SGLT2 Inhibitors In kidney Transplant Patients

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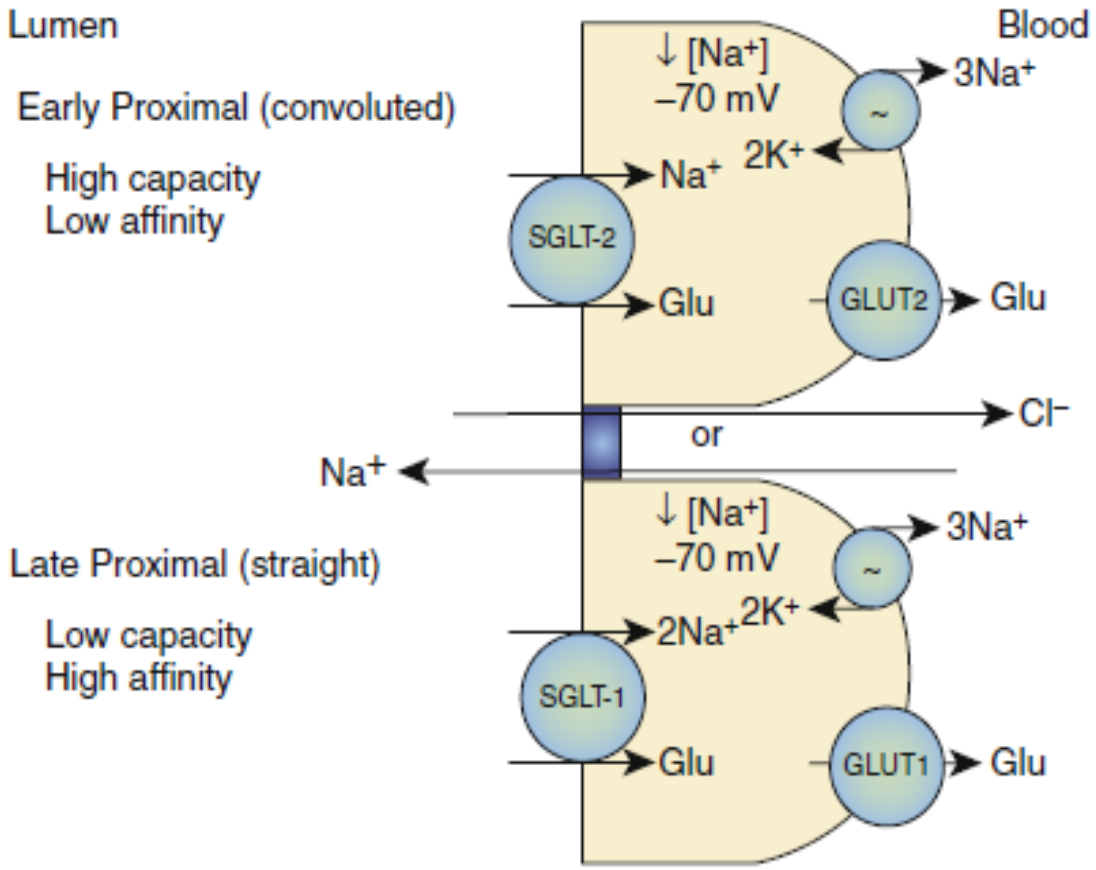
Introduction

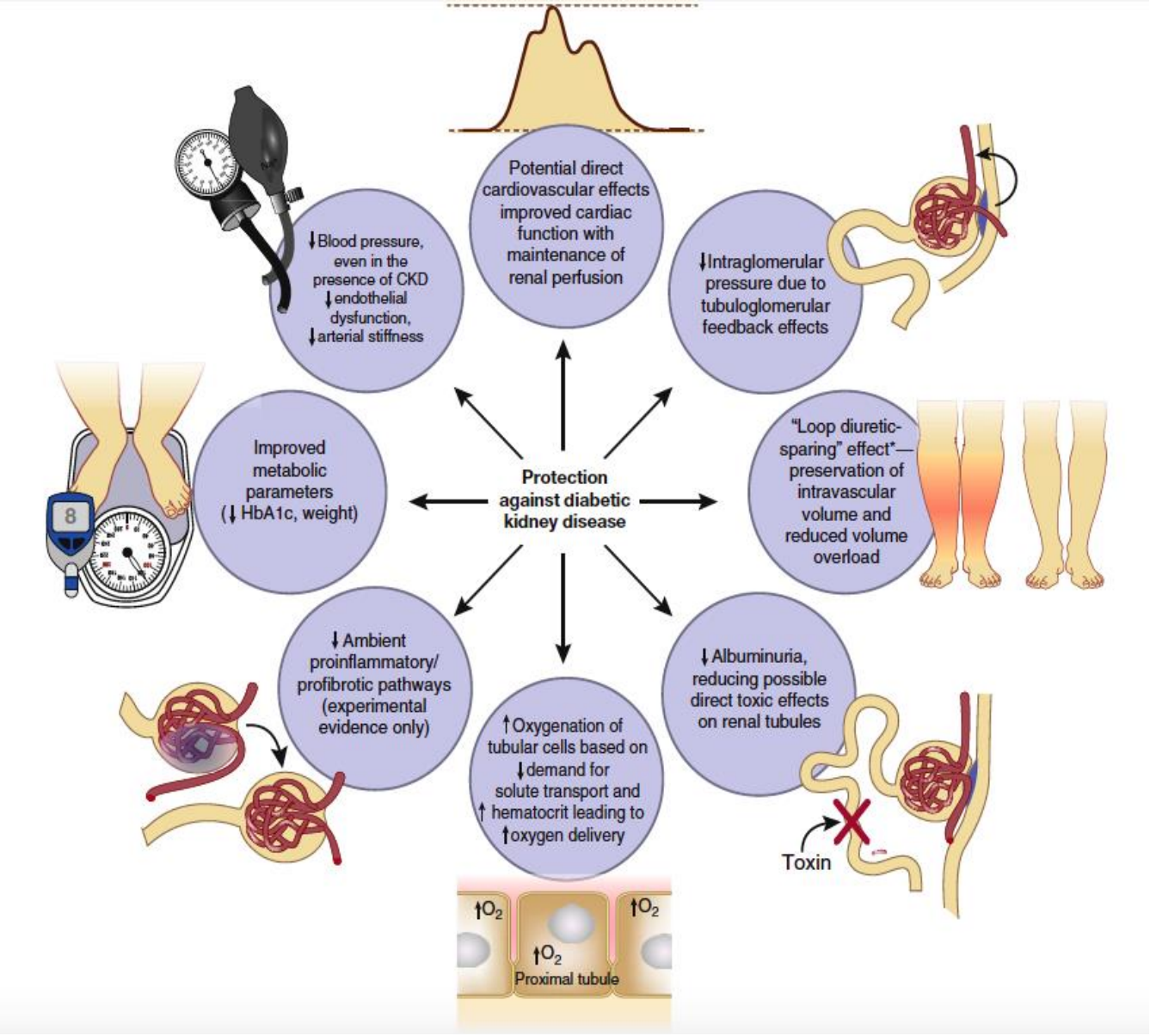
- Diabetes mellitus (DM) and post-transplantation DM (PTDM) is a well-recognized transplant comorbidity. Despite the distinct pathophysiological mechanisms, both conditions contribute to poorer prognosis and decreased survival rates in kidney transplantation recipients (KTRs).
- transplant recipients carry a significantly higher cardiovascular (CV) risks compared to the general population. This risk is further heightened with comorbid pretransplant DM or PTDM.
- For instance, a long-term study in KTRs reported that PTDM and pretransplant DM were associated with a 1.2-fold and 5.1-fold increased risk of all-cause mortality, respectively, with CV events being the leading cause of death.
- Therefore, in order to improve outcomes among kidney transplant patients, it is crucial to prioritize proper glycemic control and reduce CV risks.

