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The Changing Incidence and Presentation of Urinary Stones Over 3 Decades

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Abstract

Objective: To evaluate trends in the incidence of kidney stones and characteristics associated with changes in the incidence rate over 3 decades.

Patients and Methods: Adult stone formers in Olmsted County, Minnesota, from January 1, 1984, to December 31, 2012, were validated and characterized by age, sex, stone composition, and imaging modality. The incidence of kidney stones per 100,000 person-years was estimated. Characteristics associated with changes in the incidence rate over time were assessed using Poisson regression models.

Results: There were 3224 confirmed symptomatic (stone seen), 606 suspected symptomatic (no stone seen), and 617 incidental asymptomatic kidney stone formers. The incidence of confirmed symptomatic kidney stones increased from the year 1984 to 2012 in both men (145 to 299/100,000 person-years; incidence rate ratio per 5 years, 1.14, $P<.001$) and women (51 to 217/100,000 person-years; incidence rate ratio per 5 years, 1.29, $P<.001$). Overall, the incidence of suspected symptomatic kidney stones did not change, but that of asymptomatic kidney stones increased. Utilization of computed tomography for confirmed symptomatic stones increased from 1.8% in 1984 to 77% in 2012; there was a corresponding higher increased incidence of symptomatic small stones (≤3 mm) than of larger stones (>3 mm). Confirmed symptomatic kidney stones with documented spontaneous passage also increased. The incidence of kidney stones with unknown composition increased more than that of stones with known composition.

Conclusion: The incidence of both symptomatic and asymptomatic kidney stones has increased dramatically. The increased utilization of computed tomography during this period may have improved stone detection and contributed to the increased kidney stone incidence.

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Kidney stones are a common, painful condition responsible for substantial health problems and economic costs to society. In addition to painful recurrence, kidney stone disease is a risk factor for bone fracture,[1] cardiovascular disease,[2-4] and chronic kidney disease.[5,6] Increasing evidence suggests that the incidence and prevalence of kidney stones are steadily increasing across the world,[7,8] especially among adolescents[9,10] and women.[11-15] The factors responsible for the increased burden of kidney stones in the general population have not yet been identified. Previous studies have relied on diagnostic codes or survey questions to identify stone formers, and thus lack chart validation and clinical details, including how stones were diagnosed or whether they were causing symptoms. Granular details lacking in previous studies include stone composition, size, and location have also been lacking in previous studies.

Validation of stone formers is needed to clarify whether changes in the incidence of kidney stones are due to diagnostic factors (such as better detection of stones with improvements in imaging technology) or a true increase in stones. Identifying the type of stone formers associated with the highest increase in stone incidence could also provide insights into the underlying factors leading to an increase in the incidence of kidney stones. Thus, we performed a population-based study of incident (first-time) stone formers in Olmsted County from 1984 to 2012. Our

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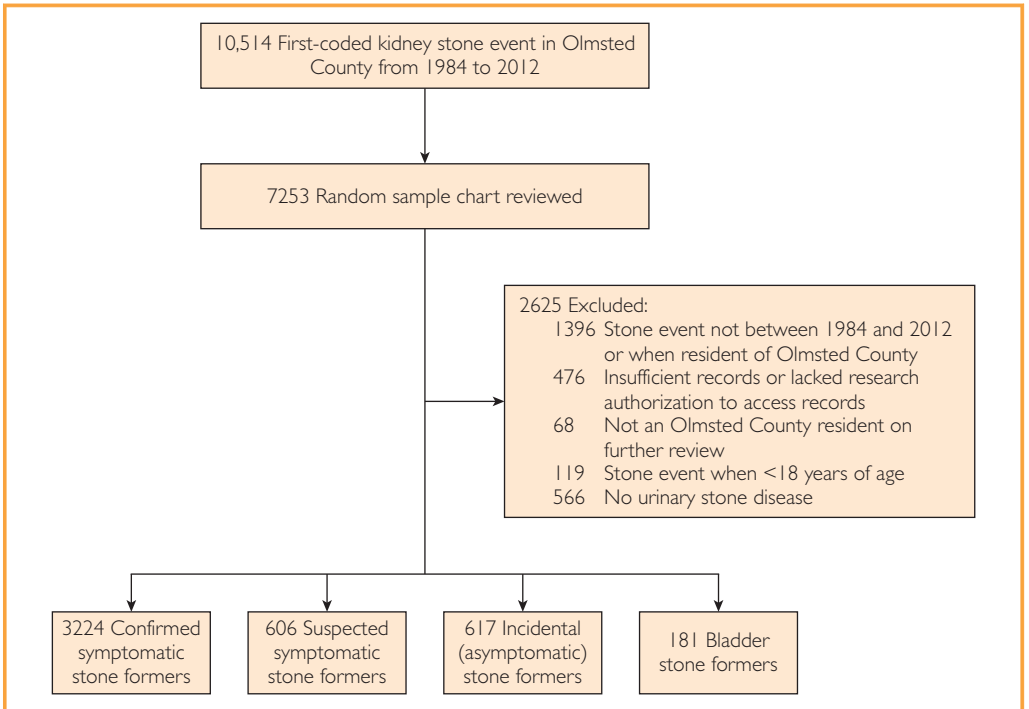

FIGURE 1. Validation and classification of stone formers. A random sample (due to funding and time constraints) of first-time coded stone formers underwent a detailed chart review. Stone formers were categorized according to the following hierarchy: confirmed symptomatic stone formers, suspected symptomatic stone formers, asymptomatic stone formers, and bladder-only stone formers.

objectives were to describe trends in the incidence of kidney and bladder stones and identify any characteristics of their presentation that have changed over this time period.

PATIENTS AND METHODS

Study Sample

After institutional review board approval, first-time kidney or bladder stone formers who were residents of Olmsted County, Minnesota, and who first presented for medical care (office, emergency room, or hospital) from January 1, 1984, to December 31, 2012, were identified using *International Classification of Disease, Ninth Revision* codes 592, 594, and 274.11 and the infrastructure of the Rochester Epidemiology Project,[16,17] as previously detailed.[18] The comprehensive medical records of newly coded stone formers were reviewed in a random order by trained abstractors. These coded stone formers were categorized into 4 mutually exclusive groups in the following order. First, confirmed symptomatic kidney stone formers who were defined by the presence of both symptoms (pain or gross hematuria) and a documented stone (seen after being voided or seen on imaging to be obstructing the ureter). Second, suspected kidney stone formers who had characteristic symptoms (pain or gross hematuria) that were clinically attributed to a stone, but confirmation was lacking (ie, imaging was deferred and the patient did not report actually seeing a voided stone). Third, asymptomatic stone formers had a nonobstructing kidney stone detected incidentally on an imaging study done for non–stone-related purposes. Fourth, bladder stone formers had stones only in the bladder as documented by cystoscopy or imaging. Stone formers were excluded if their first stone event was before 1984 or before migration into Olmsted County, if they were younger than 18 years at their first stone event, or if they had no stone but some other diagnosis for their symptoms on chart review (such as musculoskeletal back pain).

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