Dysglycemia, diabetes, and clinical outcomes in renal transplantation patients

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Background

- Postoperative hyperglycemia is a common condition in renal transplant patients.
- Factors such as high stress perioperative environment, calcineurin inhibitor exposure, changes in insulin degradation and excretion via the transplanted kidney, and the use of high dose glucocorticoids contribute to postoperative hyperglycemia.
- Hyperglycemia and diabetes mellitus (DM) increase the risk for infection, organ rejection, cardiovascular risk, and all cause mortality in solid organ transplant patients.[1, 2, 3]

Objective

Hypothesis: proper glycemic control in the immediate peri-transplant period is associated with lower risk of organ rejection, readmission, and infection.

Aim 1: To describe the degree and prevalence of hyperglycemia and hypoglycemia perioperatively in patients undergoing renal transplantation.

Aim 2: To determine whether there is an association between perioperative hemoglobin A1c, any hospital hypoglycemia (blood glucose <70mg/dL) and/or any hyperglycemia (blood glucose ≥180mg/dL) immediately following renal transplantation with organ rejection, readmission, or infection.

Aim 3: To characterize the antihyperglycemic strategy utilized in patients with or without diabetes undergoing renal transplantation in the perioperative period.

Methods

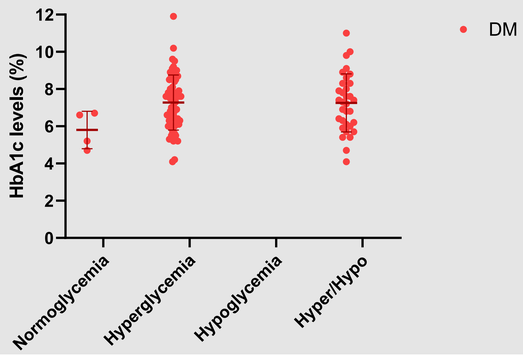
- Data from adult patients 18+ admitted to University of Colorado Hospital (UCH) for renal transplantation between January 1, 2019 and December 31, 2019 were used in this study.
- Retrospective chart review collected demographic data, history of diabetes, HbA1c, type of transplant, blood glucose throughout stay, need for IV insulin, length of stay, 30-day readmission, graft failure/rejection within the first 30 days after transplant, hospital-acquired infection, transfer to the ICU, reintubation, discharge diabetes regimen, and GMT consult.

Demographics

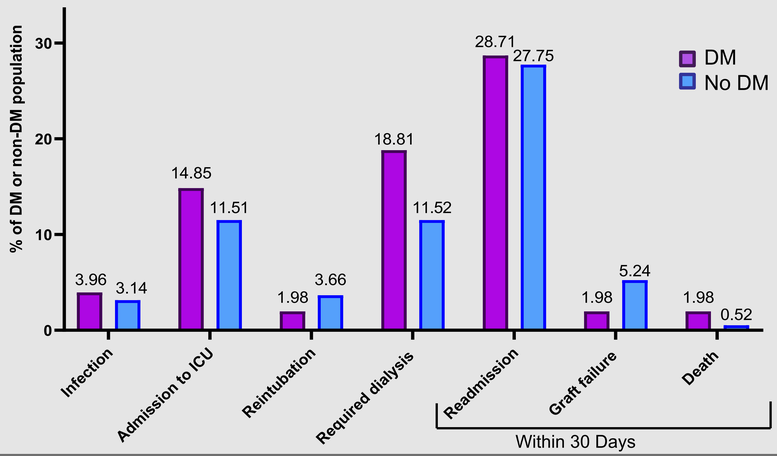
	Total Sample n=292	PMH of DM n= 101 (34.6%)	No PMH of DM n=191 (65.2%)
Mean age (years)	48.6±14.2	53.4±10.9 CI 95%=51.2-55.5	47.2±15.2 CI 95%=45.0-49.4
Average BMI (kg/m²)	27.1	28.5±5.6 CI 95% = 27.2-29.8	26.3±5.1 CI95% = 25.6-27.0
Sex n (%)			
Male	184 (63.0)	76 (75.2)	108 (56.5)
Race n (%)			
Caucasian	207 (70.9)	61 (60.4)	146 (76.4)
Black/African American	28 (9.6)	15 (14.9)	13 (6.9)
Other	56 (19.1)	25 (24.7)	31 (16.2)

