Hypercalciuria in School-Aged Children of Rasht
A Single-center Study

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Hypercalciuria is the most common identifiable metabolic cause of calcium kidney calculus disease. Idiopathic hypercalciuria is defined as hypercalciuria with normal serum electrolytes levels in the absence of any known underlying disease responsible for increased urinary calcium excretion. The aim of the present survey was to study the prevalence of urinary tract signs and symptoms of idiopathic hypercalciuria in a healthy group of primary school children living in Rasht, a city in north of Iran. The prevalence of idiopathic hypercalciuria in our study was estimated to be 5.6%. This is a first report of idiopathic hypercalciuria in Guilan province.

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Hypercalciuria is the most common identifiable metabolic cause of calcium kidney calculus disease, which was first described by Moore.[1,2] Hypercalciuria is defined as a 24-hour urinary calcium excretion more than 4 mg/kg/d in a child who weighs less than 60 kg. In infants younger than 3 months, 5 mg/kg/d is considered the upper limit of normal for calcium excretion.[3-5] The studies carried out in nonindustrialized countries have shown different prevalence of hypercalciuria; some studies reported the prevalence of idiopathic hypercalciuria of 2.9 to 3.8% among otherwise healthy children.[1,2] According to some studies, hypercalciuria has been found in 3% to 5.4% of school-aged children in Iran.[1,6-9]

Although many of the children with this problem are asymptomatic, idiopathic hypercalciuria (IH) has been identified in 20% to 30% of children with hematuria, dysuria, frequency-urgency syndrome, and voiding dysfunction.[6,10-13] Regarding the importance of hypercalciuria, varieties of studies were performed in many of the countries around the world, and its causes, prevention, and treatment have been investigated thoroughly. However, because there is not a comprehensive report regarding the prevalence and symptoms of IH in Guilan's school-aged children, we studied the prevalence and the frequency of urinary tract signs and symptoms of IH in an otherwise healthy group of primary school children living in Rasht, a city in north of Iran.

A total of 340 children were selected by stratified clustered random sampling from primary schools of Rasht, Iran, between April 2009 and February 2010. Children with conditions that would influence urinary calcium excretion, such as being on medical treatment or suffering from chronic kidney disease, were excluded. Urine samples of the students were collected and sent to the laboratory. Suspected hypercalciuria was defined as a urine calcium-creatinine ratio higher than or equal to 0.21 mg/mg. In children with suspected hypercalciuria, 24-hour urine samples were collected. Children with a daily urinary calcium excretion of 4 mg/kg/d or greater were considered to have definite hypercalciuria. Follow-up visits were scheduled for hypercalciuric patients.

The eligible children were 160 girls (47.1%) and 180 boys (52.9%). Their mean age was 9.3 ± 2.1 years. The urine calcium-creatinine ratio was abnormal (> 0.21 mg/mg) in 47 children (13.8%). Among those who were tested for 24-hour urine calcium,

19 children showed a urinary calcium excretion greater than 4 mg/kg/d. All of them had normal concentrations of serum calcium, phosphorus, creatinine, urea, and parathyroid hormone and did not show any other known causes of hypercalciuria (considered as IH). The prevalence of IH in this study was 5.6%, of whom 11 (3.3%) were boys and 8 (2.3%) were girls. There was no significant difference between the prevalence rate in males and females (P= .21). The mean and standard deviation levels of urine calcium-creatinine ratio and 24-hour urine calcium of these children are shown in Table 1.

In the present study, the prevalence of hypercalciuria was 5.6%. Some studies in different cities of Iran have shown the prevalence of IH to be 3% to 8.3%.[1,8,12,19,29] Although several factors including geographic location, genetic factors, nutritional habits in Guilan (for example, the use of salty fish, olive prepared with salt, and salty snacks), source and composition of drinking water, season, exposure to sunlight, and even environmental pollutants have been postulated to explain these differences, apparently none of them can absolutely explain the reason for these differences. A family history of urinary calculi was seen in the first-degree relatives of 12 children (63.2%), while in Escribano and colleagues and Ahmadzadeh and colleagues' studies it was 27.6% and 20%, respectively.[1,24]

Table 2 shows urinary system signs and symptoms of hypercalciuric children. In our study, the most prevalent complaints were recurrent abdominal pain and dysuria (26% and 15%, respectively). In Esfahani and colleagues' study, recurrent abdominal pain and bed-time enuresis were the most frequent complaints.[6] However, regarding high frequency of this complaint among children, we cannot attribute it to hypercalciuria before ruling out of other relevant factors. In the present study, we did not found any case of day-time enuresis, but 2 children showed bed-time enuresis. Also, Vachvanichsanong and colleagues studied 124 children with IH and reported that 28 (23%) had urinary incontinence (54% nocturnal, 21% diurenal, and 25% nocturnal with diurenal).[15] It is postulated that the high concentrations of calcium in the urine irritates the bladder, causing involuntary incontinence.[2-4]

Considering the high prevalence of hypercalciuria and the frequency of attributed signs and symptoms and also its consequences, we suggest thinking about hypercalciuia when encountering all urinary system clinical manifestations and even abdominal pain. It is important to establish a reference value for urinary calcium excretion in each geographic area.

Table 1. Urine Calcium-Creatinine Ratios and 24-hour Urine Calcium Excretion in Hypercalciuric Children

Urine Parameter	Boys	Girls	All Children
Calcium-creatinine ratio	0.34 ± 0.13	0.32 ± 0.12	0.33 ± 0.12
24-hour calcium excretion	4.74 ± 0.46	4.64 ± 0.31	4.70 ± 0.39

Table 2. Frequency of Signs and Symptoms in Hypercalciuric Children

Signs and Symptoms	Boys	Girls	All Children
Dysuria	1	2	3
Day-time enuresis	0	0	0
Bed-time enuresis	1	1	2
Recurrent abdominal pain	2	3	5
Urgency	0	1	1
Microscopic hematuria	2	1	3
Gross hematuria	0	0	0
History of urinary tract infection	0	1	1
Pyuria	0	0	0
Urolithiasis	1	0	1
Microlithiasis	1	1	2
Total	8	10	18

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CONFLICT OF INTEREST

None declared.

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