

Tehran University of Medical Sciences
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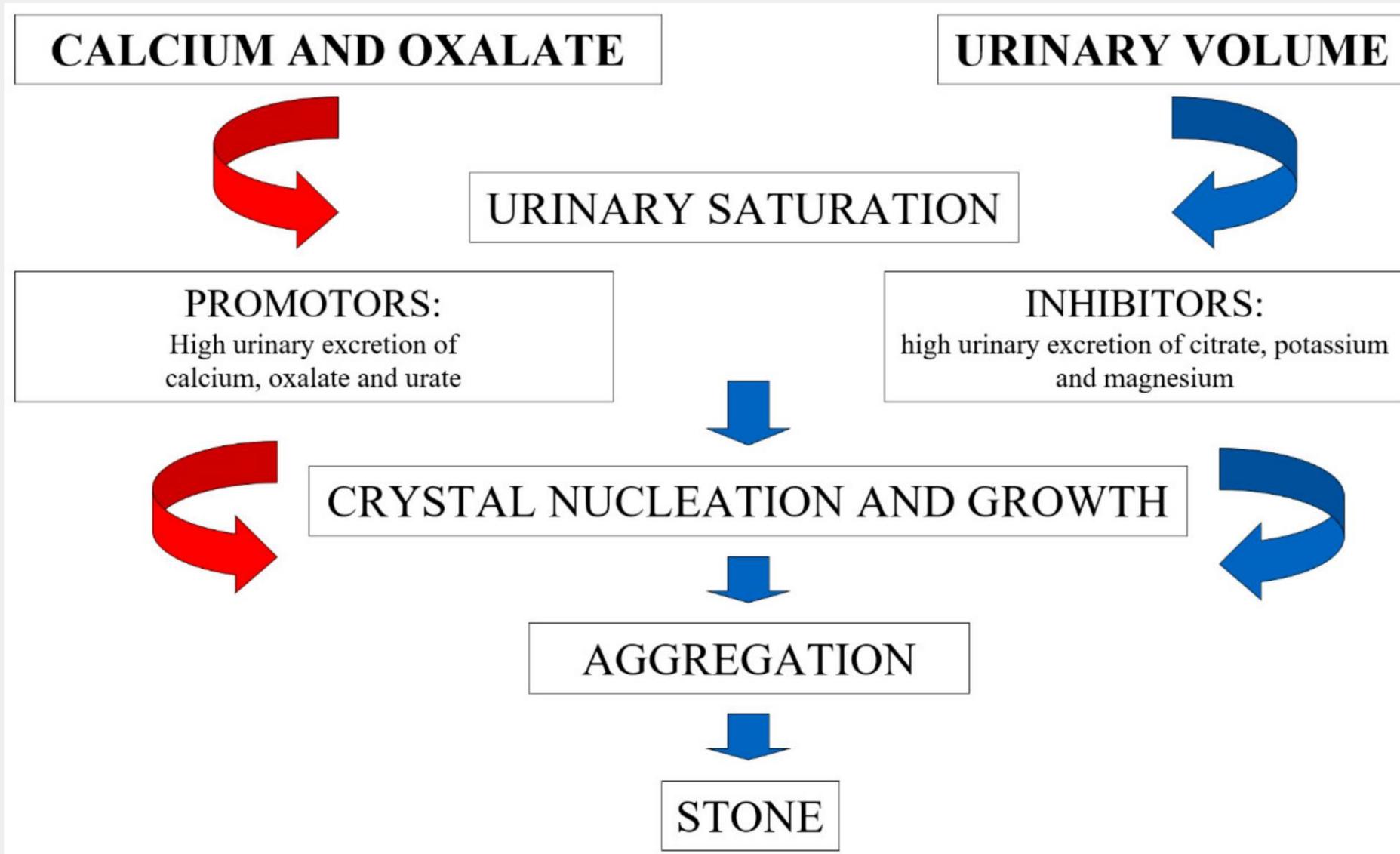
Nutritional management for kidney stones

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Introduction

- ✓ Recurrence rates after an initial symptomatic stone event are reported to be from 30–50% within 10 years of first presentation.
- ✓ The involvement of a registered dietician, in the counselling of patients with recurrent renal stones, should be incorporated into the management of these patients.
- ✓ Patients who received specific dietary recommendations had fewer stone recurrences over three years than those who only received general dietary advice.



