Calcium channel blockers (amlodipine, verapamil, nifedipine)	29.1
Beta blocker (metoprolol)	19.7
Antidyslipidemics	
Lovastatin	42.6
Gemfibrozil	14.5
Antianginals	
Isosorbide dinitrate	2.0

[a] Bogotá, Barranquilla, Bucaramanga, Cali, Cartagena, Ibague, Manizales, Medellín, and Pereira.
[b] SD = standard deviation.
[c] Data reported from 230 patients.
[d] Low = illiterate or primary schooling; high = secondary schooling; data reported from 125 patients.
[e] Data reported from 293 patients.
[f] HbA$_{1c}$ = glycosylated hemoglobin.
[g] HbA$_{1c}$ >7.0% and no other risk factor.
[h] HbA$_{1c}$ >7.0% plus comorbidity(ies)/other risk factor(s).
[i] BMI = body mass index.
[j] Data reported from 331 patients.
[k] DDD = defined daily dose.
[l] ACE = angiotensin-converting enzyme.
[m] ARBs = angiotensin receptor blockers.

for metformin (80.2 ± 34.3% of DDD), 10.3 ± 5.1 mg/day for glibenclamide (102.5 ± 50.9% of DDD), and 43 ± 26.5 U/day for insulin (72.1 ± 44.0% of DDD).

The drugs used to treat nondiabetic risk factors are shown in Table 1. Patients received an average of eight different drugs for comorbidities (antihypertensives, antidyslipidemics, and antianginals) in addition to their antidiabetic treatment. Out of the 331 patients who had their HbA$_{1c}$ level measured, 42.9% (142 patients) were defined as controlled (HbA$_{1c}$ ≤7.0%) and 57.1% (189 patients) were defined as uncontrolled (HbA$_{1c}$ >7.0%). Uncontrolled HbA$_{1c}$ levels were distributed as follows: 24.5% out of the 189 patients had levels from 7.1% to 8.0%; 11.5% had levels of 8.1% to 9.0%; and 21.1% had levels >9.0%. It should be noted that all patients in the study sample had been treated with frontline generic drugs according to standard treatment guidelines for longer than one year.

Bivariate analysis

Table 2 presents the results of the bivariate analysis by subgroup (patients with controlled diabetes and patients with uncontrolled diabetes). Both number of antidiabetic drugs used and use of medication for comorbidities were statistically significantly associated with controlled diabetes. There was no statistically significant association between controlled or uncontrolled diabetes patients and age, gender, marital status, education, type of SGSSS membership, city of residence, overweight/obesity, or other nondiabetic risk factors.

Among the 95 controlled patients receiving metformin, the mean dose was lower than that among the 141 uncontrolled patients receiving the drug (1 494 vs. 1 766 mg/day, respectively; $P = 0.002$). Similarly, the mean dose of glibenclamide was lower in controlled patients (83) versus uncontrolled patients (110) (8 vs. 12 mg/day, respectively; $P < 0.001$). For insulin, despite the fact that the mean dose in controlled patients (14) was lower than that for uncontrolled patients (87), the difference was not statistically significant (56 vs. 72 units/day; $P = 0.2$). Table 1 shows the DDD for each of the three drugs.

Multivariate analysis

In the multivariate analysis, the dependent variable was uncontrolled dia-

clamide (64, or 15.8%); and insulin (44, or 10.8%). The most frequently used combinations in polytherapy were metformin + glibenclamide (147, or 36.2%); insulin + glibenclamide (64, or 15.8%); and insulin + metformin (46, or 11.3%); glibenclamide + metformin + insulin (20, or 4.9%); and glibenclamide + insulin (6, or 1.3%). Average daily doses were 1602 ± 686 mg/day

TABLE 2. Bivariate analysis of socio-demographic, pharmacologic, and nondiabetic risk factor characteristics of 406 type 2 diabetes patients treated by the Colombian social security health system (SGSSS) diabetes control program across nine cities, July 2006–June 2007, by subgroup

