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Background and objectives: We previously observed associations between a Dietary Approaches to Stop Hypertension (DASH)-style diet and large reductions in kidney stone risk. This study examined associations between a DASH-style diet and 24-hour excretions of urinary lithogenic factors.

Design, setting, participants, & measurements: We studied 3426 participants with and without nephrolithiasis in the Health Professionals Follow-up Study (HPFS) and the Nurses' Health Studies (NHS) I and II. A dietary DASH score was based on seven components: high intake of fruits, vegetables, nuts and legumes, dairy products, and whole grains and low intake of sweetened beverages and red and processed meats. We used analysis of covariance to adjust for age, stone history, body size, and other factors.

Results: Comparing participants in the highest to lowest quintiles of DASH score, multivariate-adjusted urinary calcium excretion was 3% greater in HPFS (*P* trend 0.12), 10% greater in NHS I (*P* trend <0.01), and 12% greater in NHS II (*P* trend 0.05). Urinary oxalate was 4% to 18% greater (*P* trend all ≤0.03), urinary citrate was 11% to 16% greater (*P* trend all <0.01), and urinary volume was 16% to 32% greater (*P* trend all <0.001). Higher DASH score was associated with higher urine potassium, magnesium, phosphate, and pH, and lower relative supersaturations (RSS) of calcium oxalate (women only) and uric acid.

Conclusions: A DASH-style diet may reduce stone risk by increasing urinary citrate and volume. The small associations between higher DASH score and lower RSS suggest unidentified stone inhibitors in dairy products and/or plants.

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The Dietary Approaches to Stop Hypertension (DASH) diet, which is high in fruits and vegetables, moderate in low-fat dairy products, and low in animal protein represents an important potential means of kidney stone prevention. In recent prospective studies with follow-up ranging between 14 and 18 years, we examined the association between a DASH-style diet and kidney stone risk in over 240,000 participants in the Health Professionals Follow-up Study (HPFS) and the Nurses' Health Studies (NHS) I and II (1). After adjusting for age, body mass index (BMI), fluid intake, and other factors, individuals in the highest quintile of DASH score were between 40% and 45% less likely to form kidney stones than individuals in the lowest quintile (1).

Despite the marked reduction in stone risk, the effect of a DASH-style diet on many urinary lithogenic factors is unknown. For example, the higher calcium intake with a DASH-style diet would be expected to increase urinary calcium, whereas the lower animal protein and higher intake of potassium-rich foods would be expected to decrease it (2). In the initial trial evaluating the effects of the DASH diet on blood pressure, 24-hour urinary calcium was not increased compared with the control diet (3). Although the higher oxalate content of a DASH-style diet (because of higher intakes of fruits, vegetables, and nuts) would be expected to increase urinary oxalate, the higher calcium content of DASH may minimize this effect. Previous data suggest that orally administered calcium may bind oxalate in the intestinal tract, thereby reducing oxalate absorption and urinary excretion (4–6).

The effect of a DASH-style diet on relative urinary supersaturations is also uncertain. Higher consumption of fruits and vegetables may increase urinary oxalate but also increases urinary citrate, an important inhibitor of calcium stones. In one study of 12 healthy adults, dietary elimination of fruits and vegetables resulted in lower urinary oxalate but also decreased urinary citrate by 44% (7). Overall, fruit and vegetable restriction increased the urinary relative supersaturation (RSS) for calcium oxalate by 30% (7).

To examine the relation between a DASH-style diet and the 24-hour urinary excretion of lithogenic factors, we conducted a cross-sectional study of 3426 individuals with and without a history of kidney stones from the HPFS and the NHS I and II. These participants represent a subset of the study populations in which we previously reported associations between higher DASH scores and lower stone risk.

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Materials and Methods

Source Population

HPFS. In 1986, 51,529 male health professionals between the ages of 40 and 75 years enrolled in HPFS by returning an initial questionnaire that provided detailed information on medical history, lifestyle, and medications.

NHS I. In 1976, 121,700 female registered nurses between the ages of 30 and 55 years enrolled in NHS I by returning an initial questionnaire.

NHS II. In 1989, 116,430 female registered nurses between the age of 25 and 42 years enrolled in NHS II by returning an initial questionnaire.