Dietary factors and potential stone risk

Dietary Factors	Modification	Potential Stone Risk
Fluid intake	Reduction	Increased urine saturation
Sodium intake	Increase	Increased urine calcium and reduced citrate excretion
Calcium intake	Reduction	Increased urinary oxalate excretion
Meat intake	Increase	Low urine pH, increased urine calcium and reduced citrate excretion
Fruits intake	Reduction	Low urine pH and reduced citrate excretion
Diet content in oxalate foods	Increase	Increased urinary oxalate excretion

Dietary advice for single 24 h urine abnormalities

Hypercalciuria (>6.5 and 7.5 mmol/day for women and men, respectively)
Low animal protein intake (0.8–1 g/kg/day)
Low salt intake (<5 g NaCl/day)
High intake of fruits and vegetables
Hyperoxaluria (>0.5 mmol/day)
Low dietary oxalate intake
Balanced calcium intake (1.2 g/day)/calcium supplement
Hypocitraturia(<1.5 mmol/day)
Low animal protein intake (0.8–1 g/kg/day)
High intake of fruits and vegetables/potassium, citrate, and magnesium supplementation
Low urine pH/hyperuricosuria (>4.5 and 4.8 mmol/day for women and men, respectively)
High intake of fruits and vegetables/potassium, citrate, and magnesium supplementation
Low dietary purine intake
Low animal protein intake (0.8–1 g/kg/day)

Fluid intake

- ✓ Each 200 mL of fluids consumed per day, a 13% reduction in the risk of stone formation was found
- ✓ A large variety of beverages act same????

Beverage intake and potential stone risk

Beverage	Modification	ES (95%CI)
Water	Decrease	0.90 (0.84, 0.97)
Tea	Decrease	0.88 (0.79, 0.97)
Coffee	Decrease	0.82 (0.70, 0.97)
Beer	Decrease	0.6 (0.49, 0.74)
Soda	Increase	1.38 (1.26, 1.51)

Fruit Juice

- ✓ Grapefruit and apple juices seem to have no harmful effects
- ✓ Orange juice consumption have a 12% reduction in the risk of stones,
- ✓ lemonade, consisting of 120 mL of lemon juice diluted to a 2 L solution

Lemon juice or orange juice which is better for preventing kidney stone??

Recommendation for Fluid intake

All stone-formers should be counselled to achieve a daily urine output of 2.5 L/d

Calcium

Dietary calcium

Hirvonen et al, 1999

Sorensen et al, 2012

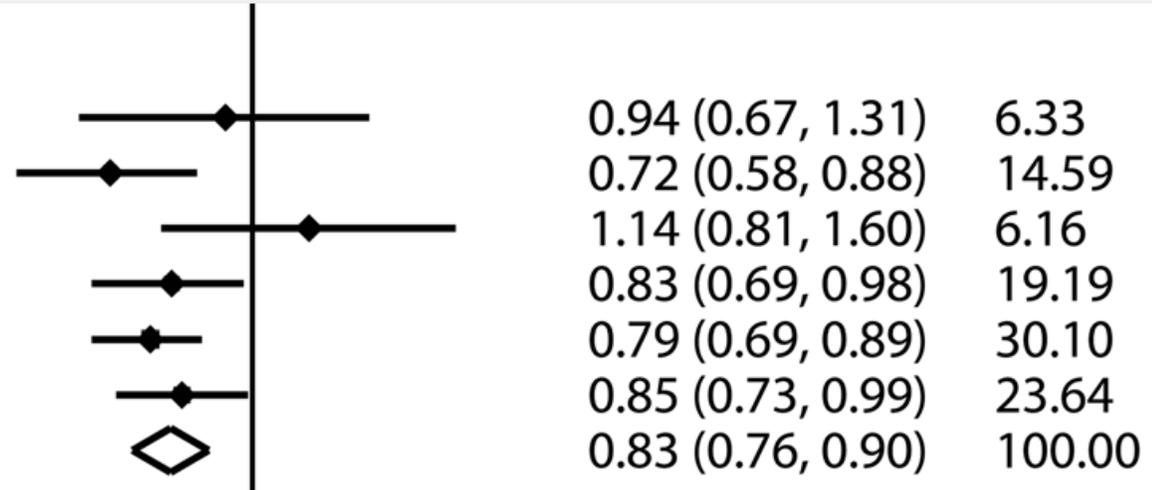
Turney et al, 2014

Ferraro et al, NHS I, 2017

Ferraro et al, NHS II, 2017

Ferraro et al, HPFS, 2017

Total (I-squared = 20.4%, p = 0.280)



