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Drinking water composition and incidence of urinary calculus: Introducing a new index

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Introduction: We searched for a pathophysiologically-based feature of major water electrolytes, which may define water quality better than the water hardness, respecting urinary calculus formation.

Methods: Utilizing a multistage stratified sampling, 2310 patients were diagnosed in the imaging centers of the provincial capitals in Iran between 2007 and 2008. These were composed of 1755 patients who were settled residents of 24 provincial capitals. Data on the regional drinking water composition were obtained from an accredited registry, and their relationships with the region's incidence of urinary calculi were evaluated by metaregression models. The stone risk index (defined as the ratio of calcium to magnesium-bicarbonate product in drinking water) was used to assess the risk of calculus formation.

Results: No correlation was found between the urinary calculus incidence and the amount of calcium, bicarbonate, or the total hardness of the drinking water. In contrast, water magnesium had a marginally significant nonlinear inverse relationship with the incidence of the disease in the capitals ($R^2 = 26\%$, $P = .05$ for a power model). The stone risk index was associated nonlinearly with the calculus incidence ($R^2 = 28.4\%$, $P = .04$).

Conclusions: Urinary calculus incidence was inversely related with drinking water magnesium content. We introduced a new index constructed on the foundation of a pathophysiologically-based formula; the stone risk index had a strong positive association with calculus incidence. This index can have therapeutic and preventive applications, yet to be confirmed by clinical trials.

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