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REVIEW ARTICLE

Situation of chronic kidney disease in Latin America, with emphasis on diabetic kidney disease: difficulties and challenges

Situación de la enfermedad renal crónica en América Latina, con énfasis en la enfermedad renal diabética: dificultades y desafíos

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Abstract

Chronic kidney disease (CKD) is a serious public health problem worldwide, with a high prevalence in the adult population and often lately diagnosed. A meeting of experts in nephrology, with participants from Argentina, Brazil, Chile, Colombia, Ecuador, El Salvador, Guatemala, Mexico, Nicaragua, and the Dominican Republic, was held with the aim of generating proposals and a call to action on how to deal with CKD and cardio-renal-metabolic syndrome. Based on a review of the best available evidence and from the perspective of experience in daily practice about the difficulties and opportunities for optimizing early diagnosis and treatment of CKD, with emphasis on diabetic kidney disease, a description of the current scenario, the challenges and proposals for improving this situation in the region are presented.

Keywords: *Chronic kidney disease. Diabetes. Diabetic kidney disease. Obesity. Epidemiology. Implementation. Kidney health policy.*

Resumen

La enfermedad renal crónica (ERC) es un grave problema de salud pública en todo el mundo, con elevada prevalencia en la población adulta y cuyo diagnóstico con frecuencia ocurre tardíamente. Con el objetivo de un cambio de visión para generar propuestas y un llamado a la acción acerca de la forma de afrontar a la ERC y el síndrome cardio-reno-metabólico, se llevó a cabo un encuentro de expertos en nefrología, con participantes de Argentina, Brasil, Chile, Colombia, Ecuador, El Salvador, Guatemala, México, Nicaragua y República Dominicana. A partir de la revisión de la mejor evidencia disponible y

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bajo la óptica de la experiencia en la práctica diaria acerca de las dificultades y las oportunidades para optimizar el diagnóstico precoz y el tratamiento de la ERC, con énfasis en la enfermedad renal diabética, se presenta una descripción del escenario actual, los retos y las propuestas para mejorar esta situación en la región.

Palabras clave: *Enfermedad renal crónica. Diabetes. Enfermedad renal diabética. Obesidad. Epidemiología. Implementación. Políticas de salud renal.*

Introduction

Chronic kidney disease (CKD) is a serious public health problem worldwide, with a high prevalence in the adult population. Its diagnosis often occurs late, typically in stage ≥ 3 of the kidney disease improving global outcomes (KDIGO) classification. CKD is projected to become the fifth leading cause of death globally by 2040, with an increasing impact on morbidity and mortality[1]. Similarly, CKD presents a challenge in Latin America, with an average prevalence of 9.9% in the adult population across all stages (Table 1)[2,3].

In this context, aiming to shift perspectives and generate proposals, as well as to call for action in addressing CKD and the cardio-renal-metabolic syndrome, a meeting of nephrology experts was held. The participants were from Argentina, Brazil, Chile, Colombia, Ecuador, El Salvador, Guatemala, Mexico, Nicaragua, and the Dominican Republic. We conducted a review of the best available evidence, combined with daily practice experiences. This focused on the challenges and opportunities for optimizing early diagnosis and treatment of CKD, with an emphasis on diabetic kidney disease (DKD) in Latin America.

Burden of disease in the region

CKD imposes a significant burden on patients, their families, and health-care systems, especially in low- and middle-income countries. This is due to the high costs of treating the disease itself and its complications, including both advanced renal and cardiovascular issues, which manifest from intermediate stages of CKD[4,5]. Consequently, mirroring global findings, regional experts highlight the importance of appropriate screening for at-risk populations to enable early diagnosis and slow progression from the initial stages of CKD. Equally, there is a recognized need to involve health-care teams at the primary care level.

The working group identified shared barriers across the region and outlined potential solutions summarized in table 2. It is crucial to note that diabetes mellitus (DM), a major global public health issue, is one of the primary risk factors for CKD. The age-standardized prevalence of type 2 DM (T2DM) is projected to average 11.3% in Latin America and the Caribbean by 2050, underscoring its significant regional impact[6].

The importance of early CKD diagnosis becomes evident when considering the high incidence and prevalence rates of renal replacement therapy in Latin America (Table 3)[7].