Characteristic	Controlled type 2 diabetes[a]		Uncontrolled type 2 diabetes		P-value[b]
	No.	%	No.	%	
Socio-demographic					
Sex					0.076
Female	71	50.0	113	59.8	
Male	71	50.0	76	40.2	
Age (years)					0.189
Young adult (30–39)	4	2.8	5	2.6	
Mature adult (40–55)	53	37.6	90	47.6	
Senior (>55)	84	59.6	94	49.7	
Marital status					0.139
Single (including those widowed, separated, and divorced)	26	22.6	24	17.4	
In a partnership (marriage or civil union)	89	77.4	114	82.6	
Education					0.615
Low (illiterate or primary schooling)	39	76.5	47	79.6	
High (secondary schooling)	12	23.5	12	20.4	
City					0.215
Barranquilla	16	11.3	19	10.1	
Bogotá	47	33.1	77	40.7	
Bucaramanga	4	2.8	6	3.2	
Cali	21	14.8	32	16.9	
Cartagena	5	3.5	7	3.7	
Ibague	5	3.5	13	6.9	
Manizales	8	5.6	6	3.2	
Medellín	25	17.6	15	7.9	
Pereira	11	7.7	14	7.4	
Type of SGSSS membership					0.091
Dependent	50	43.1	65	47.7	
Subscriber	66	56.9	71	52.3	
Anthropometric risk factor					
Overweight or obesity					0.223
No	39	27.8	44	23.5	
Yes	101	72.1	143	76.5	
Other nondiabetic risk factor					0.081
No	0		4	2.1	
Yes	142	100.0	185	97.9	
Pharmacologic					
Antidiabetic therapy					0.000
Monotherapy	91	64.5	59	31.2	
Polytherapy	50	35.5	130	68.8	
Medication for comorbidities					0.044
No	15	10.5	9	4.7	
Yes	127	89.5	180	95.3	

[a] Level of glycosylated hemoglobin (HbA$_{1c}$) ≤7.0%.
[b] Based on the chi-square test.

betes and the independent variables were polytherapy and medication for comorbidities. While adjusting to find the best model, step by step, it was found that these were the only independent variables associated with risk of uncontrolled diabetes. The relative risk (RR) of uncontrolled diabetes among polytherapy patients was 0.3 (0.206–0.470; $P < 0.001$), whereas the RR for patients taking medication for comorbidities was 0.431 (0.189–0.983; $P = 0.044$).

Treatment for nondiabetic risk factors

At the time of data collection, 100% of patients in the study sample were receiving medication for management of hyperglycemia. Among those diagnosed with a comorbidity of arterial hypertension, 90.5% were receiving antihypertensive therapy, and among those diagnosed with a comorbidity of dyslipidemia, 80.2% were receiving lipid-lowering therapy. In the group of patients with hyper-

tension, 66.2% (217 out of 328) had their hypertension under control (blood pressure <130/80 mmHg). Of the patients with dyslipidemia, 44.9% (109 out of 243) had total cholesterol levels under 200 mg/dL, and 28.6% had LDL levels considered to confer low risk (<100 mg/dL). Only 6.9% of all patients in the study sample reached the recommended goals for all three risk factors.

The indicators of quality of diabetes care are shown in Table 3. In all cases, at each clinical encounter, the parameter of greatest compliance was blood pressure monitoring. Based on their clinical history, over the 12-month period, only 81.5% or 331 patients had their HbA$_{1c}$ level measured and only 76.8% had their lipid levels measured. Other routine procedures for diabetes care, such the administration of aspirin, urine albumin screening, foot exams, and retinal exams, were even less common (administered among only 66.1%, 57.0%, 55.5%, and 35.6% of patients, respectively).

Of all patients for whom urine albumin was measured, 19.8% had evidence of impaired renal function. Of the patient group with impaired renal function (29 out of 49), only 63.0% were receiving an ACE inhibitor or ARB for antihypertensive therapy. Among all patients receiving antihypertensive therapy, 90% were receiving ACE inhibitors or ARBs.