HPFS, NHS I, and NHS II are followed by biennial mailed questionnaires that ask about lifestyle practices, other exposures of interest, and newly diagnosed diseases. The follow-up for all three cohorts exceeds 90%.

Ascertainment of Diet

To assess dietary intake, we used a semiquantitative food-frequency questionnaire (FFQ) that asked about the average use of more than 130 individual foods and 22 beverages during the previous year. The FFQ also included an open-ended section for food items not specified on the questionnaire. The intake of supplements (such as calcium) in multivitamins or isolated form was determined by the brand, type, and frequency of reported use. The baseline dietary questionnaires were completed in 1986 (HPFS), 1986 (NHS I), and 1991 (NHS II) and were updated every 4 years.

Considerable effort has been expended to confirm the validity and reliability of the dietary questionnaire in these cohorts. For example, 127 HPFS participants weighed and recorded all foodstuffs consumed over two 1-week periods (between 6 and 8 months apart). The values for individual foods and various nutrients from the food diaries were then compared with the values obtained on the questionnaire, and the results were highly correlated (8,9). Correlations were 0.88 for skim milk, 0.86 for yogurt, 0.95 for bananas, 0.76 for oranges, 0.59 for green peppers, 0.71 for tomatoes, 0.77 for bacon, 0.63 for hamburger, and 0.84 for sugar-sweetened cola (8). The correlation between total fluid intake as measured by the FFQ and 24-hour urine volume was 0.59 (10). In a similar study, dietary intake assessed by the FFQ was compared with four 7-day food records kept by a sample of 194 NHS I participants who weighed and measured everything they ate or drank. The values for individual foods and various nutrients from the food diaries were then compared with the values obtained on the questionnaire, and the results were highly correlated (11,12).

We used the FFQ to measure the dietary components of the DASH score, which was constructed according to food and nutrients emphasized or minimized in the DASH diet. This score focuses on seven components: high intake of fruits, vegetables, nuts and legumes, low-fat dairy products, and whole grains and low intake of sweetened beverages and red and processed meats (13). Because sodium was not measured well with the FFQ, we did not include sodium intake as a component in the DASH score.

We calculated each participant's DASH score using the FFQ closest in time to the urine collection. For each of the components, we classified participants into quintiles according to their intake ranking. The component score for fruits, vegetables, nuts and legumes, low-fat dairy products, and whole grains was the participant's quintile ranking (*i.e.*, quintile 1 was assigned one point and quintile 5 was assigned five points). For red and processed meats and sweetened beverages, low intake was desired: the lowest quintile was given a score of five points and the highest quintile a score of one point. We then summed up the component scores to obtain an overall DASH score ranging from 7 to 35.

Ascertainment of Other Covariates

Information on age, weight, and height was obtained on the baseline questionnaire. Self-reported weight was updated every 2 years. Self-reported weight has been validated in HPFS and NHS I (14). Information on kidney stones, hypertension, diabetes mellitus, and gout was obtained from biennial questionnaires. The validity of these self-reported diseases has been documented (15–19). Although we do not have stone composition reports from all stone formers in these cohorts, most kidney stones likely were calcium oxalate (1). Information on the use of specific medications also was obtained on biennial questionnaires. Information on family history of kidney stones was obtained in 1994 in HPFS and in 1997 in NHS II.

Urine Collections

Twenty-four-hour urine samples were collected in two cycles as part of a study to compare the urine composition of stone formers to nonformers. In the first cycle, which spanned from 1994 to 1999, we obtained one 24-hour urine collection from 1046 participants (20). The second cycle began in 2003 when we invited additional stone formers and randomly selected controls to perform two 24-hour urine collections. In the first cycle, participants were ineligible if they were >70 years of age in HPFS or >65 years in NHS I or had a history of cancer or cardiovascular disease. In the second cycle, participants were ineligible if they were older than 75 years of age or had a history of cancer (other than nonmelanoma skin cancer).

The rates of participation and completion among stone-forming and nonstone-forming participants in each cohort were reported previously (21). The 24-hour urine collection procedure used the system provided by Mission Pharmacal (San Antonio, TX) (21). The demographic characteristics and dietary intake of participants who collected urine and those who did not were similar (21).

In the study presented here, we excluded participants with missing information on diet or BMI. To remove those with likely over- or undercollections, we also excluded participants with 24-hour urinary creatinine values in the top 1% or bottom 1% of the urinary creatinine distribution of nonstone formers in each cohort. After exclusions, 1049 HPFS participants, 1277 NHS I participants, and 1100 NHS II participants provided at least one 24-hour urine collection, and 2452 participants completed two collections.