CKD associated with DM: Renal function assessment

The lack of resources and low awareness of CKD associated with T2DM in Latin America, both in the general population and among health-care teams, hinders early diagnosis and timely treatment. Renal health programs aimed at improving the health of individuals at risk or with CKD associated with T2DM have proven useful[8]. To this end, in alignment with global recommendations, the Latin American working group advocates the use of an estimated glomerular filtration rate (eGFR), primarily based on serum creatinine. In specific cases, and under nephrology guidance, cystatin C determination may be added.

Ideally, each country should adopt a standardized and widely recognized methodology (mass spectrometry with isotope dilution) for serum creatinine determination to improve eGFR calculation accuracy. It is proposed to determine eGFR from the first consultation in individuals with T2DM and repeat it according to current guideline recommendations[9] and individual patient needs. A similar approach was previously applied to 24-h albuminuria measurement. However, due to logistical difficulties and the potential for false positives or negatives, the current recommendation is to calculate the albumin/creatinine ratio (ACR) in a single urine sample.

Although current guidelines[9] recommend referring patients to a specialist when eGFR is ≤ 30 mL/min/1.73 m², the working group suggests, wherever possible, referral of T2DM patients with values ≤ 45 mL/min/1.73 m² in the region to ensure timely specialist care. In addition, referral to a nephrologist is recommended for patients with an ACR > 300 mg/g, as per current guidelines[9]. An alternative for defining nephrology referrals that have already been evaluated in some countries in the region

Table 1. The burden of chronic kidney disease and its risk factors in Latin America (excluding diabetes *mellitus*)

Country	CKD prevalence % (95%CI)	CKD attributable mortality % (95%CI)	DALYs lost to CKD (n) (95%CI)	Obesity % (95%CI)	Elevated blood pressure % (95%CI)	Smoking % (95%CI)
Argentina	8.64 (8.09-9.23)	4.49 (4.09-4.88)	2.55 (2.29-2.83)	28.5 (23.7-33.7)	22.6 (17.0-28.9)	17.7 (15.5-19.9)
Bolivia	6.16 (5.75-6.56)	5.83 (4.91-6.82)	3.08 (2.54-3.67)	18.7 (14.2-23.7)	17.9 (12.5-24.1)	19.6 (16.5-23.1)
Brazil	8.35 (7.81-8.85)	3 (2.77-3.15)	1.81 (1.65-1.97)	22.3 (18.9-25.9)	23.3 (18.1-28.8)	10.6 (9.8-11.5)
Chile	10.15 (9.48-10.83)	4.45 (4-4.83)	2.26 (1.99-2.53)	28.8 (24.2-33.7)	20.9 (15.8-26.8)	25.6 (22.7-28.4)
Colombia	11.47 (10.67-12.29)	3.85 (3.35-4.22)	2.26 (1.96-2.53)	22.1 (18.3-26.2)	19.2 (14.2-24.7)	10.4 (8.1-13.0)
Costa Rica	14.75 (14.07-15.52)	5.62 (5.03-6.1)	3.62 (3.12-4.08)	25.7 (21.2-30.6)	18.7 (14.0-24.3)	7.8 (6.0-9.9)
Cuba	12.31 (11.48-13.16)	2.57 (2.35-2.79)	2.28 (2.02-2.54)	26.7 (21.9-31.7)	19.0 (13.8-25.3)	16.2 (13.1-19.6)
Ecuador	8.27 (7.73-8.82)	7.47 (6.84-7.95)	3.88 (3.34-4.42)	19.3 (14.9-24.3)	17.9 (12.6-23.7)	5.0 (4.2-6.0)
El Salvador	11.87 (11.08-12.63)	10.15 (9.2-10.89)	6.47 (5.58-7.32)	22.7 (18.0-27.7)	18.7 (13.3-24.7)	6.1 (4.6-8.0)
Guatemala	8.90 (8.29-9.50)	6.35 (5.91-6.74)	3.7 (3.34-4.04)	18.8 (14.9-23.2)	21.2 (15.3-27.7)	7.2 (5.5-9.2)
Haiti	5.80 (5.34-6.22)	2.37 (1.87-3.39)	1.57 (1.29-2.05)	20.5 (16.0-25.6)	24.5 (17.8-31.9)	5.2 (4.1-6.7)
Honduras	8.03 (7.45-8.61)	6.02 (5.09-7.49)	3.62 (3.11-4.31)	19.4 (15.1-24.1)	21.4 (15.6-27.9)	9.0 (7.3-10.9)
Mexico	13.81 (12.95-14.65)	9.82 (9.29-10.22)	6.32 (5.64-6.98)	28.4 (24.7-32.3)	19.7 (14.8-25.1)	9.5 (9.1-10.1)
Nicaragua	10.79 (10.10-11.50)	11.89 (11.08-12.64)	7.07 (6.13-7.98)	21.8 (17.3-26.7)	20.8 (15.1-27.3)	8.8 (6.6-11.4)
Panama	11.72 (10.96-12.51)	5.82 (5.19-6.29)	3.41 (2.97-3.84)	22.5 (18.0-27.4)	19.9 (14.8-25.8)	3.5 (2.8-4.3)
Paraguay	7.55 (7.04-8.03)	5.51 (4.95-5.96)	3.07 (2.64-3.51)	19.0 (13.9-24.6)	24.6 (17.9-31.8)	9.9 (7.6-12.7)
Peru	10.00 (8.27-12.26)	5.28 (4.59-5.8)	2.63 (2.24-3.01)	19.1 (16.0-22.4)	13.7 (10.5-17.4)	8.1 (6.5-10.0)
Puerto Rico	16.82 (15.64-18.08)	6.25 (5.47-6.87)	4.33 (3.76-4.92)	-	-	8.8 (7.2-10.8)
Dominican Republic	7.60 (7.07-8.12)	3.23 (2.65-3.97)	2.28 (1.9-2.76)	26.9 (22.0-32.2)	21.5 (15.4-28.4)	6.7 (5.2-8.5)
Uruguay	9.76 (9.12-10.36)	2.92 (2.59-3.22)	1.7 (1.51-1.87)	28.9 (23.7-34.4)	20.7 (15.3-26.6)	18.6 (16.4-20.9)
Venezuela	12.28 (11.44-13.04)	5.56 (5.03-6.05)	3.62 (3.17-4.02)	25.2 (20.9-29.8)	18.6 (13.7-24.1)	13.3 (10.6-16.5)