The mean values of systolic blood pressure and diastolic blood pressure, serum total cholesterol, and serum HDL (high-density lipoprotein) cholesterol were below the therapeutic targets, while LDL cholesterol, triglycerides, and HbA$_{1c}$ were above the reference values used to define control (Table 3).

When evidence was observed of uncontrolled HbA$_{1c}$ levels, clinicians modified the pharmacologic therapy programs in 39.7% of patients. When evidence of uncontrolled blood pressure was observed, therapy was changed for 58.2% of patients. When patients' dyslipidemia was found to be uncontrolled, therapy was adjusted in 42.5% of cases.

DISCUSSION

The low rate of control of type 2 diabetes is a global problem. In both developed and underdeveloped countries, the percentage of type 2 diabetes patients that present with controlled HbA$_{1c}$ ranges from 31.0% to 49.8% (4, 15, 18, 19). Among the reasons that patients do

TABLE 3. Proportion of type 2 diabetes patients in nine Colombian cities[a] that received risk factor testing and other quality of care measures during routine visits to social security health system (SGSSS) diabetes control program clinics, July 2006–June 2007, and their average test values

Quality of care measure	% patients (n = 406)	Intermediate outcome (mean ± SD[b])
HbA_{1c}[c] measurement	81.5	
Normal range (≤ 7%)	42.9	NA[d]
Abnormal range (>7%)	57.1	NA
Blood pressure measurement	100.0	
Systolic (mmHg[e])		126.5 ± 14.4
Diastolic (mmHg)		77.5 ± 10.0
Retinal examination (documented[f])	35.6	NA
Foot examination (documented)	55.5	NA
Urine albumin screening	57.0	NA
Total cholesterol measurement	76.8	
Serum total (mg/dl)[g]		198.2 ± 55.2
Serum low-density lipoprotein (LDL) (mg/dl)[h]		114.4 ± 35.9
Serum high-density lipoprotein (HDL) (mg/dl)[i]		43.8 ± 12.7
Triglycerides (mg/dl)[j]		203.7 ± 121.2
Antiplatelet therapy (aspirin)	66.1	NA

[a] Bogotá, Barranquilla, Bucaramanga, Cali, Cartagena, Ibague, Manizales, Medellín, and Pereira.
[b] SD = standard deviation.
[c] HbA$_{1c}$ = glycosylated hemoglobin.
[d] NA = not applicable.
[e] mmHg = millimeters of mercury.
[f] Exam value recorded in patient clinical history.
[g] Data reported from 312 patients.
[h] Data reported from 252 patients.
[i] Data reported from 275 patients.
[j] Data reported from 297 patients.

not achieve adequate metabolic control are non-adherence to treatment and the use of inadequate doses of treatment drugs. Compared with similar reports from other countries, this study's observation that 42.9% of patients had controlled HbA$_{1c}$ ranks among the highest. A level of control less than 50% remains worrisome, however, as the sample was drawn from a patient population with easy access to treatment. Another cause for concern is the finding that a high percentage of patients in this study (21.1%) had HbA$_{1c}$ values greater than 9.0%, which indicates poor disease control. The mean HbA$_{1c}$ value (7.7 ± 1.9%) was similar to that reported in some prior studies (7.9 ± 1.8%) (4, 15, 20, 21) and lower than that reported in others (10.3 ± 1.6%) (22).

The frequency of use of various antidiabetic drugs was similar to reports by other authors (6, 18). The use of specific antidiabetic drugs, and their prescribed doses, were associated with the level of diabetes control. Controlled patients received lower doses of metformin and glibenclamide than uncontrolled patients and were more often treated with monotherapy (whereas most uncontrolled patients received polytherapy).