SGLT-2 inhibitors

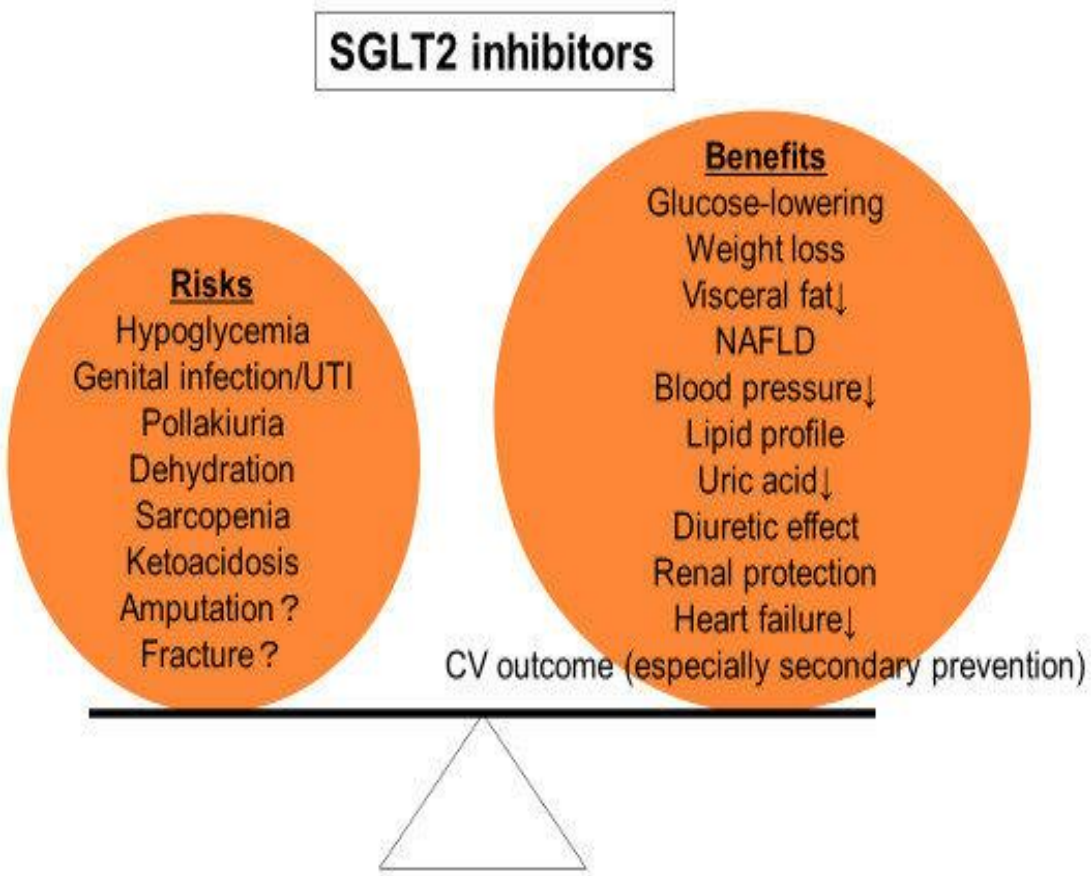
- SGLT-2 inhibitors inhibit sodium-glucose reabsorption at proximal renal tubules, causing osmotic diuresis and natriuresis As a result, the glucose and HbA1C levels drop .



- Sodium-glucose cotransporter 2 inhibitors (SGLT2i) are anti-hyperglycemic medications that offer benefits beyond glycemic control. They have demonstrated cardioprotective effects in patients with or without T2DM and reno-protective effects in those with diabetic kidney disease and other kidney conditions .



- Despite their potential advantages, such as reducing mortality, their use may increase the risk of urinary tract infections and ketoacidosis. The association with fractures, diabetic ulcers, and amputations remains somewhat contentious



Empagliflozin, Cardiovascular Outcomes, and Mortality in Type 2 Diabetes(EMPA Reg Trial)2016

- The EMPA-REG OUTCOME trial first reported the CV benefits of Empagliflozin in type 2 diabetic mellitus (T2DM) patients, demonstrating a notable decrease in CV death.

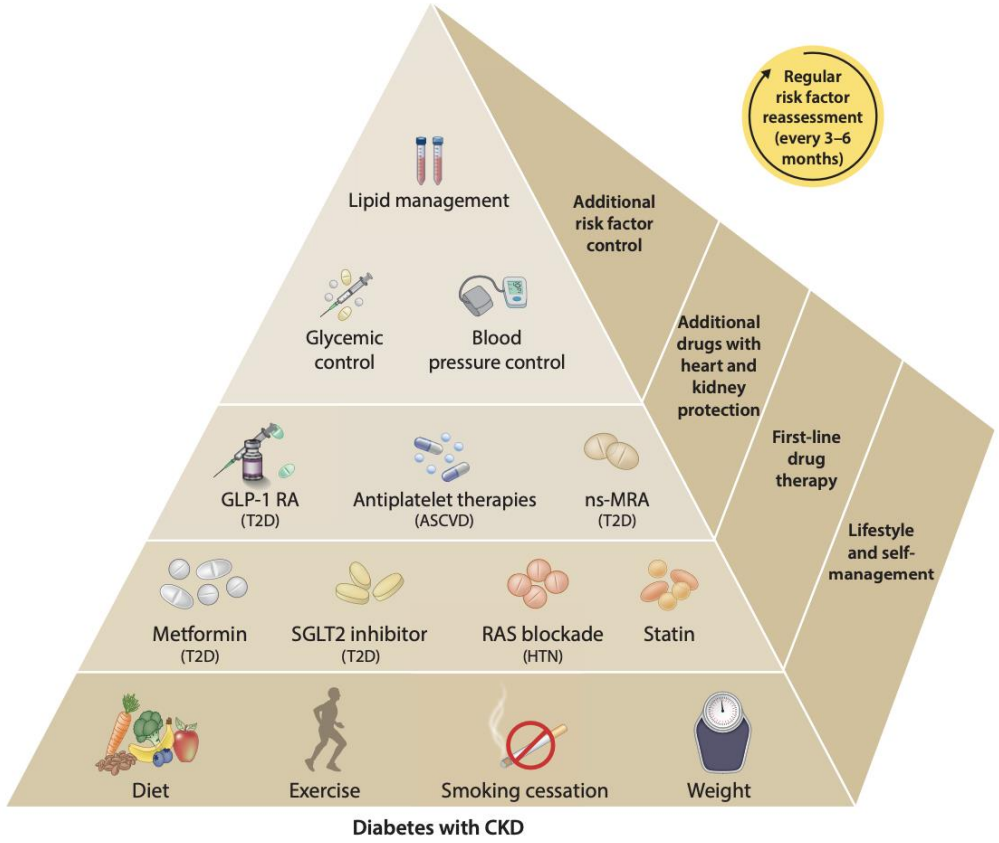
- Several meta-analyses have consistently demonstrated a reduction in the risk of major adverse cardiovascular events (MACE), including non-fatal myocardial infarction (MI), non-fatal stroke and CV deaths as well as a reduction in hospitalized heart failure.

- In patients with chronic kidney disease (CKD), strong evidence from large RCTs has consistently shown that SGLT-2 inhibitors can significantly reduce kidney disease progression and cardiac death by 28-39%. These reno-protective effects are particularly notable in patients, irrespective of coexisting type 2 diabetes.

SGLT2 and KT

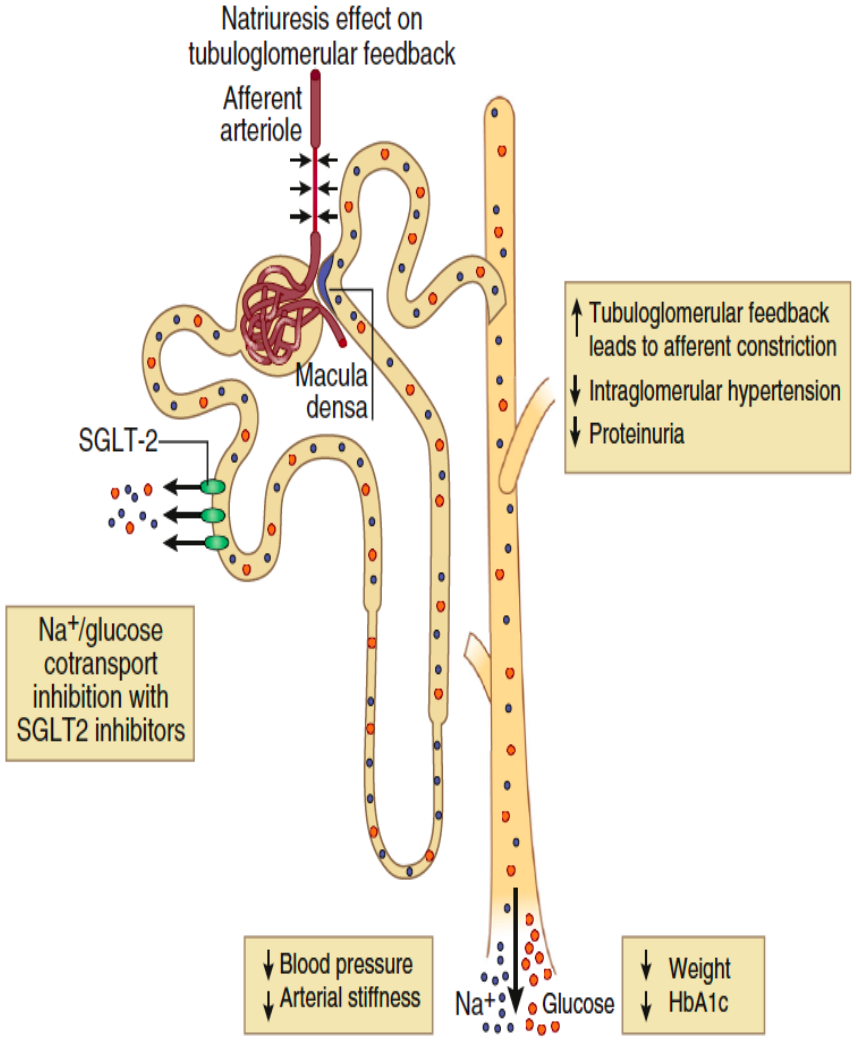
Recommendation 1.3.1: We recommend treating patients with type 2 diabetes (T2D), CKD, and an eGFR ≥20 ml/min per 1.73 m^2 with an SGLT2i *(1A)*.

