

## Prevalence of idiopathic hypercalciuria in children with urinary system related symptoms attending a pediatric hospital in Bandar Abbas in 2014

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### Abstract

**Background:** Idiopathic hypercalciuria is a group of diseases which can be manifested with urinary symptoms. Its importance is due to high prevalence, recurrent infections, and stone formations which are often asymptomatic.

**Objective:** The objective of this study was to determine the prevalence of idiopathic hypercalciuria in children with urinary system related symptoms in Bandar Abbas in 2014.

**Methods:** This descriptive cross-sectional study was done in 2014 in a children's hospital in Bandar Abbas (southern Iran) on 321 children who were between 2 months to 14 years old. Random morning urine sample was obtained from all the patients, and calcium to creatinine ratio was assessed for all the patients for two times. Hypercalciuria is defined as urinary calcium excretion rate that is greater than 4 mg/kg per 24 hours in a child older than two years of age. Data was analyzed using IBM SPSS statistics 23.0 software and Chi-square and independent-samples t-test.

**Results:** Among the 321 children assessed, 153 (47.7%) had idiopathic hypercalciuria. The mean age of the children with idiopathic hypercalciuria was 55.20±43.71. Prevalence of idiopathic hypercalciuria was 48.3% in children with urinary tract infection, 54.9% and 53.6% in children with microscopic and macroscopic hematuria respectively, In children with dysuria, there were 52.1%, and 51.8% in children with frequency, 49.1% in children with kidney stone which was confirmed with sonography, 28.6% and 37.5% in children with nocturnal and daily urinary incontinency respectively. Results of this study showed no significant relationship between urinary system symptoms and idiopathic hypercalciuria ( $p>0.05$ ).

**Conclusion:** Hypercalciuria can be presented with different symptoms associated with urinary symptoms. Therefore, it is recommended to check the urinary calcium level in children with urinary symptoms with no definite etiology.

**Keywords:** Idiopathic hypercalciuria, Urinary symptoms, Children

### 1. Introduction

Hypercalciuria is one of the most common metabolic disorders (1) which can result in different urinary system symptoms (2). Idiopathic hypercalciuria is defined as increased urinary excretion of calcium in absence of hypercalcemia or any other etiologies for hypercalciuria (3). Its importance is for its high prevalence and its association with frequency, dysuria, proteinuria, and asymptomatic kidney stones (2). Idiopathic hypercalciuria is the most common cause of isolated hematuria in children and one important risk factor for kidney and urinary tract stones (4, 5). Also, idiopathic hypercalciuria is a risk factor for recurrent urinary tract infection which can be prevented via suitable diagnosis and treatment (6). Suitable treatment prevents stone formation and decrease of bone

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density in both children and adults (7-9). Prevalence of idiopathic hypercalciuria depends on different factors such as geographical areas, nutritional variables, climate, and genetic factors, and is variable between 2.9% to 10% (9, 10). Prevalence of idiopathic hypercalciuria is variable in different countries. Idiopathic hypercalciuria is associated with higher risk of renal stones among affected children (11). Idiopathic hypercalciuria has also high prevalence among children with urinary symptoms. Balestracci et al. have reported the prevalence of 20% for idiopathic hypercalciuria among children with urinary tract infection (12). Also, the association of idiopathic hypercalciuria and reduced bone mineral density is suggested by some researchers (13, 14). It is shown that dietary interventions may reduce the complications of idiopathic hypercalciuria (15). Therefore, it is important to diagnose it in children, and epidemiologic information about the disease is helpful. No information is available about the prevalence of idiopathic hypercalciuria in Bandar Abbas. The general objective of this study was to determine the prevalence of idiopathic hypercalciuria in children with urinary symptoms referred to a children's hospital in Bandar Abbas.

## 2. Material and Methods

This descriptive cross sectional study was carried out in a children's hospital in Bandar Abbas. All children attending our pediatric nephrology clinic who had urinary symptoms were included in our study using convenience sampling during a one year period. We enrolled 321 children between 2 months to 14 years old during 2013 and 2014, who were referred for outpatient visit or hospitalization with urinary symptoms including dysuria, frequency, urinary tract infection, macroscopic and microscopic hematuria, nocturnal and daily urinary incontinency and kidney stones confirmed with sonography. Patients who were using nephrotoxic drugs, corticosteroids, vitamin D, or methylxanthines for causes other than urinary symptoms such as kidney diseases, liver and biliary tract diseases were excluded from the study. Before starting the study, a written informed consent was obtained from the parents of all the children. Random morning urine samples were obtained from all the patients for measurement of Ca/Cr levels for two times. Idiopathic hypercalciuria was defined as 24 hours' urine calcium more than 4mg/kg or Ca/Cr level more than 0.2 or more than 0.8 in less than 7 months old children. For all the patients, a checklist was completed for demographic variables including: age, sex, and place of residence. Also, the information for different urinary symptoms was recorded. Data was analyzed using IBM SPSS statistics 23 software and was analyzed using descriptive statistics (mean and standard deviation, and frequency) and Chi-Square and independent samples t test. P values less than 0.05 were assumed to be significant.

## 3. Results

We studied 321 children including 166 (51.7%) males and 155 (48.3%) females with average age of 51.62±41.08 months. Among the children studied, 153 (47.7%) had idiopathic hypercalciuria, including 82 (53.6%) males and 71 (46.6%) females with average age of 55.20±43.71 months.