Analytic Procedures Used for the Urine Measurements

Calcium and magnesium were measured by an atomic absorption spectrophotometer. Creatinine, uric acid, citrate, and phosphorus were measured by a Cobas centrifugal analyzer. Oxalate was analyzed by ion chromatography. Sodium and potassium were determined directly by flame emission photometry. We previously sent blinded split samples to assess reproducibility; the coefficients of variation for all factors analyzed were <10%.

Statistical Analyses

In the primary analysis, we examined participants who provided a single 24-hour urine collection. If a participant submitted more than one 24-hour urine collection, we used the first sample. In secondary analyses, we studied participants who submitted two collections. Values for urinary factors were obtained by calculating the arithmetic mean of the collections.

We divided DASH score into five categories on the basis of the quintile values from our prior study (1) in which we report associations

between the seven-component DASH score without sodium and incident kidney stone formation in the larger cohorts (compared with the smaller subset of these cohorts in the study presented here). Thus, each "quintile" of DASH score in the study presented here has a median value derived from the larger cohorts and the quintiles do not contain an equal number of participants.

We calculated mean values of each 24-hour urinary factor for each quintile of DASH score. Analysis of covariance was used to adjust mean values for age, kidney stone history (yes or no), BMI, hypertension (yes or no), diabetes (yes or no), thiazide use (yes or no), menopause (yes or no; in women only), 24-hour urinary creatinine, and other factors. The Mantel extension test was used to evaluate linear trends across quintiles of DASH score.

All *P* values are two tailed. We calculated 95% confidence intervals for all estimates. Data were analyzed using SAS software, version 9.1 (SAS Institute, Inc., Cary, NC). The Institutional Review Board of Brigham and Women's Hospital approved the research protocol for this study.

Results

Characteristics of men (HPFS), older women (NHS I), and younger women (NHS II) who provided a 24-hour urine collection are displayed by quintile of DASH score in Table 1. By design, most (>60%) participants had a history of kidney stones. Participants in the highest compared with lowest quintile of DASH score were older, had lower BMI, and were less likely to have a history of hypertension. Thiazide use ranged from just over 7% in men in the lowest quintile of DASH score to just over 19% in older women in the highest quintile. Intakes of individual nutrients for each quintile of DASH score were published previously (1).

Multivariate-adjusted means of each 24-hour urinary factor by DASH score for each cohort are displayed in Tables 2 through 4. Because the multivariate relations between DASH score and each 24-hour urinary factor were similar in stone formers and nonstone formers, we combined participants with and without a history of kidney stones.

Comparing participants in the highest to lowest quintiles of DASH score, multivariate-adjusted urinary calcium was 3% greater in men (*P* for trend 0.12), 10% greater in older women (*P* for trend <0.01), and 12% greater in younger women (*P* for trend 0.05). Urinary oxalate was 18% greater in men (*P* for trend <0.01), 7% greater in older women (*P* for trend <0.01), and 4% greater in younger women (*P* for trend 0.03). Urinary citrate was 11% greater in men, 12% greater in older women, and 16% greater in younger women (*P* for trend all <0.01). Urinary volume was 16% greater in men, 28% greater in older women, and 32% greater in younger women (*P* for trend all <0.001).

Higher DASH scores also were associated with higher urine sulfate, potassium, magnesium, and pH in all three cohorts (*P* for trend all ≤0.01). In general, participants in the highest compared with lowest quintile of DASH score had higher urinary phosphate and uric acid; however, these associations were not statistically significant in every cohort. There was no association between DASH score and urinary sodium in any cohort.

Higher DASH scores were only associated with lower RSS of calcium oxalate in women. Comparing participants in the highest and lowest quintiles of DASH, the RSS of calcium oxalate was 18% lower in older women and 23% lower in younger women (*P* for trend all <0.01). Higher DASH scores were associated with lower RSS with respect to uric acid in all three cohorts. The RSS of uric acid was 16% lower in men, 33% lower in older women, and 38% lower in younger women (*P* for trend all ≤0.02). DASH scores were not associated with RSS of brushite.