CKD: chronic kidney disease; DALYs: disability-adjusted life years; 95% CI: 95% confidence interval.
Adapted and modified from the data of the Global Burden of Disease and the World Health Organization – Global Health Observatory[2,3].

is telemedicine (tele-nephrology), either synchronously or asynchronously. This approach optimizes the limited number of specialists available in the region and meets interconsultation demands with adequate quality[10]. Tele-nephrology aims to improve communication between specialists and primary care physicians, providing support, case discussion, and collaborative decision-making.

Other supplementary studies recommended for all patients from the first contact include general urine examination and, in some cases, renal ultrasound. The frequency of these tests will depend on the initial diagnosis. The working group proposes conducting them at least annually.

Cardiovascular risk and T2DM

Hypertension and T2DM are the primary risk factors for CKD in Latin America[1]. Most individuals with T2DM are considered to be at high or very high cardiovascular risk[11], regardless of their renal function. The risk factors associated with CKD are summarized in table 4. The working group emphasizes that both eGFR and ACR are essential for the diagnosis and monitoring of these patients and are also adequate for estimating cardiovascular risk[12].

Regarding treatment, and in alignment with recently updated international clinical practice guidelines (KDIGO, American Diabetes Association, European Society of

Table 2. Barriers and proposed facilitators to halt the progression of chronic kidney disease in Latin America

Barriers
– Lack of diagnosis or late diagnosis of CKD
– Insufficient public awareness of CKD, particularly among individuals with DM
– Absence or inefficiency of specific health policies for CKD (programs are either unimplemented or inadequate)
– Limited number or poor distribution of nephrologists and other specialists needed for optimal management of patients with DM and CKD
– Therapeutic inertia among healthcare teams and affected populations
– Insufficient or inappropriate medical education for primary and secondary healthcare professionals
– Delay in the introduction of innovative therapies for managing CKD in individuals with type 2 diabetes into clinical practice guidelines and local/regional regulations
– Lack of access to modern, first-line treatments not included in essential health service packages
– Unhealthy lifestyles, including increasing sedentary behavior and inadequate nutritional education starting from childhood
– Inadequate implementation and reporting of standardized serum creatinine-based glomerular filtration rate estimation and albumin-to-creatinine ratio measurement from isolated urine samples
– Insufficient financial resources in some countries and regions
Proposals
– Educate the general medical community and the public, empowering patients to adhere to their treatments
– Update and train nephrologists and other specialists involved in the care of CKD patients with DM
– Provide training to physicians and the broader renal health and primary care teams
– Develop and update simplified protocols, local or regional clinical practice guidelines, and algorithms to facilitate their use
– Improve access to evidence-based first-line therapies that demonstrate cardiovascular protection or slow the progression of kidney damage
– Holistically treat individuals with type 2 DM and CKD, involving primary care physicians, other healthcare team members, and specialists as needed (e.g., endocrinology, cardiology, nephrology, psychology, social work, and nutrition)
– Collaborate between scientific societies and health ministries in the region, aligning with local regulations where possible
– Establish health programs with monitoring requirements and regulations to evaluate their implementation

CKD: chronic kidney disease; DM: diabetes mellitus.

