

INTRODUCTION

Iodinated contrast media is a crucial component in the diagnostic work up of many life-threatening illnesses.² However, it has been reported to cause acute kidney injury after administration, especially in patients with pre-existing renal disease.³ Several prophylactic treatments have been studied in hopes of minimizing these adverse events.³ The current standard of care in this patient population is prophylactic intravenous volume administration with either sodium chloride or sodium bicarbonate.¹

OBJECTIVES

To determine if prophylactic intravenous volume administration with either saline or sodium bicarbonate prior to contrast administration decreases the incidence of contrast induced acute kidney injury.

METHODS

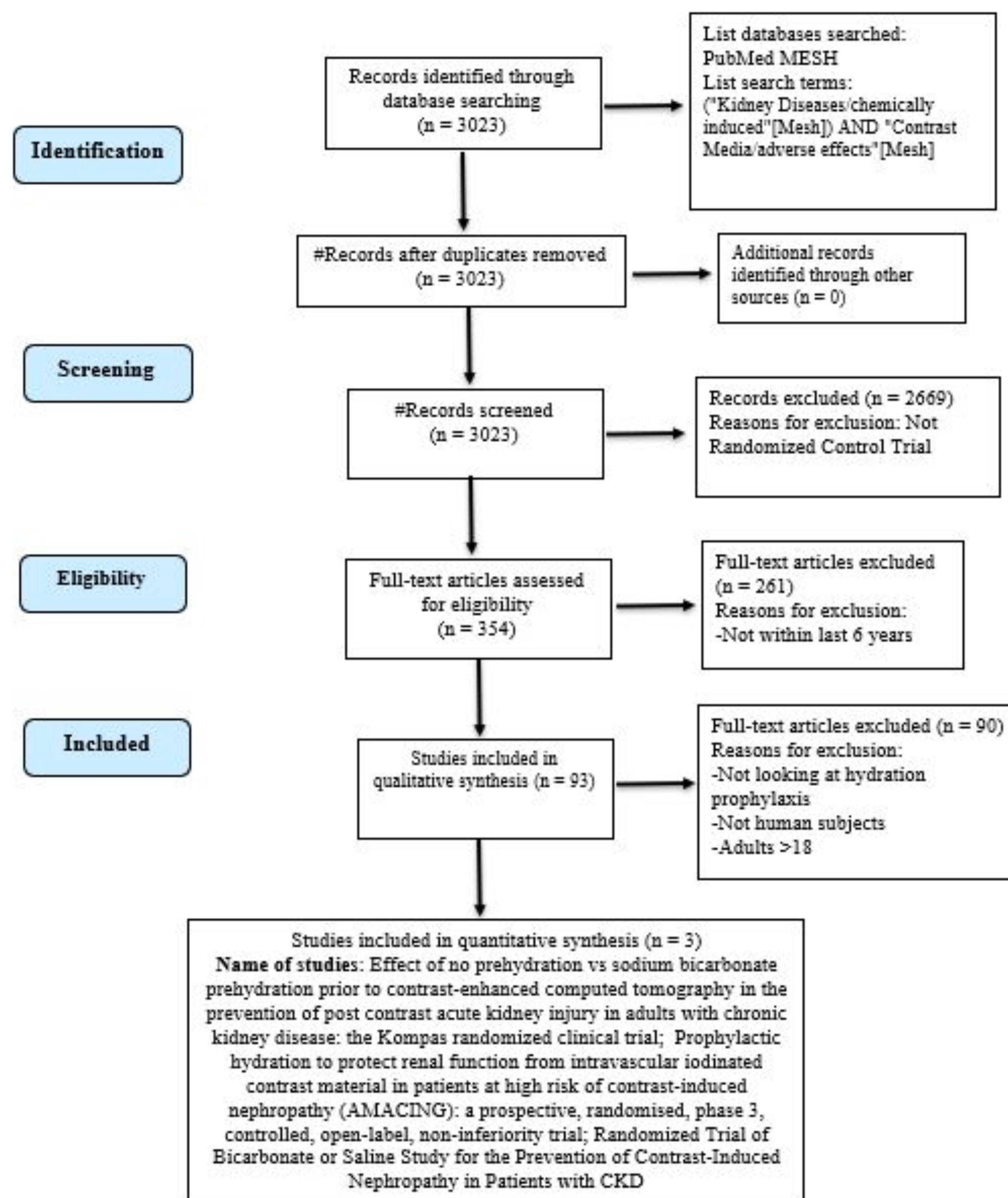


Figure 1: PRISMA flow diagram

RESULTS

Table 1. Overview of Studies

	Timal et al	Nijssen et al	Solomon et al
Patients, N	523	660	391
Gender	M - 336 (64.2%) F - 187 (35.8%)	M - 407 (61.7%) F - 253 (38.3%)	M - 225 (57.5%) F - 166 (42.5%)
Population	Male + Females >18 undergoing non-emergent CECT with CKD stage 3A and 3B in the presence of diabetes or at least 2 risk factors	Male + Females ≥ 18 undergoing elective procedure requiring contrast with eGFR = 30-59	Male + Females ≥ 18 undergoing elective coronary or peripheral angiography with eGFR < 45
Primary Outcome	% increase in baseline serum creatinine 2-5 days after contrast admin (noninferiority margin of <10%)	% increase in serum creatinine from baseline of >25% or 44 umol/L within 2-6 days of contrast exposure	Death, RRT, reduction in eGFR of ≥20% between day 30-180
Blinding	No	No	Yes
Prehydration	250mL of 1.4% sodium bicarb IV in 1hr fusion prior to CECT	0.9% NaCl 3-4 mL/kg/h IV/IA 4h before and after contrast admin (or 12h depending on protocol)	1.3% sodium bicarb (154 mEq/L) 0.9% NaCl (154 mEq/L)
Results	3% ↑ no prehydration 3.5% ↑ sodium bicarb	2.6% ↑ no prehydration 2.7% ↑ saline	14.9% bicarb 16.3% saline

Table 2. Comparison of Statistical Analysis of Studies

	Prehydration Solution	Relative Risk	95% Confidence Interval	P-Value
Study 1	1.4% sodium bicarbonate	1.7	0.5-5.9	0.36
Study 2	0.9% NaCl	1.04	-2.25 - 2.06	0.471
Study 3	1.3% sodium bicarbonate 0.9% sodium chloride	0.91	0.57-1.44	0.78

DISCUSSION

An overview of the three studies is shown in Table 1. Timal et al¹ and Nijssen et al³ had the most similar study populations, including all adults undergoing an elective procedure with an eGFR between 30-59 (CKD stage 3). Both stratified study populations based on risk factors such as diabetes, age, and cardiac disease. Primary outcomes were also similar, using an increase of serum creatinine several days after the procedure, but the percent increase