

## Association between Ringer's Lactate solution and hyperkalemia in patients with reduced kidney function.

María Alejandra Arroyo Vélez, MD; Irelis Gabriela Navarro Escalera, MD; Natividad Rodríguez Vargas, MD;

Bryan Vega Sanabria, MS4; Eric Graulau Rivera, MS4; Brenda Orta Cardona, MD

Mayagüez Medical Center, Family Medicine Residency Program

IRB PROTOCOL NO: 2311173392

### INTRODUCTION

- During hospitalization, the use of crystalloid solutions such as Normal Saline and Ringer's Lactate are very common for hydration.
- Emerging evidence supports the superiority of balance crystalloids such as Ringer's Lactate compared to normal saline.
- Although Ringer's Lactate inherently contains potassium, there exist a paucity of evidence to suggest that Ringer's Lactate could potentiate hyperkalemia, especially in patients with reduced kidney function, since their potassium handling mechanism is already impaired. Therefore, concerns of hyperkalemia has limited its use.

### OBJECTIVES

- This study has the goal of determining if there is an association between the use of Ringer's Lactate IV solution and the development of hyperkalemia in patients who have reduced kidney function defined as GFR <30ml/min.

### METHODS

- This was a retrospective cohort study, based on a record review of admitted patients in MMC Hospital from January to May 2023 who met inclusion and exclusion criteria.
- Inclusion Criteria:** Patients aged  $\geq 21$  years, who have a GFR <30 ml/min.
- Exclusion Criteria:** Patients with hyperkalemia upon admission, without laboratory results necessary for the study, or patients currently on hemodialysis.
- Relative Risk of hyperkalemia was estimated with its 95% Confidence Interval. Results were considered statistically significant with a p-value < 0.05.

### RESULTS

- Of 804 records of patients with chronic kidney disease, only 138 patients met inclusion and exclusion criteria.
- The mean age of the study group was 74.6 years old. (Range: 46-105; Median: 76.5, SD=11.4)

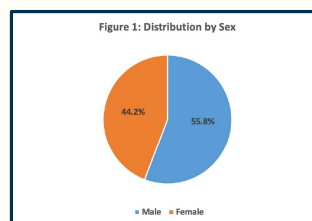


TABLE 1: PREVALENCE OF MEDICAL CONDITIONS

Medical condition	n (%)
Cancer	5 (3.6)
Diabetes Mellitus	90 (63.2)
Arterial Hypertension	124 (89.9)

TABLE 2: PREVALENCE OF USE OF MEDICATIONS

Medication	n (%)
ACE Inhibitor	24 (17.4)
Angiotensin receptor blocker	55 (39.9)
Diuretic	75 (54.3)

TABLE 3: RESULTS OF LABORATORY VALUES

Laboratory Test	Mean	Median	Range	SD
Admission Creatinine (mg/dL)	2.92	2.56	1.05, 12.72	1.58
Admission Potassium (mEq/L)	4.28	4.38	2.70, 5.30	0.54
Highest Potassium level (mEq/L)	4.99	4.93	3.50, 8.70	0.84

- The length of stay varied from 1 to 78 days of admission. The mean length of stay was 10.5 days, and the median 6.0.

### RESULTS

TABLE 4: PREVALENCE OF USE OF DIFFERENT IVF SOLUTIONS.

IV Fluid Solution	n (%)
Dextrose 5%	18 (13.1)
Normal (0.9%) Saline Solution	105 (76.1)
Saline Solution 0.45%	22 (16.1)
Ringer's Lactate	21 (15.2)

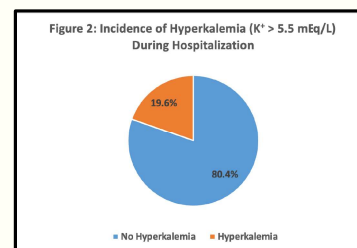


TABLE 5: COMPARISON OF SUBJECTS WITH AND WITHOUT RINGER'S LACTATE IVF.

	RL (n = 21)	No RL (n = 117)	P
Male Sex = n (%)	14 (66.7%)	63 (53.8%)	0.278
Mean Age (Years)	75.6	74.5	0.688
Mean Admission Cr (mg/dL)	3.11	2.88	0.555
Mean Admission K <sup>+</sup> (mEq/L)	4.53	4.24	0.023
Diabetes Mellitus = n (%)	11 (52.4%)	79 (67.5%)	0.181
Diuretics = n (%)	7 (33.3%)	68 (58.1%)	0.036
ACE Inhibitor or ARB = n (%)	10 (47.6%)	66 (56.4%)	0.458

TABLE 6: RISK OF HYPERKALEMIA WITH AND WITHOUT RINGER'S LACTATE IVF

	RL (n = 21)	No RL (n = 117)	RR (95% CI)
Hyperkalemia = n (%)	8 (38.1)	19 (16.2)	2.35 (1.19, 4.64)

TABLE 7: ADJUSTED RELATIVE RISK FOR THE DEVELOPMENT OF HYPERKALEMIA

Factor	HR	95% Confidence Interval
Ringer's Lactate	2.76	1.13, 6.73
Male Sex	1.73	0.75, 3.98
Admission K <sup>+</sup> level	1.70	0.76, 3.79
Diabetes Mellitus	1.27	0.54, 2.98
Diuretics	2.83	1.14, 7.02
ACE Inhibitor or ARB	0.92	0.42 to 2.00

### CONCLUSION

- Ringer's Lactate IVF is not commonly used in patients with chronic kidney disease.
- 19.6% of patients with chronic kidney disease developed hyperkalemia during admission.
- When comparing the patient's exposed to Ringer's Lactate IVF versus the ones without exposure, we saw an incidence of hyperkalemia of 38.1%.
- Incidence of hyperkalemia in patients without Ringer's Lactate exposure was 16.2%.
- There is no significant difference of age distribution, and comorbidities (diabetes, hypertension, or cancer); between patients with and without exposure to Ringer's Lactate IVF.
- The use of diuretics seems to be a significant risk factor for hyperkalemia in patients with chronic kidney disease.

### LIMITATIONS

- Ringer Lactate IVF is not commonly used in patients with chronic kidney disease, for which the sample size was small.
- Some patients used more than one IV fluids during admission.

### REFERENCES