Hypertension, European Society of Cardiology), it is deemed fundamental to begin with clear lifestyle recommendations. These should include a suitable dietary plan, physical activity, and the cessation or avoidance of smoking[13]. Furthermore, in individuals with T2DM, the early inclusion of renin-angiotensin-aldosterone system (RAAS) blockers, metformin (for those with eGFR > 30/mL/min/1.73 m^2), sodium-glucose cotransporter-2 inhibitors (SGLT2i), and statins are also recommended. The suggested treatment targets for these patients are summarized in table 5.

Kidney, T2DM, and obesity

The prevalence of obesity and metabolic syndrome is rising globally. Excess dysfunctional adipose tissue creates a “cross-talk” between various organs and systems, resulting in cardio-renal-metabolic dysfunction and clinical consequences such as an increased prevalence of DM, CKD, and cardiovascular disease. The main mediators of these alterations are inflammation, oxidative stress, endothelial dysfunction, and insulin resistance[14]. In this model, metabolic syndrome and DM form a continuum that represents the leading cause of CKD. Consequently, metabolic disturbances play a prominent pathophysiological role, with bidirectional interactions between the cardiovascular system and the kidney[15]. Specifically, hyperinsulinemia and insulin resistance contribute early to glomerular hyperfiltration, albuminuria, increased vascular permeability, and podocytopathy – clearly associated with the potential progressive loss of renal function. Simultaneously, endothelial dysfunction, oxidative stress, and increased synthesis of transforming growth factor-β contribute to inflammation and functional decline[16].

Given these factors, a strong interconnection among cardio-renal-metabolic conditions (T2DM, CKD, and cardiovascular disease) becomes evident, explaining the significant increase in their global prevalence. In this context, the rising prevalence of DM and CKD is also observed in Latin America, driven by sociocultural changes influenced by several factors: lack of awareness of risk factors among the population, changes in dietary behavior linked to industrialization and urban living, growing sedentarism, low motivation among health-care professionals to address these diseases, and absence of public policies and insufficient state resources for early diagnosis of at-risk individuals. Implementing appropriate programs could modify behaviors and establish proper treatment. Another contributing factor to the increased prevalence of CKD due to T2DM and other causes is the rise in life expectancy over the

Table 3. Prevalence and incidence rates of renal replacement therapy (dialysis and transplant) in Latin America (2019 data)

Country	Population	Prevalence rate (HD)	Prevalence rate (PD)	Dialysis (total)	Functional renal graft	Total	Dialysis (total)	In PD (%)	Rate of renal transplantation (pmp)
Argentina	44,938,712	674	46	720	243	963	163	6.4	35
Bolivia	11,513,102	452	2†	454†	3†	457†	114	0.0	2
Brazil	211,049,519	618	47	665	299	963	218	7.1	30
Chile	18,952,035	1236	81	1317	233	1550	204	10.0	22
Colombia	50,339,443	516	185	702	157	858	103	40.6	19
Costa Rica	5,047,561	40	209	249	318	567	38	NA	15
Cuba	11,333,484	293	6	299	131	430	108	0.0	15
Ecuador	17,373,657	735	21	756	12	768	6	2.7	13
El Salvador	6,453,550	297†	380†	677†	99†	776†	217†	0.0†	6†
Guatemala	16,604,026	304	221	525	51	575	140	19.9	6
Honduras	9,746,115	370‡	22‡	392‡	13‡	405‡	96‡	0.6‡	0‡
Mexico⁋	8,281,714/1,415,421	611	483	1094	729	1823	530	0.0	62
Nicaragua	6,545,503	35	65	100	11	111	31	73.7	2
Panama	4,246,440	488	113	601	100	701	181	21.5	8
Paraguay	7,044,639	317	16	333	54	387	36	6.0	4
Peru	32,510,462	515	57	572	46	618	62	6.5	3
Puerto Rico	3,193,694	1607†	130†	1737†	392†	2129†	419†	1.1†	18†
Dominican Republic	10,738,957	340	98	438	47	485	221	NA	5
Uruguay	3,461,731	734	62	796	398	1194	185	10.1	42
Venezuela	28,515,829	310	10	320	0	320	96	NA	1
Total	627,183,988	570	80	650	216	866	168	12	22

HD: Hemodialysis; PD: Peritoneal Dialysis; pmp: per million people; NA: not unavailable. Number of renal transplants performed in 2019.
†Data from 2018.
‡Data from 2020.
⁋Data from Jalisco and Aguascalientes due to lack of national data.
Adapted and modified from ref[1].

last five to seven decades. While this effect is positive, it has led to a greater incidence of chronic degenerative diseases such as those discussed in this document.