Practice Point 1.3.7: SGLT2i have not been adequately studied in kidney transplant recipients, who may benefit from SGLT2i treatment, but are immunosuppressed and potentially at increased risk for infections; therefore, the recommendation to use SGLT2i does not apply to kidney transplant recipients

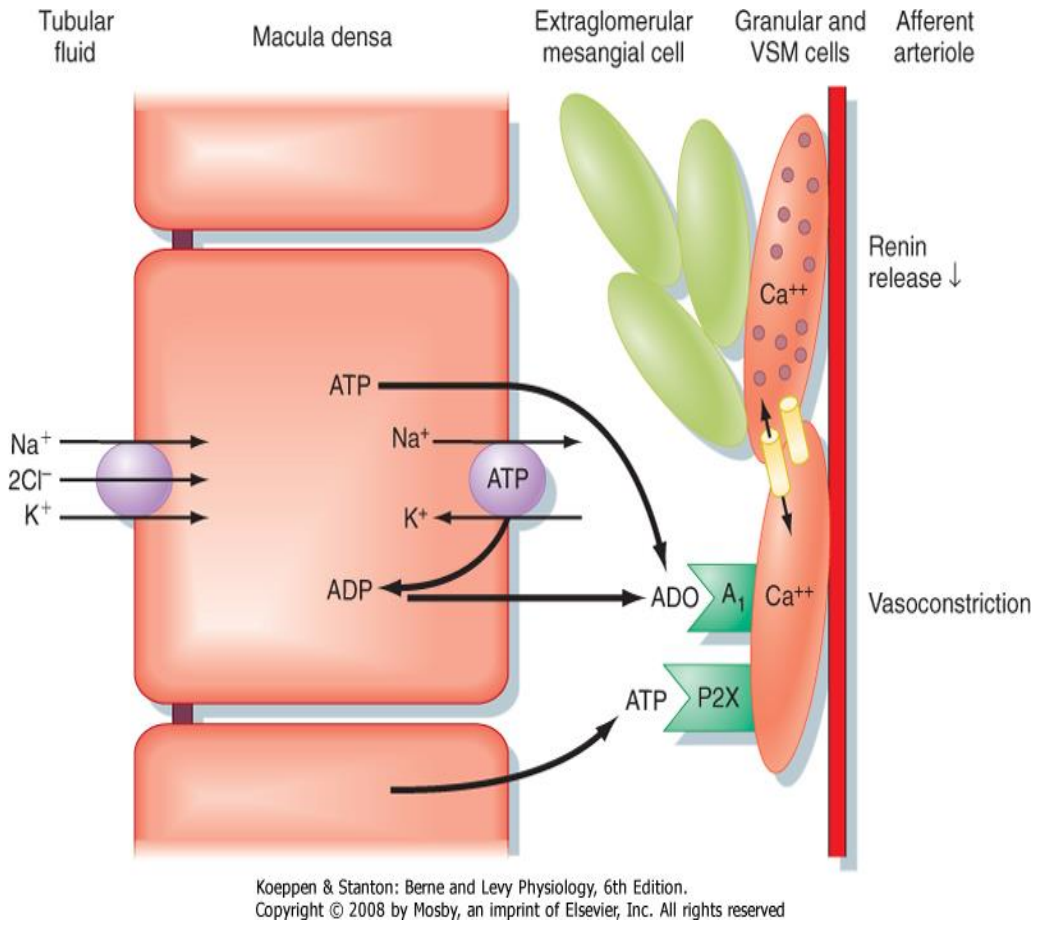


❖ Improve kidney function

- We observed a transient small decrease in eGFR starting approximately 1.5 months after initiating SGLT2i treatment (eGFR dip), followed by subsequent recovery.



- Such eGFR decline has been noted in the non-transplanted population and is recognized as a hemodynamic effect of SGLT2i rather than indicative of kidney injury. This reduction in eGFR is attributed to the vasoconstriction of afferent arterioles, leading to a decrease in intraglomerular pressure and hyperfiltration, and reduced metabolic demand for tubular reabsorption.
- The resultant decrease in renal workload may contribute to preserving kidney function in native kidneys and is believed to be beneficial for the kidney long-term



- In the context of kidney transplantation, particularly in cases involving deceased donors and delayed graft function where ischemic tubular injury is common, this effect could be especially significant for enhancing graft survival

Impact of diabetes on the effects of sodium glucose co-transporter-2 inhibitors on kidney outcomes: collaborative meta-analysis of large placebo-controlled trials.2022

- a recent meta-analysis of large placebo-controlled trials demonstrated a significant 37% reduction in the kidney disease progression among T2 DM patients using SGLT-2 inhibitors. This kidney benefit was consistent across subgroups, regardless of diabetic status, primary kidney diseases, or kidney function.

Graft Function

The Efficacy and Safety of SGLT2 Inhibitor in Diabetic Kidney Transplant Recipients. Lim, Jeong-Hoon MD, PhD[1]; Kwon, Soie MD, MS[2]; Jeon, Yena MS[3];Korea.2023

- A total of 2083 KTRs with diabetes were enrolled from 6 transplant in Korea.

SGLT2i improved a composite of all-cause mortality, DCGF, or serum creatinine doubling in KTRs. SGLT2i can be used safely and have beneficial effects on preserving graft function in diabetic KTRs.

Article

Efficacy and Safety of SGLT-2 Inhibitors for Treatment of Diabetes Mellitus among Kidney Transplant Patients: A Systematic Review and Meta-Analysis

Api Chewcharat [1,2,*], Narut Prasitlumkum [3], Charat Thongprayoon [2,*], Tarun Bathini [4],

A recent meta-analysis performed in 2020 showed that SGLT-2 inhibitors were effective in preserving kidney function among kidney transplant recipients with DM .

Use of sodium-glucose co-transporter 2 inhibitors in solid organ transplant recipients with pre-existing type 2 or post-transplantation diabetes mellitus: A systematic review

Author links open overlay,2023
panelYolanda Lin [a], Merisa Mok [b], Jennifer Harrison [c d 1],

- Of the 17 studies that were included in this systematic review, there were 15 studies on kidney transplant recipients (2417 patients) and two studies on heart transplant recipients (122 patients).
- SGLT2 inhibitors may improve glycemic control without negatively impacting kidney function over short follow-up duration.

SYSTEMATIC REVIEW

The Efficacy and Safety of SGLT2 Inhibitors in Diabetes Kidney Transplant Recipients: A Systematic Review and Meta-Analysis

[version 1; peer review: awaiting peer review]

Kanachai Boonpiraks[1], Pajaree Krisanapan[2], Suthiya Anumas[1],

- A total of seven studies comprising 2,713 patients were included in this analysis.

In contrast to findings in the non-transplant population, this meta-analysis revealed a neutral impact of SGLT-2 inhibitors on kidney function, as assessed by eGFR and UPCR.

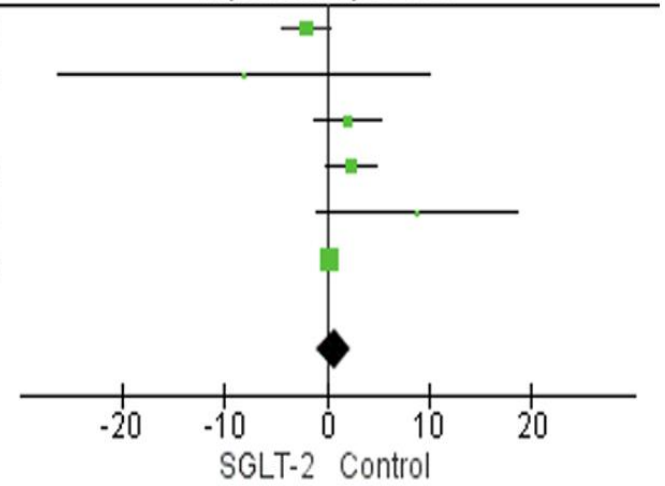
- This neutral effect may be attributed to the comparatively shorter follow-up periods, with a median duration of 12 months. In contrast, non-transplant studies typical have 2-3 years follow-ups, during which the renal benefits of SGLT-2 inhibitors, especially in eGFR, become more pronounced compared to the placebo group after 12 months.