Both of these differences were statistically significant based on the chi-square test (Table 2). The latter finding may be explained by the fact that polytherapy is used in more difficult cases and in later stages of the disease (12). It should be noted that in both groups the prescribed doses of antidiabetic drugs were lower than the recommended DDD.

Most patients with type 2 diabetes had other associated risk factors that hindered management and control of all their diseases. This outcome was particularly common in the case of asymptomatic diseases such as hypertension and dyslipidemia, as found in earlier research (23). Patients received additional drugs for each of these comorbidities, similar to previous study samples (4, 6, 18, 20). Taking medication for comorbidities was significantly correlated with a lack of control of diabetes (Table 2), which is probably related to the fact that uncontrolled patients often have more complications and are more difficult to treat than those who are controlled (23). As mentioned above, the entire sample of patients was treated with generic drugs.

No association was found between the degree of diabetes control and variables such as age, gender, marital status, education, type of SGSSS membership, presence of nondiabetic risk factors, or city of residence, as had been established in another study (24). Although the mean BMI was high, along with the percentage of patients who were overweight or obese, significant effects of these factors were not observed with regard to diabetes control, as has been observed in other studies (18, 25).

There was a high rate of diagnosis of hypertension and dyslipidemia, reflecting good quality of care in terms of identification of nondiabetic risk factors. Treatment of these morbidities was also common, resulting in varying degrees of success. For example, effective antihypertensive therapy was observed in 66.2% of patients, a higher proportion than that reported by Grant et al. (30.4% to 38.2%) (4); Liebl et al. (35.0%; range: 20.1% to 53.4%) (15); Resnick et al. (39.6%) (18); and Isaza et al. (45.2%) (24), whereas effective lipid-lowering therapy was observed in 44.9% of patients, a lower level of efficacy than that reported by Grant et al. (64.2% to 66.9%) (4). These results indicate progress in the treatment of hypertension but difficulty in achieving treatment goals for lipid-lowering therapy, most likely due to the use of inadequate and insufficient doses of lipid-lowering drugs, as was observed in a previous study (26).

It is particularly troubling that only 6.9% of patients had achieved the goals recommended for all three risk factors. However, this finding is very similar to those of Grant et al. and Lebovitz, who observed percentages of 7.3% and 10.0% respectively for this criterion (4, 19). While the rate of blood pressure measurement among the current sample was 100%—higher than in other studies (4, 15), clinicians failed to ensure that all patients underwent at least one HbA$_{1c}$ test per year; only 81.5% of patients underwent this test at the recommended frequency, a number lower than that reported by Grant et al. (97.4%) (4) but higher than in an overall sample of Europeans (64.0%, range: 49.0%–71.0%) (15). The current sample was also less likely to undergo lipid profile testing in past 12 months than the sample used by Grant et al. (76.8% versus 87.6% respectively) (4).

The use of aspirin as a prophylaxis for cardiovascular risk was higher in this sample compared to previous studies (66.1%

vs. 35.9% (4) and 53.8% (20)). The most poorly applied quality of care indicators in the current sample were documented retinal and foot examinations, which were conducted more frequently in other study samples (55.4% vs. 77.6%, and 63.6% vs. 83.7%, respectively) (4, 20). While it has been noted that improved compliance has been achieved in the overall use of aspirin (24), physicians' incorporation of this drug in the treatment regimes of type 2 diabetes patients must be further encouraged, along with timely examinations of eye and foot injuries, in order to detect organ damage early enough to prevent related complications (20).

The use of ACE inhibitors or ARBs as antihypertensive agents in patients with type 2 diabetes was high (12), but the doses used were inadequate to invoke these drugs' kidney-protective properties in cases where some degree of renal disease was present (10).

The modification of antidiabetic, antihypertensive, or lipid-lowering therapy when control of HbA_{1c}, blood pressure, and total cholesterol was lacking was insufficient (4). Therefore, the current authors recommend the implementation of diabetes care improvement programs, which have been shown to increase the effectiveness of these therapies and reduce related complications (27).