The working group highlights the importance of early screening for populations at risk. Generalized screening of the entire adult population is not feasible, so efforts should focus on individuals with key conditions associated with CKD development: visceral obesity, hypertension, glucose abnormalities, and a family history of CKD. Once affected individuals are identified, cultural changes related to these risk factors (non-pharmacological options) should be encouraged, alongside offering the best therapeutic options. Drugs targeting the pathophysiological mechanisms underlying renal damage are proposed, focusing on: blocking maladaptive mechanisms (particularly the RAAS and sympathetic system), reducing inflammation, improving hemodynamics, and optimizing metabolic control. To this end, RAAS blockers, SGLT2i, glucagon-like peptide-1 receptor agonists (GLP-1 RA), and non-steroidal mineralocorticoid receptor antagonists (MRAs) are included. To date, these four drug classes have demonstrated slowing of CKD progression and cardio-renal protection.

Table 4. Risk factors to consider for early detection of chronic kidney disease

T2DM
Hypertension or established cardiovascular disease
Age*
Chronic inflammation states
Family history of CKD (first degree)
Obesity

T2DM: type 2 diabetes mellitus; CKD: chronic kidney disease.
*Age of onset of DM2 should be prioritized; younger onset tends to have a worse prognosis. In some countries, such as Mexico, type 2 diabetes and chronic kidney disease are commonly observed at younger ages.

Therapeutic approach

Residual risk in T2DM treatment with CKD

DKD is a serious complication affecting 30-40% of patients with T2DM[17]. However, treatments to prevent the progression of DKD were unavailable until the early 1990s, when the role of the RAAS in the hemodynamic and structural changes of this disease was documented[18].

At least three pathophysiological mechanisms or axes are implicated in the onset and progression of DKD: Hemodynamic, metabolic, and inflammatory[19]. At present, there is no single intervention that completely addresses all three pathophysiological axes, making the idea of combination therapy attractive.

For RAAS blockade, in a meta-analysis, both angiotensin-converting enzyme inhibitors (ACEi) and angiotensin receptor blockers (ARB) demonstrated a 13% reduction in the risk of kidney failure and a 29% reduction in the doubling of serum creatinine levels[20]. Nevertheless, as observed in the RENNAL[21] and IDNT[22] studies, patients treated with RAAS blockade still face a high residual risk of disease progression.

In 2015, SGLT2i was added to the therapeutic arsenal, with robust indirect or secondary evidence from cardiovascular safety studies and subsequent trials with primary renal outcomes. These studies demonstrated clear benefits, including a 37% reduction in the risk of renal disease progression[23]. However, in registry studies and renal-focused trials in CKD patients (CREDENCE, DAPA-CKD, and EMPA-KIDNEY)[24-26], the residual risk of disease progression persisted.

In patients on ACEi or ARBs, an "aldosterone escape" phenomenon has been recognized, potentially linked to mineralocorticoid receptor overactivity, proteinuria, and renal disease progression[27]. Finerenone, a non-steroidal MRA, and other drugs such as aldosterone synthase inhibitors[28] emerged to address safety concerns (induction of hyperkalemia) associated with classic steroidal MRAs (spironolactone and eplerenone) in reducing the progression of renal damage. Despite the clear benefit of finerenone in both cardiovascular and renal endpoints, the incidence of the composite renal variable (kidney failure, sustained reduction in eGFR > 40%, or renal-cause mortality) was reduced by 13% in participants in the FIDELIO-DKD study, similar to findings from previous studies, yet the residual risk of DKD progression remains uneliminated[29].

These observations raise questions about new pharmacological alternatives to manage residual risk. ACEi, ARBs, and finerenone do not affect glucose levels, whereas SGLT2i have reduced metabolic control efficacy when eGFR is < 60 mL/min/1.73 m^2. Despite the cardiovascular and renal benefits of these strategies, DKD patients frequently require additional pharmacological interventions.