A. eGFR

Study or Subgroup	SGLT-2i Mean	SD	Total	Control Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI	Year
Halden et al.(2019)	-3	5.2	22	-1	2.6	22	21.2%	-2.00 [-4.43, 0.43]	2019
Schwaiger et al.(2019)	-2.7	18.8	8	5.4	24.2	14	0.8%	-8.10 [-26.28, 10.08]	2019
Hisadome et al.(2021)	0.9	6.7	28	-1.2	8	57	15.6%	2.10 [-1.14, 5.34]	2021
Lim et al.(2022)	2.9	17.8	226	0.5	20.3	1857	20.6%	2.40 [-0.10, 4.90]	2022
Demir et al.(2023)	1.02	17.45	36	-7.84	18.58	21	2.7%	8.86 [-0.92, 18.64]	2023
Mahmoud et al.(2023)	0.2	0.14	98	-0.1	0.07	70	39.1%	0.30 [0.27, 0.33]	2023
Total (95% CI)			**418**			**2041**	**100.0%**	**0.69 [-0.96, 2.34]**	

Heterogeneity: Tau² = 1.81; Chi² = 11.11, df = 5 (P = 0.05); I² = 55%

Test for overall effect: Z = 0.82 (P = 0.41)

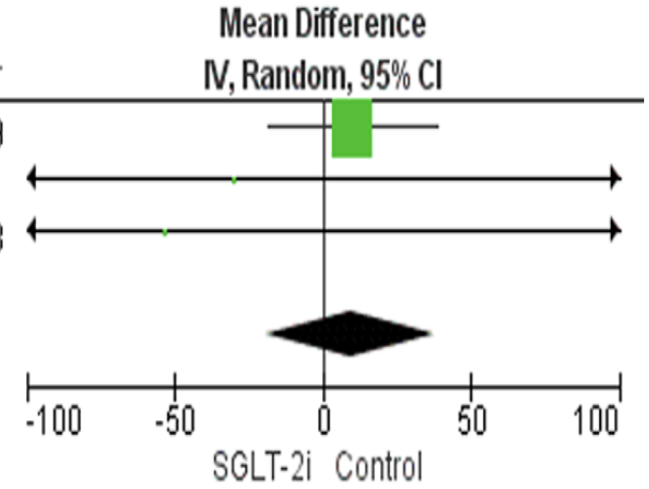


B. UPCR

Study or Subgroup	SGLT-2i Mean	SD	Total	Control Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI	Year
Halden et al.(2019)	10	51.9	22	0	44.4	22	98.6%	10.00 [-18.54, 38.54]	2019
Hisadome et al.(2021)	-10	475.1	28	20	750.3	57	1.2%	-30.00 [-292.50, 232.50]	2021
Demir et al.(2023)	-126	1,678.4	36	-73	852.8	21	0.2%	-53.00 [-711.51, 605.51]	2023
Total (95% CI)			**86**			**100**	**100.0%**	**9.42 [-18.93, 37.76]**	

Heterogeneity: Tau² = 0.00; Chi² = 0.12, df = 2 (P = 0.94); I² = 0%

Test for overall effect: Z = 0.65 (P = 0.51)



❖ Lowering HbA1C

- **Incretin based therapies and SGLT-2 inhibitors in kidney transplant recipients with diabetes: A systematic review and *meta*-analysis**
  Dora Oikonomaki[a] · Greece,2021

- Sixteen studies and 310 individuals with a mean age of 55.98 ± 8.81 years were included in the analysis. Participants received DPP-4 inhibitors in 8 studies, SGLT-2 inhibitors in 6 studies and GLP-1 receptor agonists in 2 studies, with a mean follow-up of 22.03 ± 14.95 weeks.
- DPP-4 inhibitors and SGLT2 inhibitors appear both efficacious and safe in renal transplant recipients.
- Most studies did not show adverse effects on the glomerular filtration rate (GFR) and hepatic function.

Article

Efficacy and Safety of SGLT-2 Inhibitors for Treatment of Diabetes Mellitus among Kidney Transplant Patients: A Systematic Review and Meta-Analysis

Api Chewcharat [1,2,*], Narut Prasitlumkum [3], Charat Thongprayoon [2,*], Tarun Bathini [4],

A recent meta-analysis performed in 2020, comprising 8 studies involving a total of 132 participants, has provided evidence of the effectiveness of SGLT-2 inhibitors in treating DM among KTRs.

The analysis demonstrated that SGLT-2 inhibitors were effective in lowering HbA1C when treated at least 12 months, reducing body weight when treated at least 6 months, and preserving kidney function among kidney transplant recipients with DM without reported serious adverse events,including euglycemic ketoacidosis and acute rejection.

❖ Decreased BMI

Sodium-Glucose Co-Transporter-2 Inhibitors in Non-Diabetic Adults With Overweight or Obesity: A Systematic Review and Meta-Analysis 2021 china

Hanrui Zheng[1,2†], Min Liu[3†], Sheyu Li[4,5], Qingyang Shi[5], Shengzhao Zhang[6], Yiling Zhou[4] and Na Su[1,2]*

Six randomized controlled trials involving 872 individuals were included in the meta-analysis. Compared to the placebo group, the SGLT2 inhibitors group had statistically signicant reductions in absolute changes in body weight ($P<0.00001$) and BMI ($P<0.00001$) in SGLT2 inhibitors group,

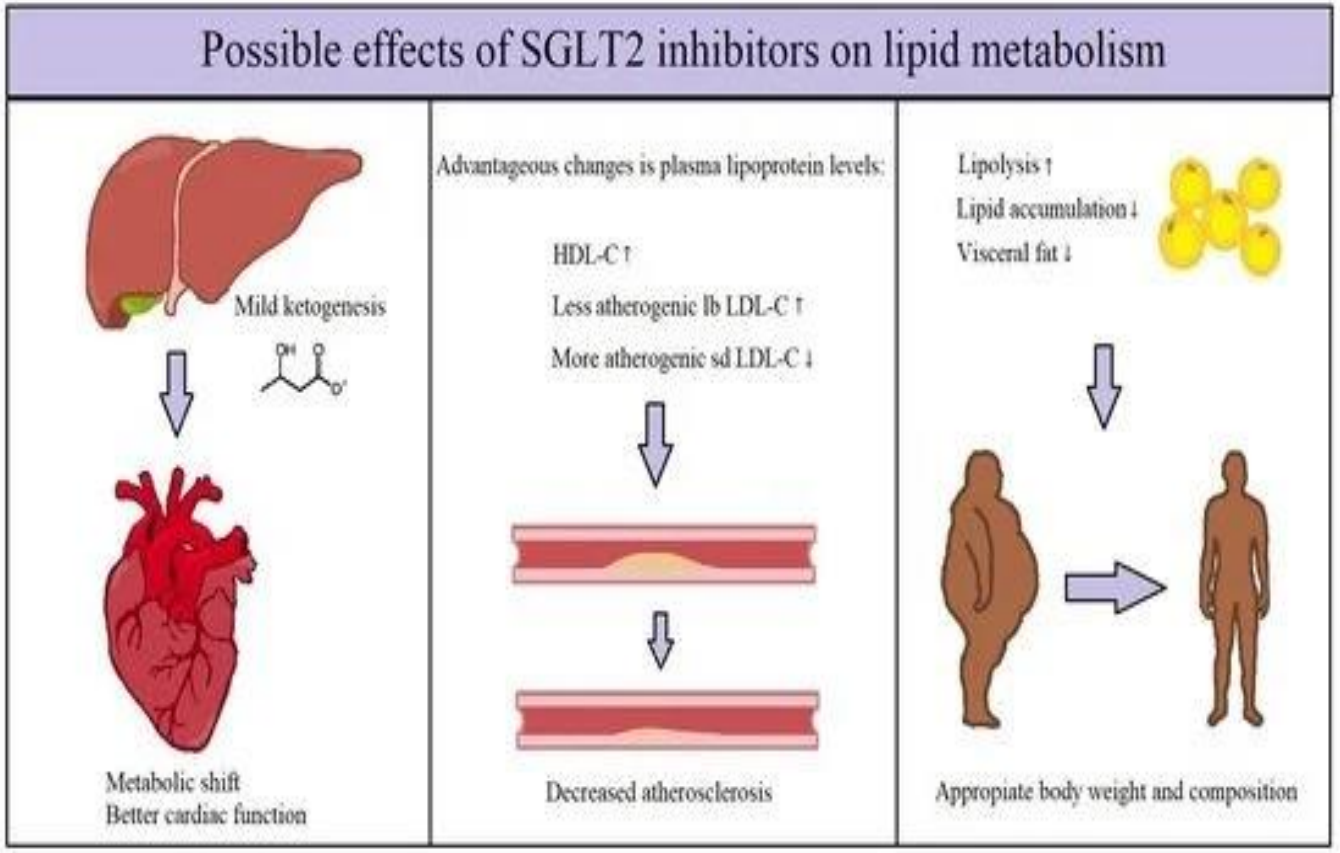
SGLT2 inhibitors could be used in selected adults with overweight and obesity but not diabetes if they are at low risk of genital infection and urinary infection.