Results

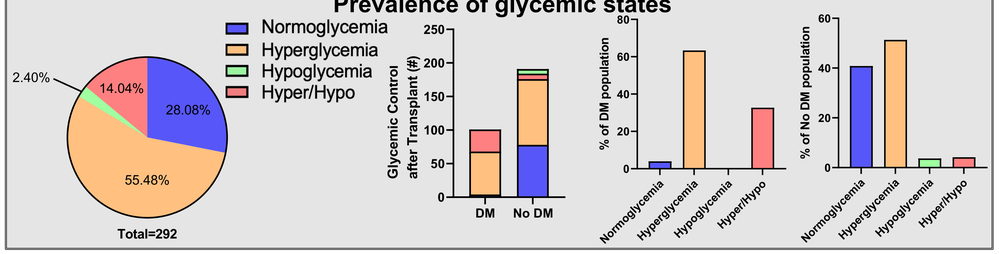
Variation of HbA1c by glycemic status while hospitalized for patients with DM



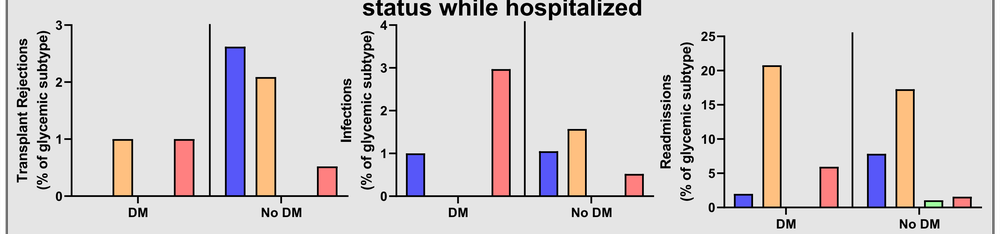
Clinical Outcomes for renal transplant patients with DM or no DM



Prevalence of glycemic states



Prevalence of clinical outcomes stratified by glycemic status while hospitalized



Renal Graft Characteristics

	Total Sample (n=292)	PMH of DM (n= 101)	No PMH of DM (n=191)
Kidney Donor Type, n (%)			
Deceased	176 (60.3)	69 (68.3)	107 (56.0)
Living, non-related	87 (29.8)	27 (26.7)	60 (31.4)
Living, related	29 (9.9)	5 (5.0)	24 (12.6)
Cause of ESRD, n (%)			
DM	90 (30.8)	90 (89.1)	0 (0)
Non-DM	202 (69.2)	11 (10.9)	191 (100)
Average Length of Stay	4.2 days	4.5 days CI 95% = 4.5±0.441	4.0 days CI 95% = 4.037±0.327

Discussion

- 69.5% of the renal transplant population was hyperglycemic on at least one postoperative day
- Hyperglycemia during hospitalization correlates with higher rates of readmission and hospital acquired infection
- HbA1c is a less accurate measure in ESRD but was lower in those who were normoglycemic and higher in those experiencing hyperglycemia
- A higher percentage of patients with DM experienced infection, admission to the ICU, dialysis during admission, 30-day readmission, and death within 30 days as compared to patients without DM while the reverse was true for reintubation, and 30-day graft failure.

Conclusions

- Any hyperglycemia during hospitalization was associated with higher rates of hospital acquired infections and 30-day readmissions
- Further analysis are planned to evaluate insulin dosing strategies in this population

Reference

1. Cosio FG, Kudva Y, van der Velde M, Larson TS, Textor SC, Griffin MD, Stegall MD. New onset hyperglycemia and diabetes are associated with increased cardiovascular risk after kidney transplantation. *Kidney Int* 2005;67(6):2415-2421.
2. Valderhaug TG, Hjelmesæth J, Hartmann A, Røislien J, Bergrem HA, Leivestad T, Line PD, Jenssen T. The association of early post-transplant glucose levels with long-term mortality. *Diabetologia* 2011;54: 1341-1349.
3. Mateo R, Gupta S, Wallia A, Cameron C, Schmidt K, Oakes DJ, Aleppo G, Andrei A-C, Wilcox JE, Grady K, Gordon R, Molitch ME. Relationship Between Hyperglycemia and Heart Transplant Rejection. *Transplantation Proceedings* 2015;47:2727-2731.