Table 5. Treatment goals in patients with cardiovascular risk factors

Risk factor	Suggested goals
Hypertension	Normalization (blood pressure < 130/80 mmHg)
Low-density lipoprotein cholesterol	Every patient should be evaluated based on cardiovascular risk to set the therapeutic target: – Very high risk: LDL goal < 55 mg/dL – High risk: LDL goal < 70 mg/dL – Intermediate risk: LDL goal < 100 mg/dL KDIGO 2024 recommendations do not specify goals but apply the "statin intensity" guidelines from KDIGO 2013 for dyslipidemia. 100% of patients should use statins (ezetimibe is added when monotherapy with statins is insufficient). Glycated hemoglobin is around 7% (this goal will be less ambitious in older adults and frail patients). Use of GLP-1 receptor agonists is highlighted, as they are associated with greater effects on metabolic control in patients with chronic kidney disease.
Diabetes mellitus	Metformin is recommended by both KDIGO and the American Diabetes Association guidelines due to its significant benefits in controlling blood sugar. In Latin America, given resource constraints, its combined use can be an effective strategy to improve health outcomes and optimize costs associated with treating Type 2 diabetes, as long as the patient has an estimated glomerular filtration rate ≥ 30 mL/min 1.73/m^2.

The role of GLP-1 receptor agonists (GLP-1 RAs)

GLP-1-RAs are incretin-based drugs with potent effects on glycemia and weight, demonstrated cardiovascular benefits, and a 21% reduction in renal outcomes[30]. The underlying mechanisms associated with these benefits are not fully understood but appear to include both indirect actions (weight reduction, improved blood pressure, and, of course, metabolic control) and direct intrarenal mechanisms (anti-inflammatory effects, natriuresis, hemodynamic modulation, and among others)[9]. Initial evidence of nephroprotection originated from secondary endpoints in cardiovascular safety studies, primarily softer outcomes such as proteinuria, without initial evidence of benefits in hard clinical outcomes[30]. This scenario changed with the results of the randomized controlled FLOW trial, which had a composite renal and cardiovascular mortality outcome as its primary endpoint. The trial included adults with CKD and T2DM, with an eGFR of 50-75 mL/min/1.73 m^2 and an ACR of 300-5000 mg/g, or an eGFR of 25-50 mL/min/1.73 m^2 and an ACR of 100-5000 mg/g. Patients were randomized to receive 1 mg of subcutaneous semaglutide weekly or placebo in addition to standard therapy. This intervention reduced the primary composite endpoint (including major renal events such as dialysis, transplantation, or eGFR < 15 mL/min/1.73 m^2, renal-cause mortality, and cardiovascular-cause mortality) by 24%, in addition to showing other cardiovascular benefits[31].

GLP-1-RAs are considered first-line therapy for patients with diabetes and cardiovascular risk factors or established cardiovascular disease, regardless of glycated hemoglobin (HbA1c) levels[32]. In CKD guidelines, they are reserved as second-line therapy for patients not meeting individual targets for weight, HbA1c, and albuminuria, or those requiring better control of cardiovascular risk factors[9] (Table 6). However, the results of the FLOW trial could once again revolutionize treatment recommendations for CKD in the context of diabetes. The chronology of therapeutic advances is summarized in figure 1.

Actions to facilitate clinical application

Notable among the actions aimed at promoting the adoption of guideline recommendations in clinical practice is the proposal to conduct continuing medical education sessions to provide clear knowledge and messages to physicians at all levels of care. This strategy includes a national intervention through in-person events such as congresses, update seminars, or workshops to present the available scientific evidence on disease-modifying therapies with appropriate guidance for prescription. In addition, regional or local interventions, conducted either in person or virtually, are suggested to present clinical cases of interest and validate the benefits of these medications in daily practice.

A second suggested action involves collaboration with the pharmaceutical industry, which plays a significant role by supporting various academic activities that facilitate knowledge dissemination across all levels of health care.

A third strategy proposed for guideline adoption involves the engagement of medical societies at the national level to enhance the collection, evaluation, editing, and distribution of information through authorized channels (e.g., digital media and scientific journals). Similarly, presenting cost-effectiveness analyses to insurers and governments, emphasizing the utility of disease-modifying therapies as powerful tools to reduce health complications and lower health-care system costs, is essential.

Fourth, the development of national CKD registries and the application of tools to predict CKD and DKD progression can enable the screening of at-risk patient groups for targeted interventions.