Effect of Sodium–Glucose Cotransporter 2 Inhibitors on Weight Reduction in Overweight and Obese Populations without Diabetes: A Systematic Review and a Meta-Analysis

Yun Kyung Cho[1], Ye-Jee Kim[2], Chang Hee Jung[3,4,*]

Accepted October 14, 2021

A meta-analysis demonstrated that although the weight lowering effect was mild, SGLT2 inhibitors significantly reduced body weight in obese patients without diabetes.



SYSTEMATIC REVIEW

The Efficacy and Safety of SGLT2 Inhibitors in Diabetes Kidney Transplant Recipients: A Systematic Review and Meta-Analysis

2025

[version 1; peer review: awaiting peer review]

Kanachai Boonpiraks[1], Pajaree Krisanapan[2], Suthiya Anumas[1],

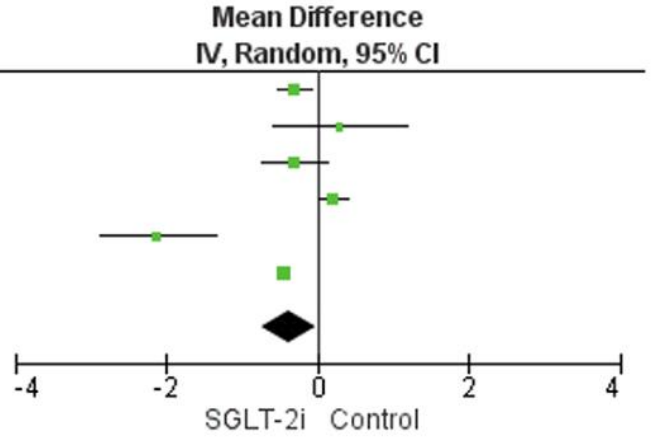
- A total of seven studies comprising 2,713 patients were included in this analysis. Regarding the efficacy of SGLT-2 inhibitors on metabolic profiles, the reduction of 0.37% in HbA1c levels compared to the control group aligns with previous meta-analyses.
- These findings demonstrated that SGLT-2 inhibitors are also effective when compared to standard therapies, including insulin and other oral hypoglycemic agents.

A. HbA1c

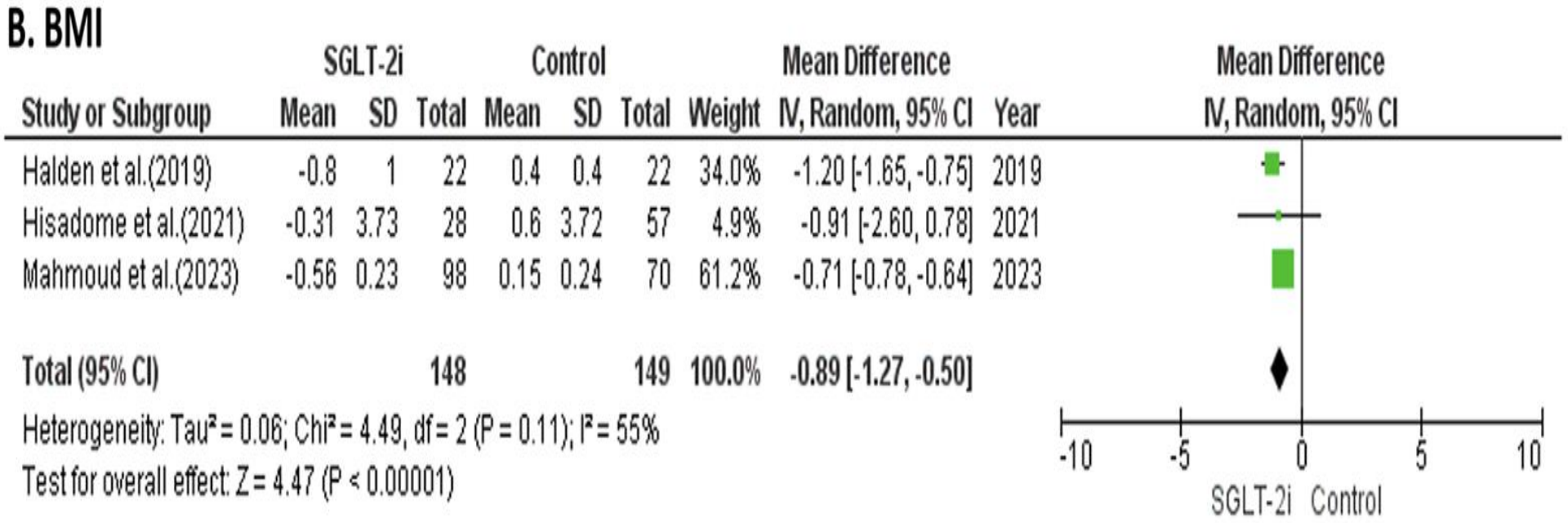
	SGLT-2i			Control				Mean Difference	
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	Year
Halden et al.(2019)	-0.2	0.4	22	0.1	0.4	22	20.1%	-0.30 [-0.54, -0.06]	2019
Schwaiger et al.(2019)	0.4	0.8	8	0.1	1.3	14	9.5%	0.30 [-0.58, 1.18]	2019
Hisadome et al.(2021)	-0.1	1	28	0.2	0.9	57	16.6%	-0.30 [-0.74, 0.14]	2021
Lim et al.(2022)	0.1	1.4	226	-0.1	1.3	1857	20.7%	0.20 [0.01, 0.39]	2022
Demir et al.(2023)	-1.35	1.94	36	0.77	1.01	21	11.0%	-2.12 [-2.89, -1.35]	2023
Mahmoud et al.(2023)	-0.4	0.06	98	0.05	0.01	70	22.0%	-0.45 [-0.46, -0.44]	2023
Total (95% CI)			**418**			**2041**	**100.0%**	**-0.37 [-0.73, -0.01]**	

Heterogeneity: Tau² = 0.15; Chi² = 66.90, df = 5 (P < 0.00001); I² = 93%

Test for overall effect: Z = 2.03 (P = 0.04)



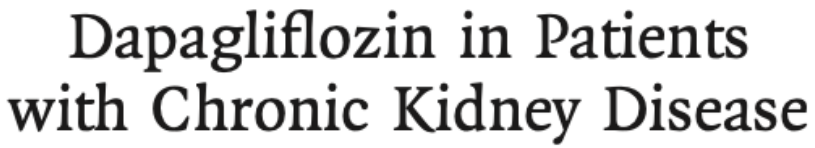
- This meta-analysis showed that SGLT-2 inhibitors also benefit BMI, with a significant reduction of 0.89 kg/m2 compared to the control.



❖ Decrease cardiovascular Disease


Empagliflozin in Patients with Chronic Kidney Disease

The EMPA-KIDNEY Collaborative Group*


Dapagliflozin in Patients with Chronic Kidney Disease

- The EMPA-KIDNEY trial, and DAPA-CKD trial, which included CKD patients with eGFR as low as 20 and 25 mL/min/1.73 m2, demonstrated a significant reduction in CV death: 16% with empagliflozin and 31% with dapagliflozin over a 2-year follow-up period. This benefit was consistent across a range of eGFR levels, though KTRs were not included in these trials group.

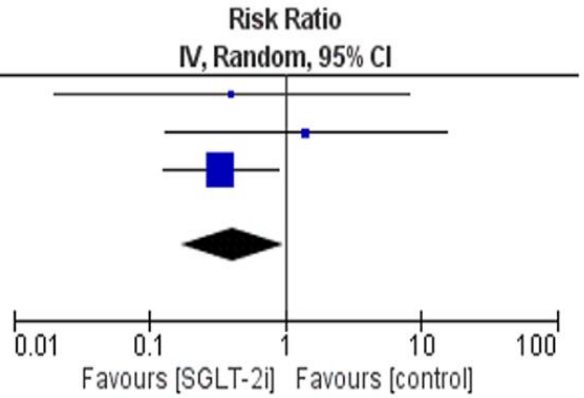
- Given that KTRs have a significant elevated risk of CV death, 10 to 20 times higher than the general population,SGLT-2 inhibitors have been proposed as a new hope in this population.

- This meta-analysis reveals that SGLT-2 inhibitors significantly reduce mortality and cardiovascular risk.