Additional adjustment for family history of kidney stones (yes or no), season of urine collection, supplemental (*i.e.*, nondietary) calcium intake, fluid intake, smoking status (current, past, or never), gout (yes or no), and use of medications (including nonsteroidal anti-inflammatory drugs, postmenopausal hormones, oral contraceptives, bisphosphonates, and statins) did not materially change our results. In stratified analyses of participants with total calcium intakes above and below the median, associations between higher DASH score and urinary oxalate were similar. Finally, we observed similar relations between DASH score and urine composition among participants who submitted two 24-hour urine collections.

Discussion

We previously reported that consumption of a DASH-style diet high in fruits and vegetables, moderate in low-fat dairy products, and low in animal protein was associated with a marked decrease in the risk of incident kidney stones in three distinct cohorts (1). The study presented here, which delineates cross-sectional associations between a DASH-style diet and 24-hour urine composition in a subset of the previous study population, suggests that the reduction in stone risk was mediated, at least in part, by higher urinary citrates and greater urinary volumes. Although most kidney stones in these cohorts likely were calcium oxalate, the higher urinary pH observed with higher DASH scores also would reduce uric acid stone formation.

Despite substantially higher calcium intakes, participants with higher DASH scores had the same or only marginally higher urinary calcium than participants with lower DASH scores. It is possible that the effect of higher calcium intake on urinary calcium is offset by high intakes of potassium and alkali, factors that decrease urinary calcium excretion (2). In Meschi's study of 12 healthy adults, dietary elimination of fruits and vegetables (with constant intakes of calcium, protein, and sodium) resulted in a decrease in urinary potassium of 62%, an increase in urinary ammonium of 12%, and an increase in urinary calcium of 49% (7).

The small effect of a DASH-style diet on urinary calcium may also reflect the nonlinearity of the relation between calcium intake and urinary calcium excretion. Although the shape of the calcium intake/urinary calcium curve at typical levels of calcium intake remains incompletely defined, the existence of a "plateau effect" for intestinal calcium absorption is well established (22–24). For example, in a study of 13 healthy volunteers on controlled diets, Pak found that a calcium intake of 198 mg/d resulted in urinary calcium of 138 mg/d (an intestinal calcium absorption of 70%, assuming calcium balance), whereas a calcium intake of 1878 mg/d resulted in urinary calcium excretion of 202 mg/d (an intestinal calcium absorp-

Table 1. Demographic and dietary factors by quintile of DASH score by cohort

Factor	HPFS (n = 1049)					NHS I (n = 1277)					NHS II (n = 1100)				
	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
Age (years)	62	63	64	65	65	66	65	67	66	68	48	49	50	51	50
BMI (kg/m^2)	26.9	26.3	26.3	25.8	25.3	26.8	27.2	26.7	27.3	26.0	28.2	27.7	27.1	26.7	26.3
History of kidney stones (%)	67	57	63	54	62	76	72	71	66	62	74	68	63	52	56
History of hypertension (%)	37	37	33	41	32	52	49	52	47	44	22	25	19	24	22
History of diabetes (%)	4	3	6	9	9	7	11	12	11	9	4	3	6	6	5
Thiazide use (%)	7	8	9	10	10	13	16	17	17	19	15	16	16	16	11
DASH score components															
fruit (servings/d)	1.3	2.0	2.5	3.2	3.7	1.3	1.7	2.3	2.8	3.2	0.8	1.3	1.7	2.2	2.7
vegetables (servings/d)	2.1	2.6	3.2	3.8	4.9	2.1	2.7	3.1	4.1	4.8	1.8	2.5	3.2	4.0	5.2
nuts (servings/d)	0.5	0.8	0.9	1.2	1.6	0.5	0.7	0.8	1.0	1.3	0.4	0.6	0.9	1.1	1.3
low-fat dairy (servings/d)	0.4	0.5	0.8	1.1	1.3	0.3	0.5	0.8	1.1	1.6	0.2	0.4	0.7	1.1	1.3
red and processed meats (servings/d)[a]	1.1	0.9	0.8	0.8	0.5	0.9	0.8	0.7	0.7	0.4	0.8	0.7	0.7	0.6	0.4
whole grains (servings/d)	0.6	1.0	1.4	1.9	2.7	0.5	0.9	1.2	1.6	2.1	0.4	0.9	1.0	1.5	1.8
sweetened beverages (servings/d)[a]	0.5	0.3	0.3	0.3	0.1	0.6	0.4	0.2	0.2	0.1	0.8	0.4	0.3	0.3	0.2

Values are means unless otherwise indicated. Q, DASH score quintile.
[a]In constructing the DASH score, higher intakes of these components received lower scores.

