

## Microlithiasis and Nephrolithiasis among infants: Is it a new phenomenon?

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### ABSTRACT

**Objectives:** Although nephrolithiasis is a rare but a serious problem for children's health, recent data has showed that the prevalence of pediatric nephrolithiasis has increased in both developed and developing countries. North and West of Iran, as a country located in Afro-Asian stone-forming belt, has the highest incidence for renal stones among adults. This study aimed to determine the incidence of microlithiasis and nephrolithiasis among infants in a city at North West of Iran.

**Methodology:** It was a cross-sectional study on infants aged less than one year old, diagnosed as patients with microlithiasis and nephrolithiasis, over three months period (since March 2010) who were referred to pediatrician in a city of East Azerbaijan province. Demographic data (age, sex), number of stones, size of stones, presence of hydronephrosis in kidneys, history of jaundice and family history of stone disease were recorded.

**Results:** Incidence of microlithiasis and nephrolithiasis was 0.04866 and 0.03244, respectively. Fever (30%) was the main cause of complication. Male to female ratio was 4:1, and 20% of our subjects had a positive history of nephrolithiasis in their first degree relatives.

**Conclusion:** This area has the highest incidence of microlithiasis and nephrolithiasis. Emergent population-based and case-control studies are needed to report its incidence/prevalence of nephrolithiasis in other parts of the country as well as to find its etiology.

**KEY WORDS:** Renal stone, Infant, Supplement.

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### INTRODUCTION

Nephrolithiasis is a rare<sup>1</sup> but a serious problem for children's health<sup>2</sup> and these children have feeding and growth problems.<sup>3</sup> However, incidence of nephrolithiasis has increased in different countries in recent years.<sup>1,4,5</sup> Except a few studies on pediatric urolithiasis<sup>6,7</sup> most of them had not separated infants less than 12 months. In addition, the recognition of nephrolithiasis among infants due to preventing progress of kidney failure as well as recurrence of stones should be among main goals of early detection in infants.<sup>8</sup>

Iran is located in Afro-Asian stone-forming belt<sup>4</sup>; and its west and north parts has the highest incidence rate for nephrolithiasis among adults of the country.<sup>9</sup> To the best of our knowledge, there were not any published reports on incidence/prevalence of

nephrolithiasis among infants of the country. It has been already reported<sup>2</sup> that pediatric urolithiasis is a serious problem with early onset of presentation in the main pediatric center of the East Azerbaijan.

The objective of this study was to find out incidence of microlithiasis and nephrolithiasis among infants of Hadishahr, East Azerbaijan province, located at west north of Iran over three months (since March 2010). The race of people is Turk and the city has common borders with Republic of Azerbaijan and Armenia.

### METHODOLOGY

All infants aged less than 12 months who were diagnosed with microlithiasis or nephrolithiasis were referred to a dietary clinic from the only hospital of the city and/or only pediatrician of the city. Diagnosis of nephrolithiasis was confirmed by an ultrasonographic exam. The method of collecting information was based on a face to face interview by the infants' mothers and their laboratory/ultrasonography documents, carried by a trained dietitian.

Demographic data (age, sex), number of stones in each kidney, location of stone, size of stones, presence of hydronephrosis in kidneys, and main clinical features, past medical and surgical history, family history of stone disease, recurrence (which was considered if the patient had previous surgery or spontaneous passage of stone before the current presentation) and results of imaging findings were recorded. In addition, infants have been investigated regarding history of jaundice in 72 hours after birth and its related hospitalization.

We categorized stones less than  $\leq 3$ mm as microlithiasis<sup>7</sup> and more than 3mm as nephrolithiasis. This study was approved by ethical committee of Tabriz University of Medical Sciences. SPSS (statistical Pack-

age for the Social Sciences) software (version 17, Nie, Bent & Hull, USA) was used to analyze the data. The level of significance was adopted at 0.05 for all comparisons.

### RESULTS

Among all 10 diagnosed infants, mean age was 4.09 months (SD=2.86). The youngest infant aged one week and the oldest was 9 months. Male to female ratio was 4:1. Nephrolithiasis was found in four infants (36.4%) and the rest had just microlithiasis. Microlithiasis was found in left kidney of four infants and two patients had just in right kidney. However, four patients had bilateral urolithiasis (among them, three had nephrolithiasis and one had microlithiasis). Half of patients had more than one kidney stone. In addition, eight stones were found just in one patient. More than half of the patients had not reported any evidence about hydronephrosis by their Ultrasonography report. Hydronephrosis was found in three of them and in one infant hydronephrosis was existed in both kidneys. Fever was the main clinical symptom in patients (Table-I).

Except two patients whose father had nephrolithiasis (and one had a surgery operation due to his stone in childhood), none of them had a first degree relative with a history of nephrolithiasis. None of them had recurrence and all of the infants were identified for the first time. Citrate potassium (1ml/kg/day in three divided doses) was prescribed for all patients. Except two infants, all of them had a term pregnancy. None of the premature infants had got Furosemide. All the stones were recognized by Ultrasonography, and nobody had simple radiography. Except one patient, all of them had jaundice after birth, and only four patients were hospitalized for their jaundice after birth. In addition, gestational diabetes existed in mother of two patients; and rest of the mothers had not reported any chronic disease before or during pregnancy.