B. CVD

Study or Subgroup	SGLT-2i Events	SGLT-2i Total	Control Events	Control Total	Weight	Risk Ratio IV, Random, 95% CI	Year
Hisadome et al.(2021)	0	28	2	57	8.4%	0.40 [0.02, 8.06]	2021
Mahmoud et al.(2023)	2	98	1	70	13.3%	1.43 [0.13, 15.45]	2023
Lim et al. (2024)	5	127	15	127	78.3%	0.33 [0.12, 0.89]	2024
Total (95% CI)		**253**		**254**	**100.0%**	**0.41 [0.17, 0.98]**	
Total events	7		18				

Heterogeneity: Tau² = 0.00; Chi² = 1.23, df = 2 (P = 0.54); I² = 0%
Test for overall effect: Z = 2.01 (P = 0.04)

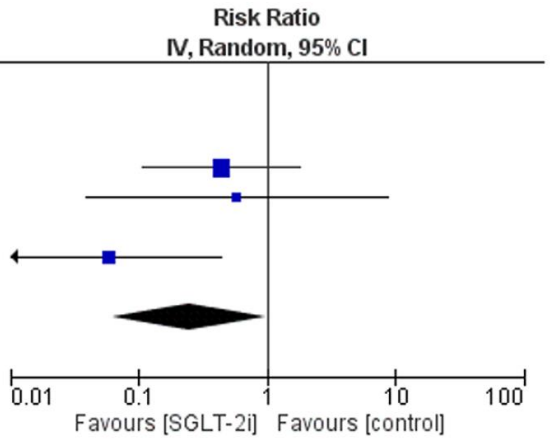


CVD, cardiovascular disease

A. Mortality

Study or Subgroup	SGLT-2i Events	SGLT-2i Total	Control Events	Control Total	Weight	Risk Ratio IV, Random, 95% CI	Year
Halden et al.(2019)	0	22	0	22		Not estimable	2019
Schwaiger et al.(2019)	0	8	0	14		Not estimable	2019
Hisadome et al.(2021)	0	28	0	57		Not estimable	2021
Lim et al.(2022)	2	226	37	1857	47.9%	0.44 [0.11, 1.83]	2022
Demir et al.(2023)	1	36	1	21	20.3%	0.58 [0.04, 8.85]	2023
Mahmoud et al.(2023)	0	98	0	70		Not estimable	2023
Lim et al. (2024)	1	127	17	127	31.8%	0.06 [0.01, 0.44]	2024
Total (95% CI)		**545**		**2168**	**100.0%**	**0.25 [0.06, 0.98]**	
Total events	4		55				

Heterogeneity: Tau² = 0.51; Chi² = 3.01, df = 2 (P = 0.22); I² = 33%
Test for overall effect: Z = 1.99 (P = 0.05)

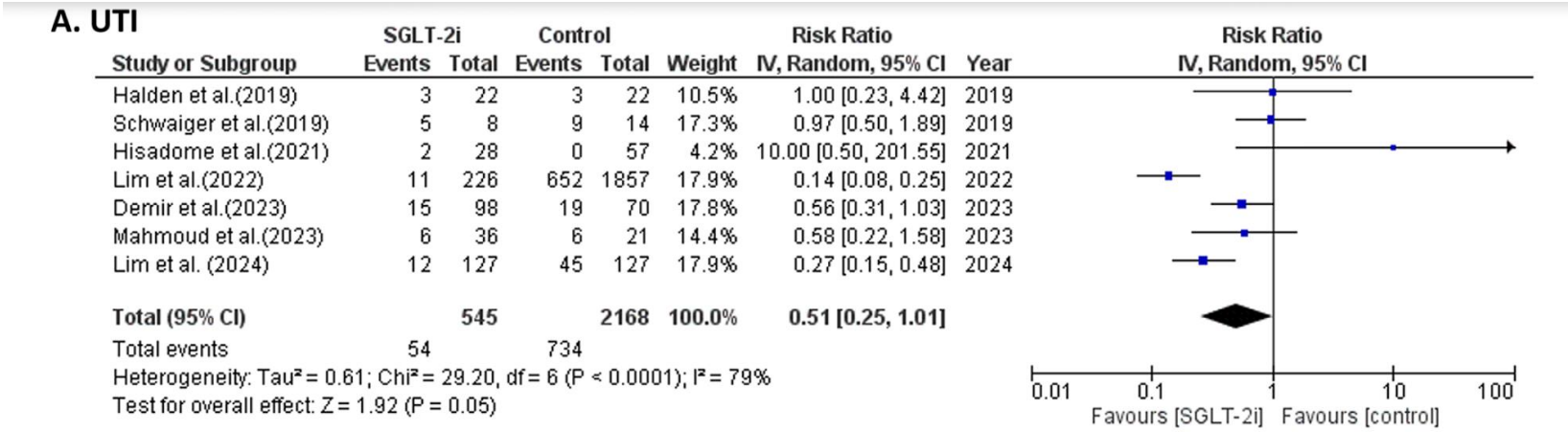


❖ UTI, Urosepsis, Genital Infection

Urinary tract and genital infections in patients with type 2 diabetes treated with sodium-glucose co-transporter 2 inhibitors: A meta-analysis of randomized controlled trials (2016)

- A total of 52 RCTs involving 36 689 patients were eligible for our meta-analysis. The study found that canagliflozin, dapagliflozin and empagliflozin were associated with a significantly higher risk of genital infections compared with placebo and other active treatments.
- Only dapagliflozin had a dose–response relationship with UTIs and genital infections.

- The recent meta-analysis observed that SGLT-2 inhibitors did not increase risk of serious infection, including UTIs, genital mycotic infection, and urosepsis, compared to the control group.
- In our analysis, only 20.6% of cases was prescribed with dapagliflozin. The overall infection rate of SGLT-2 inhibitors was comparable to that of the control group. Importantly, our study did not find an increase rate of genital infection with SGLT-2 inhibitors, unlike in non-transplant population. This may be attributed to the effective routine post-transplant screening, care, and patient education in transplant clinics.

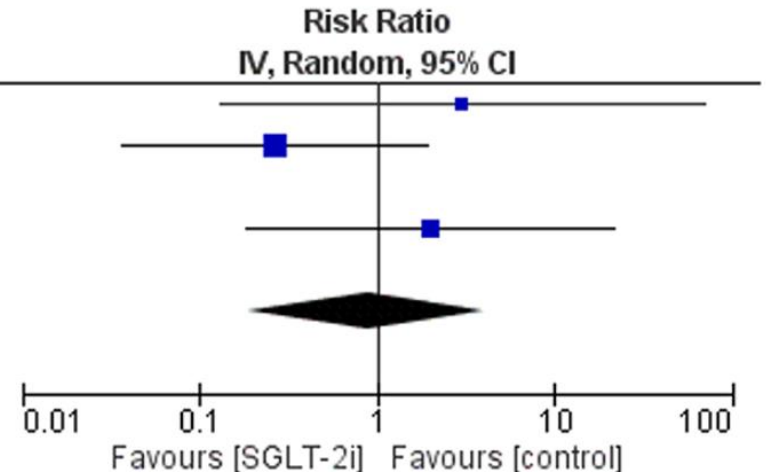


B. Genital Mycotic Infection

Study or Subgroup	SGLT-2i Events	SGLT-2i Total	Control Events	Control Total	Weight	Risk Ratio IV, Random, 95% CI	Year
Halden et al.(2019)	1	22	0	22	21.1%	3.00 [0.13, 69.87]	2019
Lim et al.(2022)	1	226	31	1857	45.1%	0.27 [0.04, 1.93]	2022
Demir et al.(2023)	0	36	0	21		Not estimable	2023
Lim et al. (2024)	2	127	1	127	33.8%	2.00 [0.18, 21.78]	2024
Total (95% CI)		**411**		**2027**	**100.0%**	**0.88 [0.19, 4.08]**	
Total events	4		32				

Heterogeneity: Tau² = 0.34; Chi² = 2.43, df = 2 (P = 0.30); I² = 18%

Test for overall effect: Z = 0.17 (P = 0.87)

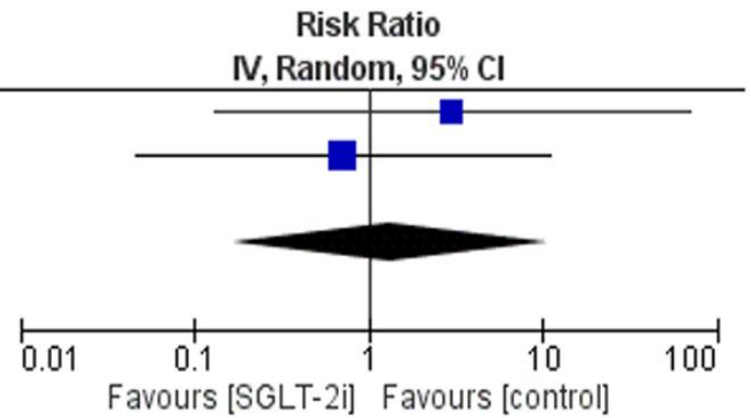


C. Urosepsis

Study or Subgroup	SGLT-2i Events	SGLT-2i Total	Control Events	Control Total	Weight	Risk Ratio IV, Random, 95% CI	Year
Halden et al.(2019)	1	22	0	22	43.4%	3.00 [0.13, 69.87]	2019
Mahmoud et al.(2023)	1	98	1	70	56.6%	0.71 [0.05, 11.23]	2023
Total (95% CI)		**120**		**92**	**100.0%**	**1.33 [0.17, 10.58]**	
Total events	2		1				

Heterogeneity: Tau² = 0.00; Chi² = 0.45, df = 1 (P = 0.50); I² = 0%

Test for overall effect: Z = 0.27 (P = 0.79)



Safety of sodium-glucose cotransporter 2 inhibitors in kidney transplant recipients with diabetes mellitus

Talia Diker Cohen [a,b,1,*], Amir Polansky [a,b,1], Idan Bergman [b,c], Gida Ayada [d,e], Tanya Babich [b,f], Amit Akirov [a,b], Tali Steinmetz [b,g], Idit Dotan [a,b]

[a] *Institute of Endocrinology, Diabetes and Metabolism, Rabin Medical Center, Beilinson Hospital, Petah Tikva, Israel*

Diabetes and Metabolism 51 (2025) 101627

- Two hundred forty individuals using SGLT2i (median age 63, 20 % female) were matched with non-users.
- we observed a transient small decrease in eGFR starting approximately 1.5 months after initiating SGLT2i treatment (eGFR dip), followed by subsequent recovery.