**Table 1.** Frequency of idiopathic hypercalciuria in children with urinary symptoms

Urinary system symptoms		Idiopathic hypercalciuria; n (%)	No idiopathic hypercalciuria; n (%)	p-value
Urinary tract infection	Yes	115 (48.3)	123 (51.7)	0.690
	No	38 (45.8)	45 (54.2)	
Microscopic hematuria	Yes	28 (54.9)	23 (45.1)	0.259
	No	125 (46.3)	145 (53.7)	
Macroscopic hematuria	Yes	15 (53.6)	13 (46.4)	0.512
	No	138 (47.1)	155 (52.9)	
Dysuria	Yes	50 (52.1)	46 (47.9)	0.300
	No	103 (45.8)	122 (54.2)	
Frequency	Yes	43 (51.8)	40 (48.2)	0.380
	No	110 (46.2)	128 (53.8)	
Kidney stone	Yes	28 (49.1)	29 (50.9)	0.808
	No	125 (47.3)	139 (52.7)	
Nocturnal urinary incontinency	Yes	4 (28.6)	10 (71.4)	0.144
	No	149 (48.5)	158 (51.5)	
Daily urinary incontinency	Yes	3 (37.5)	5 (62.5)	0.560
	No	150 (47.9)	163 (52.1)	

After clinic and laboratory tests, urinary tract infection was confirmed in 238 (74.1%), among which, 115 (48.3%) had idiopathic hypercalciuria, including 56 males and 59 females. Also, 51 (15.9%) had microscopic hematuria and 28 (8.7%) had macroscopic hematuria. Among them, 28 (54.9%) and 15 (53.6%) had idiopathic hypercalciuria respectively. Dysuria was reported in 96 (29.9%) of the children in this study, among which, 50 (52.1%) had idiopathic hypercalciuria. Ultrasound sonography showed kidney stones in 57 (17.8%) including 43 (51.8%) children with idiopathic hypercalciuria. Among the children in our study, 14 (4.4%) had nocturnal urinary incontinency, and 8 (2.5%) had daily urinary incontinency among which 4 (28.6%) and 3 (37.5%) had idiopathic hypercalciuria respectively. There was no significant relationship between urinary tract infection, hematuria, dysuria, frequency, kidney stone, daily and nocturnal urinary incontinency, and idiopathic hypercalciuria ( $p>0.05$ ). Details are shown in Table 1.

#### **4. Discussion**

In this study, we assessed the frequency of idiopathic hypercalciuria in children between 2 months to 14 years old with various urinary symptoms. Some studies have selected their samples from children with confirmed idiopathic hypercalciuria, and have reported the prevalence of different symptoms related to the urinary system in these patients. Both study designs are able to show the importance of urinary system related symptoms in children with idiopathic hypercalciuria. Assessment of 24-hour urine calcium level is difficult in children and we have used urine Ca/Cr level in random morning sample in study participants, which is shown to be accurate enough, and has specificity and sensitivity of more than 90%. In our study the prevalence of idiopathic hypercalciuria was very high, and was more frequent among children with microscopic hematuria (54.9%) and less frequent among children with nocturnal urinary incontinency (28.6%). In this study, we found no significant relationship between different urinary systems related symptoms and prevalence of idiopathic hypercalciuria. High difference in the prevalence of idiopathic hypercalciuria in our study and similar studies in Ahwaz (16), and Tehran (17) which have reported the prevalence of 3% and 5.4% respectively, can be due to difference in climate, study designs and data collections. Although in the current study, the prevalence of idiopathic hypercalciuria was higher (53.6%) among males, but the difference in prevalence of idiopathic hypercalciuria according to gender was not statistically significant. Moore et al. (9) and Ahmadzadeh et al. have reported higher prevalence of idiopathic hypercalciuria among males, but higher prevalence of idiopathic hypercalciuria is reported among females (42.9% versus 17.1%) in the study by Sadeghi et al. (18). Prevalence of dysuria, frequency, microscopic and macroscopic hematuria, kidney stone, and urinary tract infection were higher in the current study, in comparison to the study in Shiraz (19)(18, 19), but the prevalence of daily and nocturnal urinary incontinency was similar in these studies. In a study in 2001 Maria Goretti et al. reported the prevalence of 31% for hematuria, among the patients with idiopathic hypercalciuria, which is lower than our study (20). Also, the prevalence of kidney stones was 56% in the study by Goretti et al. and 49.1% in our study. In a study in 2004 Biyikli et al. reported idiopathic hypercalciuria in about 43% of children over 5 years old, with recurrent urinary tract infections (21). This rate was 48.3% in our study. One study in 2006 reported the prevalence of 21% for idiopathic hypercalciuria among the children with urinary tract infection (22), which is lower than our study.

#### **5. Conclusions**

Based on the results of our study and similar studies, the prevalence of idiopathic hypercalciuria is high among children with urinary symptoms. The importance of our findings is that idiopathic hypercalciuria should be considered as an important cause of urinary symptoms in children when other causes are less probable. Also, we recommend that the children with urinary symptoms with no definite etiology should be screened for idiopathic hypercalciuria. More studies are recommended in different areas, because the prevalence of idiopathic hypercalciuria is variable, based on the place of residence and nutritional status.

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#### **Conflict of Interest:**

There is no conflict of interest to be declared.

#### **Authors' contributions:**

All authors contributed to this project and article equally. All authors read and approved the final manuscript.

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