Recommendation for Calcium

- ✓ The goal for dietary calcium intake should be 1000–1200 mg/day
- ✓ If calcium supplementation in a patient with calcium oxalate stone disease be required, calcium supplementation should be taken at mealtimes

Oxalate

- ✓ Oxalate is mainly found in plants, leaves, fruits, and seeds.
- ✓ Large quantities of oxalate are usually ingested every day.
- ✓ Intestinal oxalate absorption is low and highly variable (10%–15%)
- ✓ High oxalate foods include broadleaf vegetables such as spinach, green cabbage, beets, but also nuts, tea, chocolate, and rhubarb.

Oxalate

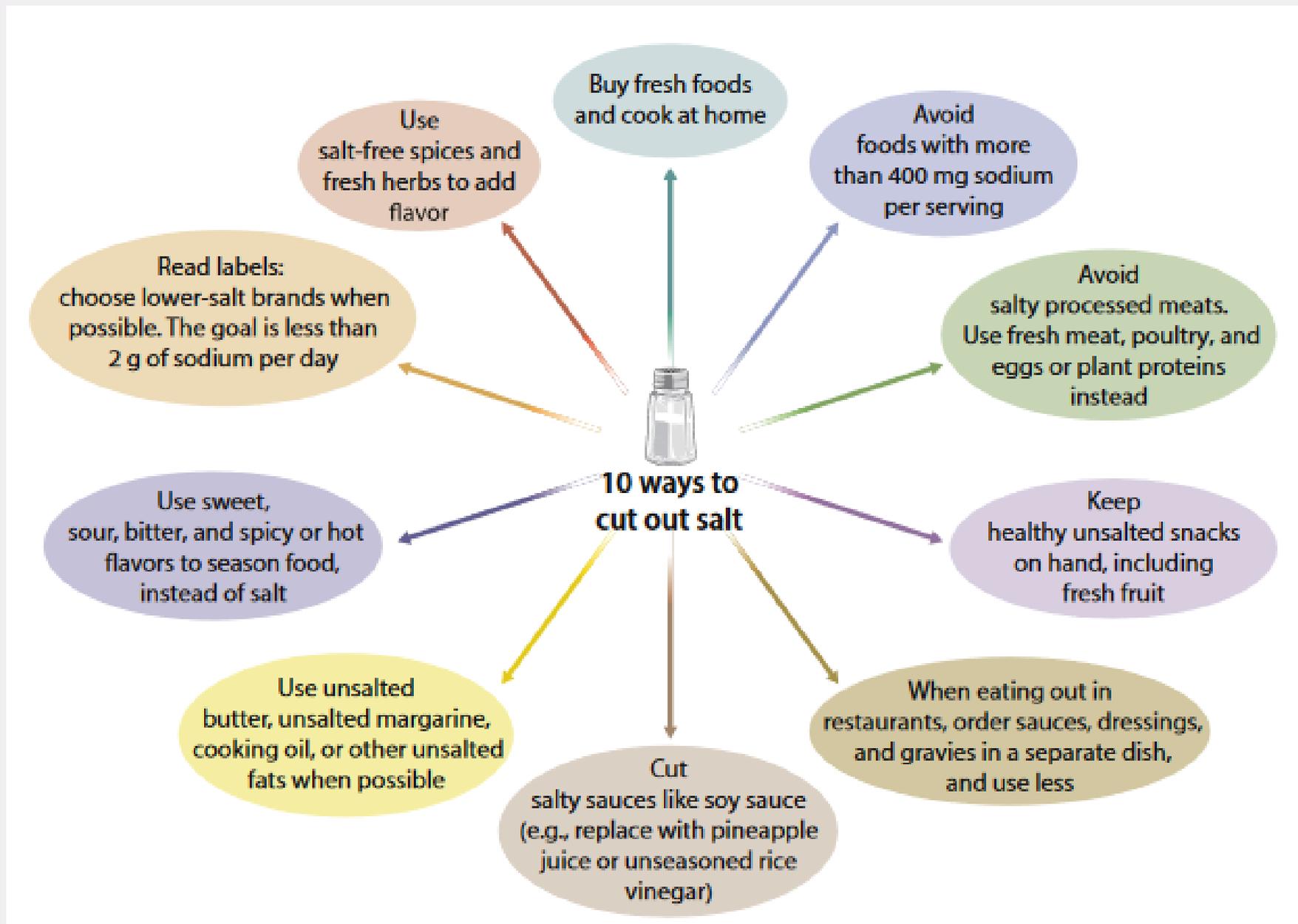
- ❑ Urinary oxalate excretion is affected by calcium intake.
- ❑ With the recommended daily dietary calcium, CaOx stone risk has been shown not to be significantly influenced, even with relatively high dietary oxalate.
- ❑ The restriction of dietary oxalate in subjects with idiopathic hyperoxaluria may not be efficacious but likely will not increase stone risk.
- ❑ Patients with IBD or who have undergone bariatric surgery, dietary oxalate restriction should be imposed in addition to higher total calcium intake at mealtime.