- our study found that diabetic KTR using SGLT2i had a lower likelihood of hospital admission due to UTIs. our findings suggest that these medications do not appear to increase UTI risk in the KTR population, particularly when patients are carefully selected and monitored.

- We also observed a reduction in HbA1c in SGLT2i users; however, there was no significant decrease in BMI.

❖ DKA

- DKA is one of the most serious acute metabolic complications of DM. It occurs as a consequence of severe absolute or relative insulin deficiency, which results in a low glucose uptake in insulin-dependent tissues (muscle, liver and fat)

- Sodium/glucose co-transporter-2 inhibitor (SGLT2-i) drugs have been associated with the occurrence of a particular type of DKA defined as euglycemic (euDKA), characterized by glycemic levels below 300 mg/dL.

- Even the etiopathogenetic mechanism of euDKA in patients taking an SGLT2-i is not fully understood yet, although an important role is surely played by precipitating factors, such as infections, concurrent pathologies, the post-operative stage, a reduction in caloric and/or fluid intake, alcohol abuse, a low-carbohydrate diet and a significant reduction in the daily insulin dose.

Comparison of the incidence of DKA with SGLT2-i vs. placebo in major randomized controlled trials

TRIAL	SGLT2-i	Incidence in SGLT2-i Groups	Incidence in Placebo Groups	Hazard Ratio (95% CI)	*p* Values
EMPAREG-OUTCOME	Empagliflozin 10 mg Empagliflozin 25 mg	1/2345 (<0.1%) 3/2342 (0.1%)	1/2333 (<0.1%)	—	NS
EMPEROR-Preserved	Empagliflozin 10 mg	4/1465 (0.3%)	5/1471 (0.3%)	—	—
EMPA-KIDNEY	Empagliflozin 10 mg	6/3304 (0.2%) 0.09/100 patients-yr	1/3305 (<0.1%) 0.02/100 patients-yr	—	—
DECLARE-TIMI 58	Dapagliflozin 10 mg	27/8574 (0.3%)	12/8569 (0.1%)	2.18 (1.10–4.30)	0.02
DAPA-HF	Dapagliflozin 10 mg	3/2373 * 0.1/100 patients-yr	0/2371	—	—
DELIVER	Dapagliflozin 10 mg	0/3132	2/3131 (<0.1%)	—	—
DAPA-CKD	Dapagliflozin 10 mg	0/2149	2/2149 (<0.1%)	—	0.5
CANVAS	Canagliflozin 100 mg Canagliflozin 300 mg	0.6/1000 patients-yr	0.3/1000 patients-yr	2–33 (0.76–7.17)	0.14
CREDENCE	Canagliflozin 100 mg	11/2200 2.2/1000 patients-yr	1/2197 0.2/1000 patients-yr	10.8 (1.39–83.65)	NA **
VERTIS-CV	Ertugliflozin 5 mg Ertugliflozin 15 mg	7/2746 (0.3) 12/2747 (0.4)	2/2745 (0.1)	—	—

Ketoacidosis and SGLT2 Inhibitors: A Narrative Review

From the data reported in clinical trials and observational studies, the incidence seems to be relatively low, on the other hand the use of these drugs is rapidly increasing worldwide, Therefore, it is essential that both physicians and patients are aware of the relatively small risk of euDKA associated with the use of SGLT2i as well as the main predisposing factors and its heterogeneous clinical presentation.

- Although rare, euDKA is a life-threatening complication. Therefore, it is important to spread knowledge of the risk of euDKA and its correct clinical approach, which involves the suspension of SGLT2i treatment, insulin infusion and an adequate intake of fluids in the presence of symptoms/signs of hyperketonemia, to avoid its evolution towards more severe forms.Thus, a timely diagnosis is essential.

- The recent meta analysis by Kanachai Boonpiraks demonstrated that SGLT-2 inhibitors did not increase the risk of DKA and graft rejection. Therefore, our findings shed new light on the safety profile of SGLT-2 inhibitors in kidney transplant recipients.
- In other meta analysis byApi Chewcharat et al, didn’t report serious adverse events, including euglycemic ketoacidosis and acute rejection.

Use Of SGLT2 Inhibitors In Non Diabetic KT?

- For many years, the only therapeutic strategy available for managing proteinuric kidney disease in both native and kidney transplant recipients (KTRs) has been renin-angioten-sin-aldosterone system blockade agents.

- However, in the last few years, sodium-glucose cotransporter-2 inhibitors (SGLT2is) have demonstrated a clear kidney-protective effect by delaying the progression of both diabetic and nondiabetic proteinuric chronic kidney disease (CKD) through a reduction in albuminuria.

Use of SGLT2i in Non-Diabetic Kidney Transplant Recipients

Aina Quilis[a*], Eva Gavela[a], Julia Kánter[a], Cristina Castro-Alonso[a], Emma Calatayud[a,b], Elena Vivó [a], Manuel Parra[a], Paula Gandia[a], and Asunción Sancho[a,b,c]

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Spain 2024

- We included 22 patients (68.2% men), median age 58 years, with a median post-transplant period of 67 months.
- After a 6-month follow-up period, the introduction of SGLT2i

as the antiproteinuric agent resulted in a signi cant reduction in proteinuria in non-diabetic KTRs.

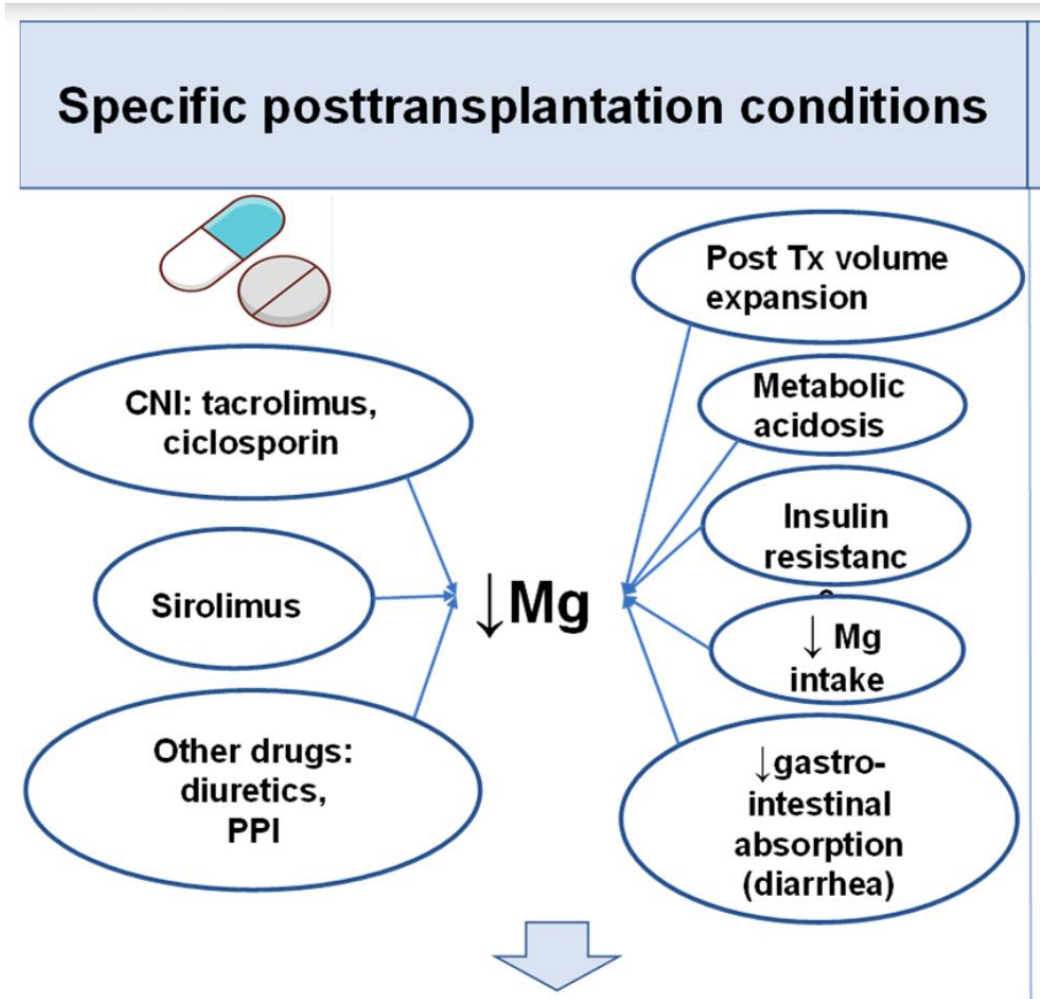
- The use of SGLT2i has been effective as an antiproteinuric