Based on the results of this study, the prevalent traits of patients with uncontrolled diabetes are 1) treatment with polytherapy, managed with inadequate doses of metformin and glibenclamide, and 2) the consumption of substantial amounts of medication for other comorbidities (mainly hypertension and dyslipidemia). There were no statistically significant differences between the DDDs used for the control of diabetes across the nine cities covered in the study, similar to findings regarding the treatment of hypertension in the study of Isaza et al. (24).

The aforementioned results suggest uncontrolled type 2 diabetes patients should receive increased doses of antidiabetic drugs (according to therapeutic guidelines). In addition, the comorbidities that combine to form cardiovascular risk factors should be treated with frontline drugs at the appropriate dose. Use of antiplatelet doses of aspirin, evaluation of both the retina and feet, and measurement of urinary albumin must also be encouraged. The clinician must take the initiative to determine the best course of action and adjust management regimens accordingly when difficulty is encountered in achieving therapeutic goals.

The purpose of controlling diabetes properly should be shared with the entire health care team, the patients, and their families. At the same time, strategies should be developed for promoting a healthy lifestyle among patients with type 2 diabetes, with directives for the health care team, including the prescribing physician, that include well-defined therapeutic goals and treatment strategies. It is also recommended that health insurance programs monitor the effectiveness of treatment and become involved in medication adjustment by directing advice and guidance directly to the clinician.

Limitations

This study had several limitations. First, the sample was limited to members of the national social security health system insurance program, so the results can not be generalized to groups with different insurance characteristics. In addition, the results may have been skewed by the lack of standardization of SGSSS techniques for measuring laboratory parameters, as the study data were obtained from the medical histories of patients who received SGSSS care in nine different cities.

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RESUMEN

Calidad y eficacia de la atención a diabéticos en un grupo de pacientes de Colombia

Objetivo. Evaluar la calidad y la eficacia de la atención de la diabetes en una muestra de diabéticos colombianos tratados en el Sistema General de Seguridad Social en Salud (SGSSS).

Métodos. Estudio retrospectivo en 19 704 pacientes del SGSSS con tratamiento farmacológico para la diabetes tipo 2, mayores de 30 años y atendidos por el Programa de Control de la Diabetes del SGSSS al menos dos veces entre el 1 de julio de 2006 y el 30 de junio de 2007 en alguna de nueve ciudades. Se obtuvo una muestra aleatoria de 406 pacientes. A partir de sus historias clínicas se evaluaron los factores: consumo de medicamentos antidiabéticos y dosis diaria prescrita; tratamiento antitrombótico; medicamentos adicionales; nivel y control de la glucohemoglobina (HbA$_{1c}$), presión arterial y colesterol; albuminuria; estado de los pies y la retina; y cambio de régimen terapéutico en la última consulta.

Resultados. Las tasas anuales de análisis relacionados con los factores de riesgo fueron elevadas (HbA$_{1c}$: 81,5%, tensión arterial: 100% y colesterol total: 76,8%) y una alta proporción de los pacientes alcanzaron los valores recomendados de HbA$_{1c}$ ≤ 7,0% (42,9%), tensión arterial < 130/80 mm Hg (66,2%) y colesterol total < 200 mg/dL (44,9%). Sin embargo, solo 6,9% de los pacientes tenían los niveles recomendados en los tres factores de riesgo. En la última consulta, se ajustó el régimen farmacológico a 39,7%, 58,2% y 42,5% de los pacientes que presentaban valores alterados de HbA$_{1c}$, tensión arterial y colesterol, respectivamente.

Conclusiones. A pesar de la alta tasa de análisis, el control metabólico no fue eficaz. La baja tasa de ajuste del tratamiento de los pacientes con resultados fuera del rango recomendado indica que es necesario cambiar el procedimiento habitual de atención de los pacientes diabéticos para garantizar el adecuado ajuste de los regímenes terapéuticos.

Palabras clave Diabetes mellitus; efectividad; calidad de la atención de salud; Colombia.