A variety of factors must be addressed to ensure the appropriate implementation of new treatment modalities. These include: overcoming therapeutic inertia (from both physicians and patients), addressing the availability and cost of therapies, ensuring consistent and adequate screening for at-risk populations, increasing the involvement of primary care providers, and establishing health policies and allocating sufficient human and financial resources by ministries and governments in all countries.

Conclusion

CKD remains a major public health issue in our region, with diabetes being the most prevalent cause. A key challenge is the delayed diagnosis of CKD, both diabetic and non-diabetic, especially in the early stages, as it is often a painless and asymptomatic condition initially. Limited CKD screening, relying solely on albuminuria measurement, may miss a significant proportion of patients with eGFR > 60 mL/min who meet diagnostic criteria –particularly relevant in patients with diabetes-associated CKD–. Similarly, screening based only on serum creatinine could overlook many CKD cases. Therefore, a program measuring both indicators

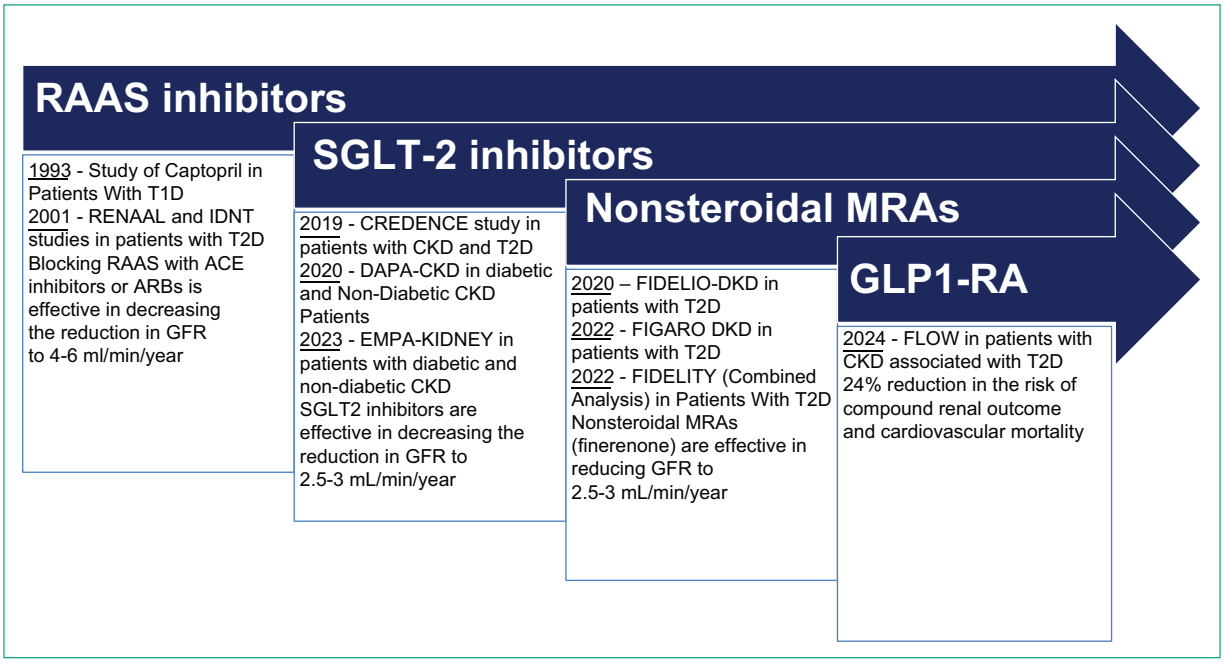

Figure 1. Timeline of the development of nephroprotection strategies. ARA: angiotensin receptor antagonists; GLP1-RA: glucagon-like peptide-1 receptor agonists; MRA: mineralocorticoid receptor antagonists; T1DM: type 1 diabetes mellitus; T2DM: type 2 diabetes mellitus; CKD: chronic kidney disease; ACEI: angiotensin-converting enzyme inhibitors; SGLT2: sodium-glucose cotransporter-2; RAAS: renin-angiotensin-aldosterone system; GFR: glomerular filtration rate *(adapted from Obrador et al.[7]).*

is necessary to strengthen early diagnosis in high-risk populations. To address this, efforts should focus on developing and enhancing: (1) structured, multidisciplinary nephroprotection programs, (2) health system registries in each country that include patients in renal replacement therapy as well as those with CKD at earlier stages, (3) collaborative teams representing patients, health-care professionals, and government agencies to integrate CKD into public health policies, and (4) programs with increased financial allocation from governments to achieve equitable distribution and reduce disparities in gender, race, social status, or geographic location. Negotiations with insurers, governments, and the pharmaceutical industry to regulate prices and include innovative therapies in coverage policies are also proposed.