treatment in nondiabetic kidney transplant recipients who

develop proteinuria during follow-up, with an acceptable safety

Mg and SGLT 2 Inhibitors

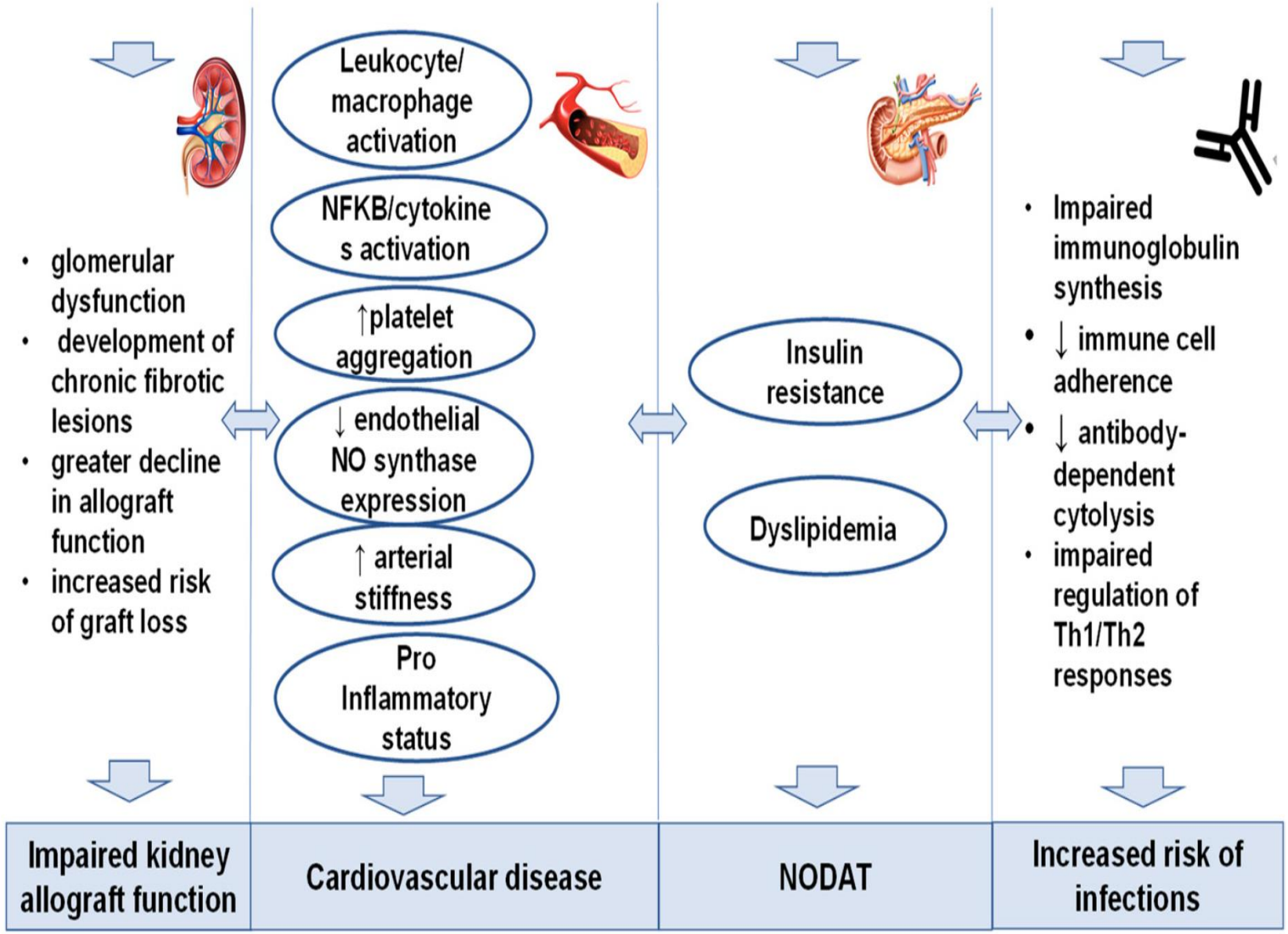
- Mg2+ is crucial for maintaining cardiac excitability, regulating blood pressure, preserving bone integrity, supporting glucose and insulin metabolism, and modulating the immune system .
- Hypomagnesemia is a frequent electrolyte imbalance in kidney transplant recipients (KTRs), often attributed to calcineurin inhibitor (CNi) therapy, and tacrolimus in particular ; chronic diarrhea, which is a common adverse effect of mycophenolate, can lead to low magnesium absorption; tubular atrophy and concomitant use of diuretics.



The Impact of Hypomagnesemia on the Long-Term Evolution After Kidney Transplantation

The Impact of Hypomagnesemia after Kidney Transplantation

- Sodium-glucose cotransporter type 2 inhibitors (SGLT2i) have shown an additional beneficial effect on serum Mg2+ levels in CKD patients



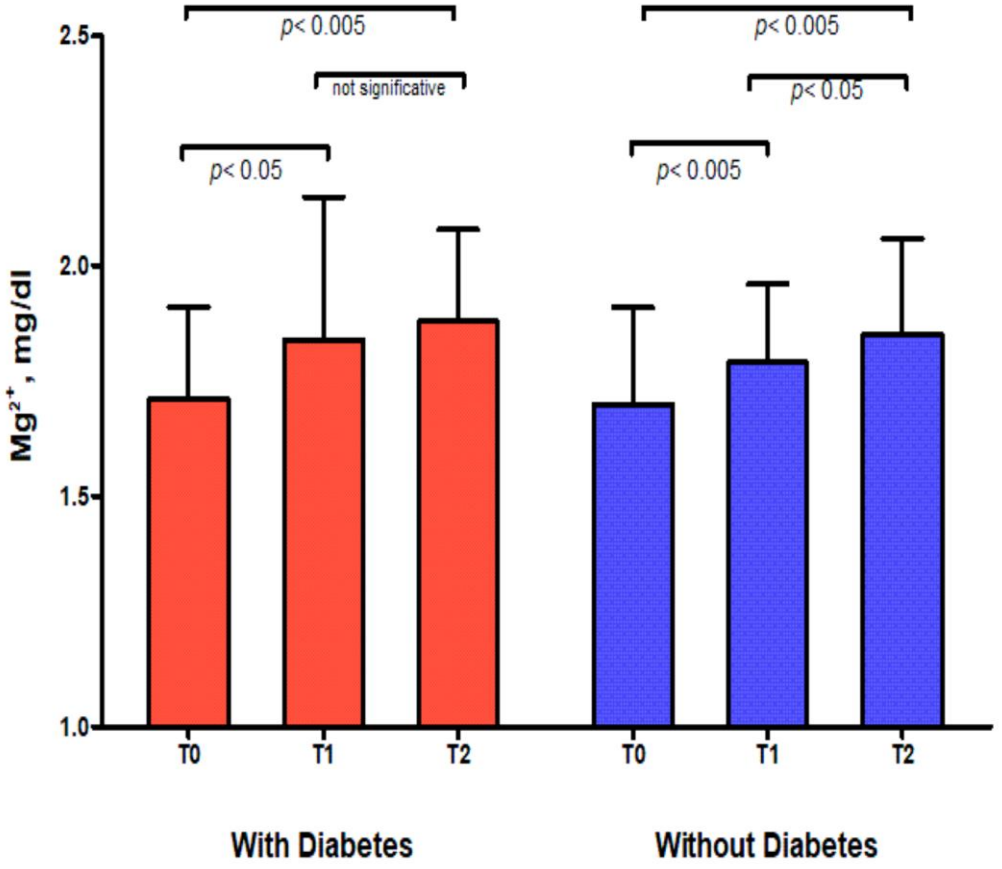
The Impact of Hypomagnesemia on the Long-Term Evolution After Kidney Transplantation, 2024

Impact of SGLT2 Inhibitors on Magnesium in Kidney Transplant Patients with and Without Diabetes

Italy2025

Carmine Secondulfo [1], Nicoletta Vecchione [2], Dora Russo [2], Sarah Hamzeh [2], Candida Iacuzzo [3],

SGLT2i are effective at increasing the serum magnesium levels during a 6-month treatment period in kidney transplant recipients both with and without diabetes, offering an additional but critical benefit, while simultaneously offering renal and cardiovascular benefits.



Thanks