Table 2. Twenty-four-hour urine composition by DASH score in men (HPFS)

Component	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	*P* for Trend
Calcium (mg)	195	184	201	206	201	0.12
Oxalate (mg)	38	39	40	39	45	<0.001
Citrate (mg)	661	674	708	710	733	0.004
Uric acid (mg)	601	607	623	610	645	0.04
Sodium (mEq)	186	183	183	185	177	0.26
Sulfate (mmol)	22	24	23	24	25	<0.001
Potassium (mEq)	66	75	77	79	87	<0.001
Magnesium (mg)	115	120	122	127	135	<0.001
Phosphate (mg)	1035	1066	1052	1107	1100	0.002
pH (units)	5.8	5.8	5.9	5.9	5.9	0.01
Volume (L)	1.55	1.71	1.72	1.71	1.79	<0.001
RSS						
calcium oxalate	2.08	1.86	1.95	1.93	1.97	0.61
brushite	1.38	1.18	1.34	1.37	1.35	0.57
uric acid	2.68	2.49	2.35	2.35	2.26	0.02

Means adjusted for age, kidney stone history (yes or no), BMI, hypertension, diabetes, thiazide use, and 24-hour urinary creatinine.

Table 3. Twenty-four-hour urine composition by DASH score in older women (NHS I)

Component	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	*P* for Trend
Calcium (mg)	180	190	201	202	198	0.008
Oxalate (mg)	29	28	30	30	31	0.001
Citrate (mg)	589	612	643	660	661	0.001
Uric acid (mg)	434	447	451	450	447	0.29
Sodium (mEq)	138	142	142	139	141	0.70
Sulfate (mmol)	16	16	16	18	18	<0.001
Potassium (mEq)	52	59	60	64	69	<0.001
Magnesium (mg)	95	96	99	107	110	<0.001
Phosphate (mg)	715	772	732	774	774	0.002
pH (units)	5.9	5.9	6.0	6.1	6.1	<0.001
Volume (L)	1.59	1.76	1.79	1.84	2.04	<0.001
RSS						
calcium oxalate	1.76	1.55	1.65	1.60	1.45	0.003
brushite	1.28	1.18	1.27	1.38	1.24	0.68
uric acid	1.81	1.68	1.57	1.42	1.22	<0.001

Means adjusted for age, kidney stone history (yes or no), BMI, hypertension, diabetes, menopause, thiazide use, and 24-hour urinary creatinine.

tion of 11%, assuming calcium balance) (23). Of note, we previously reported that the magnitude of the independent association between calcium intake and urinary calcium in our study population was small (25).

Our urinary calcium results are consistent with data from the initial trial examining the effect of the DASH diet on blood pressure (3). In the DASH trial, the control diet contained 443 mg/d and the DASH diet contained 1265 mg/d of calcium (both diets contained similar amounts of sodium, and the DASH diet had more total protein). However, after switching from the control diet in the run-in period to the DASH diet, participants in the DASH group excreted 4 mg/d less urinary calcium.

Although participants with higher DASH scores in our study had much higher oxalate intakes, consumption of a DASH-style diet was associated with only slightly higher urinary oxalate. These results are consistent with our previous quantification of the independent association between dietary and urinary oxalate in these study populations (26). The small effect of dietary oxalate on urinary oxalate may reflect the primacy of endogenous oxalate synthesis in determining urinary oxalate levels and is consistent with the modest or null associations we previously observed in these cohorts between dietary oxalate and kidney stone formation (19). Although it is possible that the higher calcium content of the DASH-style diet results in reduced intestinal oxalate

Table 4. Twenty-four-hour urine composition by DASH score in younger women (NHS II)

