

ORIGINAL ARTICLE

Prevalence of Hypercalciuria among Children in Markazi Province, Iran

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ABSTRACT

Background: Hypercalciuria is defined as a urine calcium/creatinine ratio greater than 0.2 mg/mg. This condition can result from various illnesses and is associated with many renal, endocrine, and bone diseases. The aim of the present study was to study the incidence of hypercalciuria among the children living in Markazi province, Iran.

Materials and Methods: The present cross-sectional study was conducted on random urine samples of 700 children with the age group of 5-15 years, who were residents of Arak city, Markazi province, Iran. The subjects were randomly chosen out of different clusters. In each cluster, the sampling was conducted using the simple random sampling method. The collected urine samples (5 ml) were evaluated for calcium and creatinine. A urine calcium/creatinine ratio of greater than 0.2 was considered as hypercalciuria.

Results: According to the results, 109 (15.6%) patients were diagnosed with hypercalciuria. Furthermore, out of the 289 female and 411 male patients, 57 (19.7%) and 52 (12.7%) subjects were identified to have hypercalciuria, respectively. Additionally, no significant relationship was observed between hypercalciuria and gender.

Conclusion: As the findings of the present study indicated, hypercalciuria had a high prevalence (15.6%) among the children living in Arak. High hypercalciuria prevalence can lead to multiple problems, especially in children, such as issues with growth, renal stones, and sodium excretion due to mineral salt consumption.

Key Words: Calcium, Creatinine, Hypercalciuria

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INTRODUCTION

Hypercalciuria is referred to a condition with a urine calcium/creatinine (Ca/Cr) ratio of more than 0.2 mg/mg [1]. This condition can be caused by various illnesses, such as endocrine, renal, and bone diseases. The urinary excretion of calcium is influenced by dietary intake; accordingly, hypercalciuria may result from a poor balanced diet [2]. One of the most important causes of hypercalciuria is high salt regimen, such as bread, water with high level of minerals, and salty foods, which affects the urinary calcium excretion.

Hypercalciuria occurs due to a change in the calcium transport system. This condition has a growing frequency in the Western countries [3]. Significant changes in the frequency of hypercalciuria have been reported among the children with nocturnal enuresis and healthy controls [1].

The clinical signs of hypercalciuria include urolithiasis, enuresis, dysuria, nephrocalcinosis, hematuria, urinary tract infection, and abdominal pain [4]. The mechanisms responsible for this condition entail enhanced gastrointestinal absorption of calcium, increased bone resorption and/or decreased renal reabsorption of calcium [5].

With this background in mind, the present study was conducted to determine the incidence of urine Ca/Cr ratio in the children with the age group of 5-15 years in Arak, Markazi province, Iran.

MATERIALS AND METHODS

This cross-sectional study was conducted on 700 children aged 5-15 years, living in Markazi

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province, Iran. For this study, information, such as gender, age and reflux, was extracted from the children's medical records. Subsequently, the mean non-fasting single-spot urine Ca/Cr ratio of the children was estimated. Due to the limitation of 24-hour urine collection in the children, random urine Ca/Cr mg/mg was used for screening hypercalciuria. The urine samples were obtained from each subject at school, and a single laboratory measured all the urine Ca and Cr levels using special kits. The measurements were conducted using an auto analyser (Selectra, USA). The Jaffe and Alcion techniques were utilized for urine Cr (with precision coefficient of variation of 2.3%) and Ca (with precision coefficient of variation of 1.3%), respectively. The urinary Ca and Cr levels were measured, and the cases with a urine Ca/Cr ratio of more than 0.2 mg/mg were considered as hypercalciuric.

Statistical analysis

The data were analyzed using the SPSS version 11.5 (Chicago, IL, USA). The Mann-Whitney U test was employed to compare the mean urine Ca and Cr between the two genders. In addition, the relative frequency of hypercalciuria was compared between the groups through the Kolmogorov-Smirnov test to confirm the normal distribution of the obtained data. Then, the independent sample t-test was used to compare the data between the two groups. P-value of less than 0.05 was considered statistically significant. Additionally, the Chi-square, Fisher's exact test, and Student's t-test were applied to test for significance at 95% confidence interval.

This study was approved by the Ethics Committees of the Arak University of Medical Sciences with the permission number of 89-80-4, 2010. The information of the subjects were contained confidentially just used for the current study purpose and were deleted after the study, without any disclosure to any third party.

RESULTS

According to the results, the mean age of the subjects was 10.8 ± 4.2 years. Out of the 700 cases, 129 (36.7%), 6 (0.9%), 11 (1.6%), and 7 (1%) children had a diet (that included salty foods), hematuria, renal scars, and reflux, respectively. However, none of the participants suffered from abdominal pain. The mean urine Ca and Cr were 10.1 ± 4.8 and 120.7 ± 85.7 mg/dL, respectively. Furthermore, the mean Ca/Cr ratio was 0.127 ± 0.11 mg/mg.

The mean Ca/Cr ratios of the males and

females were 0.12 ± 0.13 and 0.13 ± 0.10 , respectively. There was no significant difference between the two genders in terms of the Ca/Cr ratio ($P > 0.05$). Out of 289 and 411 female and male children, 57 (19.7%) and 52 (12.7%) cases suffered from hypercalciuria, respectively. Therefore, there was no significant relationship between the two genders in this regard. Finally, the overall incidence rate of hypercalciuria in the children aged 5 to 15 years was 15.6%.

DISCUSSION

As the findings of the present study indicated, the incidence of hypercalciuria in the children with 5-15 years of age was 15.6%. In a study conducted among the Turkish children (15 days to 15 years old), the prevalence of hypercalciuria was reported to be 9.6%. In addition, in the mentioned study, the Ca/Cr concentration ratios varied based on districts, altitudes, and ethnic origins [6]. However, hypercalciuria prevalence has been different among the Iranian children [7-12].

The most important causes of this disease are a regimen with high levels of salt or water with high level of minerals affecting urinary calcium excretion, which may be driven by the geographical location, altitude, and ethnicity. A high rate of appendectomy among the children with idiopathic hypercalciuria has been reported [13]. The absorptive hypercalciuria is demonstrated to result in reduced bone formation and relatively increased bone resorption [14, 15].

The researchers have indicated that the children with hypercalciuria and nephrolithiasis have low bone density [16]. The bone risk index was shown to elevate with increasing calciuria and urine acidity [17]. Hypercalciuria and acidosis potentially lead to nephrocalcinosis and growth impairment. Sorkhi and Haji Aahmadi examined hypercalciuria using random urine samples from different studies with variations in urine Ca/Cr ratio and recommended to investigate this ratio in every geographical area [12].

Our results demonstrated a higher prevalence of hypercalciuria than those reported by the literature [6, 10, 12]. This high value might be due to the location of the study, which is surrounded by desert in the north and mountains in the south.

CONCLUSION

As the findings of the present study indicated, hypercalciuria had a high prevalence (15.6%) among the children living in Arak. High hypercalciuria prevalence can lead to multiple

problems, especially in children, such as issues with growth, renal stones, and sodium excretion due to mineral salt consumption.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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