Official data from managers of the Center of Health and Treatment of the city shows that number of total births of the area was 494 in last year, (mean=41.1 births/month). However, the lowest and highest

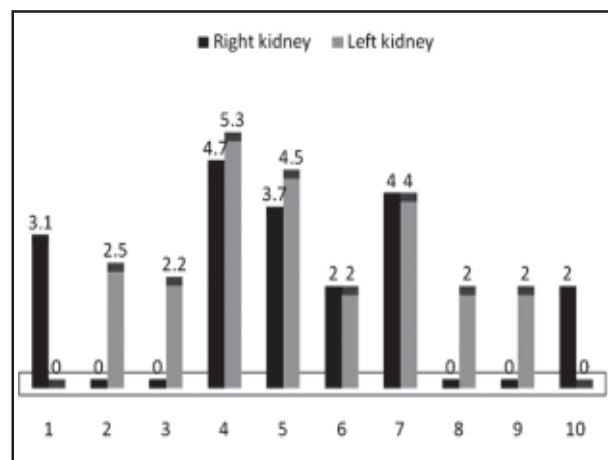


Fig-1: Size of nephrolithiasis among infants (mm).

Table-I: Main complication of Urolithiasis.

Fever	30%
Irritable	20%
Hematuria	20%
Restless + UTI + Hematuria	20%
Crystal in urine	10%

birth rate was in October (n=28) and November (n=56), respectively. In addition, since we could find at least ten patients in a period of three months, it means that incidence was 10/123.3 or 0.081 (or 8100 per 100,000) for new births in year; by other words, incidence of microlithiasis and nephrolithiasis was 0.04866 and 0.03244, respectively.

**DISCUSSION**

Most studies on pediatric urolithiasis did not report infants less than one year as a separate age group;<sup>2,5,10-14</sup> therefore, to the best of our knowledge this study is among few investigations on incidence of microlithiasis and nephrolithiasis in infants (Tablet-II). Mohamad J et al,<sup>15</sup> reported that urolithiasis among infants less than five months is very rare if the infant wasn't premature or hospitalized in the intensive care unit (ICU). It seems that this small study perhaps found the highest incidence of microlithiasis and nephrolithiasis in the world; for example in this area the rate of observed nephrolithiasis was 484.1 and 514.9 times more than its incidence in New Zealand<sup>6</sup> and Iceland<sup>5</sup>, respectively. The study of Iceland<sup>5</sup>, had included children less than 18 years. However, the right incidence of nephrolithiasis or microlithiasis in this study seems to be much higher than what was reported; because some of the infants might have been missed from our study or might have visited other physicians/pediatricians/nephrologists and/or in other cities. In addition, microlithiasis/nephrolithiasis might be asymptomatic

in many other infants.

Only 20% of our subjects had a positive history of renal stones in their fathers. Positive family history of renal stones was reported in 16% first degree relatives in children of United Kingdom.<sup>3</sup> One third of children in Iceland<sup>5</sup>, 10% in Tunisia<sup>11</sup> and 25% in Ontario, Canada<sup>14</sup> had a positive family history. In Turkey, the only study on infants revealed that 60% had a positive family history for urolithiasis.<sup>16</sup>

In the studied infants, male to female ratio was 4:1. This is in agreement with most of previous studies on pediatric urolithiasis that male to female ratio was reported to be 2.1:1 in United Kingdom<sup>3</sup>; 1.25 (mean age 11.3 years) in Ontario, Canada<sup>14</sup>; and 2.1:1 in Kuwait.<sup>17</sup> There were just two infants with renal stones last year in New Zealand and both of them were males.<sup>6</sup> In Iran, the ratio was 1.17<sup>18</sup> and 2.25<sup>19</sup> among children of Qom and in Iranian LBW infants, respectively. However, the male ratio in our infants is much higher than other studies.

In this study, fever was the main cause of complication. In infants of Turkey, restlessness was the most common symptom of urolithiasis, followed by vomiting and fever.<sup>8</sup> While 90% of our infants had jaundice in the first 72 hours after birth, but it seems that there is no published report on association between nephrolithiasis and jaundice.

**Limitations of the Study:** This study had some limitations: Firstly no analysis was done to determine the composition of stones; because none of the infants had passed stone spontaneously nor had used

Tablet-II: Incidence of Urolithiasis in other studies.

Country	Years of study	Age	Incidence	Note
Kuwait <sup>19</sup>	Jan 1996 to Sept 2000	children less than 15 years	1.8 per 100,000	There were just 31 children with a mean age at presentation at 38 months, (with a range of 2 months to 10 years)
Iceland <sup>5</sup>	1995 to2000	less than 18 years	5.6 and 6.3 per 100,000 children less than 18 and 16 years of age, respectively	The major strength of this retrospective study: its probable inclusion of all children with Nephrolithiasis in the whole Iceland. The hospital admission rate was 0.98/1000.
New Zealand <sup>6</sup>	On Oct 2008, pediatricians were asked to report any Nephrolithiasis in the previous 12 months	Less than one year	Incidence: 0/55500.The upper 95% confidenceinterval for this zero incidence is approximately 6.7/100000 or1 per 15000.	There were 86% responses from pediatricians.
Emergency Departments of South Carolina state, USA <sup>1</sup>	First period: 1996; Second period: 2007	less than 18 years	First period: 7.9 per 100000; Second period: 18.5 per 100000	Not reported clearly (because authors had categorized patients into 4 age group)

ESWL or surgery. Secondly there was not data on laboratory assessments (such as metabolic abnormalities), due to lack of financial as well as laboratory facilities. Thirdly some investigators believe that CT KUB should have been used to confirm the diagnosis of microlithiasis and finally the small sample size.

We conclude that as per findings of this study, this area has the highest incidence of microlithiasis and nephrolithiasis. Hence, emergent population-based and case-control studies are needed to report the real incidence/prevalence of renal stones as well as its etiology among infants.

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