Component	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	*P* for Trend
Calcium (mg)	196	207	212	200	219	0.05
Oxalate (mg)	27	26	28	28	28	0.03
Citrate (mg)	665	728	780	764	772	0.002
Uric acid (mg)	503	504	506	522	518	0.09
Sodium (mEq)	152	148	155	152	150	0.97
Sulfate (mmol)	16	17	17	17	18	0.01
Potassium (mEq)	48	52	56	59	64	<0.001
Magnesium (mg)	90	96	100	105	105	<0.001
Phosphate (mg)	832	834	835	853	857	0.15
pH (units)	5.9	6.0	6.1	6.1	6.1	<0.001
Volume (L)	1.49	1.65	1.68	1.84	1.96	<0.001
RSS						
calcium oxalate	1.93	1.64	1.71	1.48	1.49	<0.001
brushite	1.66	1.57	1.71	1.47	1.56	0.32
uric acid	2.23	1.86	1.70	1.51	1.39	<0.001

Means adjusted for age, kidney stone history (yes or no), BMI, hypertension, diabetes, thiazide use, and 24-hour urinary creatinine.

absorption (with a concomitant reduction in urinary oxalate) (4–6), the magnitudes of the associations between higher DASH score and urinary oxalate in our study were similar in participants with calcium intakes above and below the median. In addition, we previously reported that higher DASH scores were associated with reduced kidney stone risk even in participants with lower calcium intakes (1).

The positive association between higher DASH score and greater 24-hour urine volume was independent of fluid intake. Because differences in fluid intake do not account for the increase in 24-hour urine volume in participants with higher DASH scores, we speculate that higher urinary volumes were, at least partly, a result of the higher food water content in a DASH-style diet. In Meschi's study, dietary elimination of fruits and vegetables resulted in a 12% decrease in urinary volume (7).

The small magnitude of the association between higher DASH score and lower urinary RSS with respect to calcium oxalate is notable, particularly in light of our recent report in the same study populations of large reductions in incident kidney stone risk associated with higher DASH scores (1). Because most incident kidney stones in these cohorts consisted predominantly of calcium oxalate (1), this discrepancy is unlikely to be explained by the association between higher DASH score and lower urinary RSS with respect to uric acid.

We propose three possibilities that may account for the disparate effect of DASH score on urinary supersaturation compared with kidney stone risk. First, the DASH-style diet appears to modulate stone risk by increasing urinary citrate, and the effect of urinary citrate on stone risk may not be fully captured by formulas used to calculate urinary supersaturation. For example, urinary citrate likely inhibits crystal agglomeration (27), the process whereby calcium oxalate crystals combine to form a stone. Second, the clinical significance of small changes in urinary supersaturation is uncertain; it is possible that the magnitude of changes in supersaturation we observed could lead to large differences in kidney stone risk over time. Finally, we suggest the possibility of important, and perhaps as of yet unidentified, stone inhibitors in dairy products and/or plants not presently incorporated into calculations of urinary supersaturation. For example, we previously described the association between higher phytate intake and lower stone risk in this study population (28).

The higher 24-hour urinary excretions of citrate, potassium, magnesium, and phosphate and the higher urinary pH in participants with higher DASH scores were expected given the higher levels of alkali, potassium, magnesium, and phosphorus in a DASH-style diet. The higher levels of 24-hour urinary sulfate reflect greater fish consumption and the presence of sulfur-containing amino acids in several components of the DASH-style diet, including milk, whole wheat, and certain nuts (29).

The limitations of our study deserve mention. First, we studied 24-hour urine composition. Therefore, we could not identify associations between a DASH-style diet and potentially important postprandial increases in lithogenic factors such as calcium and oxalate (30). Second, we ascertained long-term dietary patterns with the FFQ, whereas 24-hour urine composition is likely to reflect short-term dietary intake. Thus, it is possible that some associations between DASH scores and 24-hour urinary factors are of greater magnitude than we describe. However, we also conducted analyses of participants with two 24-hour urine collections to minimize the effect of short-term dietary variation. Finally, this study did not include urine collections from non-white participants.

In conclusion, the reduction in stone risk associated with a DASH-style diet appears partly mediated by higher urine ci-

trates and volumes. The effect of a DASH-style diet on stone risk may be underestimated by conventional estimates of urinary supersaturation. The higher oxalate content of a DASH-style diet does not lead to large increases in 24-hour urinary oxalate, a finding consistent with our previous reports of only small associations between oxalate intake and both urinary oxalate excretion and incident kidney stone risk. Overall, we believe our results provide a strong rationale for a randomized trial examining the effect of a DASH-style diet on kidney stone recurrence.

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Disclosures

None.

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