Recommendation

- Oxalate is anyway broadly present in foods, so it is difficult to significantly limit its intake.
- Dietary manipulation might be useful only in case of excessive intake of high-oxalate vegetables, such as spinach, chocolate, and nuts.
- Patients with hyperoxaluria and CaOx stone should consume a total calcium of 1000 to 1200 mg/day with meals.

Sodium

- ❑ A 6 g increase in daily dietary sodium chloride seems to be capable of increasing urinary calcium excretion by 40 mg/day.
- ❑ The average daily intake in an Iranian population was 10 g/day.



Recommendation

Patients with recurrent calcium nephrolithiasis should aim for sodium intake of 1500 mg daily and not exceed 2300 mg daily

Proteins of Animal and Plant Origin

- Dairy protein vs non-dairy animal protein intake
- non-dairy animal proteins (poultry, meat, fish, eggs):
 - ✓ negative calcium balance
 - ✓ low urinary pH
 - ✓ low urinary excretions of citrate, potassium, and magnesium
 - ✓ Urinary oxalate excretion

Recommendation

In patients with recurrent calcium oxalate and uric acid nephrolithiasis, moderation of animal protein intake and avoidance of purine rich foods is suggested.

The intake of dairy protein was inversely associated with incident kidney stone disease.

Citrate and Dietary Alkali Load

- ❑ Higher potential renal acid load (PRAL) of food is directly associated with calciuria, citraturia, and with increased risk of stone formation.
- ❑ Half of recurrent calcium stone formers have hypocitraturia (urinary citrate of less than 300 mg/day).
- ❑ Normal daily urinary citrate level should be more than 640 mg/day.

Citrate and Dietary Alkali Load

- ❑ Dietary potassium has a strong relationship with the incidence of nephrolithiasis.
- ❑ The origin of the potassium intake should also be considered.
- ❑ Potassium citrate, but not potassium chloride
- ❑ Dietary animal protein to potassium ratio

Recommendation

Adherence to a diet rich in fruit and vegetables, with restricted amounts of salt and animal protein could reduce the risk of kidney stone.

Vegetarian/Vegan Diets

- lacto-ovo-vegetarianism
- ovo-vegetarianism
- vegan diet

Vegetarian/Vegan Diets

Diet high in fruits and vegetables, low in animal proteins, balanced in low-fat **dairy products**, and with a reduced salt content is the best way to decrease the risk of kidney stone disease

Vitamin C

- Supplemental vitamin C at 1000 mg/day was associated with twofold increased risk of kidney stones.
- Greater than 1000 mg/day vitamin C results in 6.8 mg more oxalate in urine.

Recommendation

Vitamin C supplementation of more than 1000 mg daily is not recommended due to the associated risk of hyperoxaluria and nephrolithiasis

Conclusion

Nutrients	Recommendation
Ca	800–1,200 mg/d
Oxalate	40–50 mg/d
Na	2,000–3,000 mg/d
Protein	0.8–1.4 g/kg/d
Fluid	>2.5 L/d
Vitamin D	Low dose if vitamin D insufficiency or deficiency (1,000 IU/d)
Vitamin C	Dietary Reference Intake



Thank you!