of what they considered to be indicative of AKI was different, with Nijssen et al³ requiring a higher threshold than Timal et al¹. Neither of these studies were able to be blinded. Nijssen et al³ determined that in their subgroups there was no statistically significant difference with prehydration. Timal et al¹ reported similar findings, with no statistically significant interactions in the subgroups. Solomon et al⁵ differed from the other two studies, as it compared two methods of commonly used prehydration solutions, with saline being the control group. Study population also differed, with inclusion criteria of patients with lower eGFRs. It also specifically looked at contrast with elective coronary or peripheral angiography procedures while the other studies had no preference with procedure characteristics. There were multiple primary outcomes that differed, including eGFR reduction, death, and renal replacement therapy. Though double blinding was used, there were multiple issues with this study. The study was terminated prematurely, due to inadequate power from decreased enrollment, which could have caused false negatives. There was also a difference in baseline eGFR between the groups, which favored the saline group. A higher dose of sodium chloride was also given than what is typically used when comparing sodium bicarb. Despite these limitations, the study concluded that there was no statistically significant difference in incidence of AKI between sodium bicarb and saline. Though this outcome contributes to the discussion of the necessity of prehydration, it's difficult to incorporate into practice due to its low power. Further studies with adequate power are needed to confirm this finding.

CONCLUSIONS

Withholding administration of prehydration solution before the use of iodinated contrast had similar outcomes of contrast induced renal injury when compared to the use of sodium bicarbonate or sodium chloride prehydration solution. Although the three studies included in this review did not show a statistically significant difference in the incidence of AKI, the lack of uniformity of primary endpoints and prehydration protocols warrants further investigation. Further studies should be conducted with more standardized patient populations and a precise consensus of desired endpoint. No longer requiring prehydration has the potential to reduce cost and facility burden. While there are still several unanswered questions regarding the specific outcomes of renal injury after contrast use, the risk of CIAKI in patients with decreased kidney function does not appear to be any higher when prehydration is not used.

REFERENCES

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