Regarding the treatment of patients with CKD, whether associated with DM or other causes, significant progress has been made in recent years, particularly in pharmacological interventions for DKD. For all patients with DM and CKD, it is essential to focus on three primary treatment objectives: (1) optimize metabolic control, (2) slow the progression of kidney disease, and (3) reduce cardiovascular risk.

Table 6. Therapies for diabetic kidney disease according to phenotype

RAAS blockade	1. T2DM and hypertension 2. T2DM and moderate to severe albuminuria (ACR > 30 mg/g), with or without hypertension
SGLT2i	T2DM and DKD with eGFR > 20 mL/min/1.73 m², regardless of ACR value
Finerenone	T2DM, DKD with eGFR > 25 mL/min/1.73 m², ACR > 30 mg/g, and potassium < 5 mEq/L, in patients on the maximum tolerated dose of SRAA blockers
GLP-1 Receptor Agonists (GLP1-RA)	1. T2DM and DKD with overweight or obesity 2. T2DM and DKD with HbA1c above individual target, despite first-line treatment according to clinical practice guidelines 3. T2DM and DKD with ACR > 30 mg/g, despite first-line treatment according to clinical practice guidelines

GLP1-RA: GLP-1 receptor agonists; T2DM: type 2 diabetes mellitus; DKD: diabetic kidney disease; SGLT2i: sodium-glucose co-transporter 2 inhibitors; ACR: albumin-to-creatinine ratio; RAAS: renin-angiotensin-aldosterone system; eGFR: estimated glomerular filtration rate.

Finally, despite the availability of guidelines and their dissemination through various channels, there remains a low level of implementation of these recommendations in routine clinical practice. The barriers to achieving this

are related to healthcare professionals, patients, and the health-care systems specific to each country in the region.

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Conflicts of interest

J. Rico Fontalvo has received honoraria for lectures from AbbVie, AstraZeneca, Bayer, Boehringer Ingelheim, Lilly, Merck, Novartis, Novo Nordisk, and Sanofi; and participated in advisory boards for AstraZeneca, Bayer, Lilly, Boehringer Ingelheim, and Novo Nordisk. A. Elberg has received honoraria for speaking and consulting from AstraZeneca, Bagó, Baliarda, Bayer, Boehringer Ingelheim, Novo Nordisk, Raffo, Sanofi, and Servier. E. Lorca has received honoraria for speaking and consulting from AstraZeneca, Axon Pharma, Baxter, Bayer, Boehringer-Ingelheim, Eli Lilly, Fresenius Kabi, Fresenius Medical Care, Merck, Novartis, and Novo Nordisk. R. Daza has received honoraria for lectures from AstraZeneca, Bayer, Boehringer Ingelheim, and Novo Nordisk. C. Castellaro has received honoraria for speaking and consulting from AstraZeneca, Bagó, Baliarda, Bayer, Boehringer Ingelheim, Elea, MSD, Novo Nordisk, and Raffo; and has served as an advisor for AstraZeneca, Bagó, Boehringer Ingelheim, Elea, Novo Nordisk, and Raffo. V. Villavicencio has received honoraria from AstraZeneca and Boehringer Ingelheim. V. Sánchez Polo has received honoraria for lectures from AbbVie, Asofarma, AstraZeneca, Iclos, Janssen, and Novartis; and is a researcher for Astellas, Aurinia, Novartis, and Sanofi. C. Bonanno has received honoraria for lectures from AstraZeneca, Bayer, and Boehringer Ingelheim. G. Rosa Diez has received honoraria as a speaker and advisory board member for AstraZeneca, Boehringer Ingelheim, and Novo Nordisk. R. Correa-Rotter is a member of the executive committee for the DAPA-CKD, SONAR, and FINE-REAL studies, and national leader for the FLOW study; and has received honoraria for consulting or lectures from Amgen, AstraZeneca, Bayer, Boehringer Ingelheim, Novo Nordisk, and Sanofi.

Ethical considerations

Protection of human and animal subjects. The authors declare that no experiments have been conducted on humans or animals for this research.

Confidentiality of data. The study does not involve patient personal data nor requires ethical approval. The SAGER guidelines do not apply.

Use of artificial intelligence for generating text. The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript nor for the creation of images, graphics, tables, or their corresponding captions.

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