THE STUDY OF THE EPIDEMIOLOGY OF INFECTIOUS DISEASES BASED ON ULTRASOUND (SONOGRAPHY) RESULTS OBTAINED FROM CHILDREN WITH CALCULUS STONE IN ONE OF THE MEDICAL CENTERS OF TEHRAN PROVINCE

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Abstract. ***Background and Goal:*** urinary infections are invasions to any urinary systems by microbial factors. This infection is the most common urinary infection and is the second most commonly reported infection in children. The aim of this study was to investigate the epidemiology of infectious diseases based on ultrasound (sonography) results obtained from children with calculus stone in a medical center in Tehran. ***Methods:*** This cross-sectional study was conducted in children who were in the Mofid hospital due to problems with calculus stone in 1397. First, specifications of all patients admitted with calculus stone were recorded. All children with calculus stones were under ultrasound (sonography) of the kidneys and urinary system, and the number, condition and dispersion of the stones were recorded and examined. ***Findings:*** 31 children in hospital in the Nephrology department were studied which were 58.68% girl and 41.49% boy and on all of them ultrasound (sonography) was done. Blood and kidney ultrasound (sonography) findings (48.38%) and (22.58%) respectively, were abnormal. In the study of ultrasound (sonography) findings, the most common results were 21/21% remaining urine volume and 30/80% increase in bladder thickness, after which the stasis in the pilocalysis system was 9.26%, 9% kidney anomalies and 4.5% stones. ***Conclusion:*** The epidemiology of urinary infections was 32% of girls (form 58.6% female) and 22% male (from 41.94% male), which indicates a high level of urinary infections, especially in the female population.

Keywords: Calculus Stones, Infectious Diseases, Urinary Infections, Ultrasound (sonography), Kidney Stones.

1. Introduction

Since many years ago, calculus stones have been recognized, but since 1939, the connection between kidney stones and hypercalciuria has become clear (1). In the formation of the stones, many factors such as metabolic background, structural problems and infection are more common than others. Nutrition, inheritance, age, and climatic conditions also have an effect on this (2). Urinary tract stones in children are usually formed in three areas: urinary tract infection, urethral obstruction and metabolic areas. The main cause of creation of calculus stones is the disturbance of the critical balance between sedimentation and the dissolution of crystals. If we want to report based on clinical observations on this field, we have to say that kidney stones have been ten times more in infants and children than it was in the past 20 years (3). Diagnosis of kidney stones is most often done by ultrasound (sonography) and sometimes requires CT scan without contrast agent. The clinical signs of calculus stones in children are often nonspecific and the clear blood in the urinary tract with microscopy may be the only signs. Basically, calculus stones are the cause of infection and infection also plays an important role in the formation of stones (4). Urinary infection is the invasion to any tissue of the urinary system

by microbial factors (5). This infection is the most common urinary infections and is the second most commonly reported infection in children and therefore, it's important to be examined (6). Urinary infections are one of the most common types of infectious bacterial diseases in infants and children with a prevalence of 5.7% (7). The importance of early diagnosis and treatment of urinary infections is that if definitive and adequate treatment in not done, there will be unavoidable problems such as blood pressure, kidney failure, psychiatric problems, dialysis and kidney transplantation (8). The prognosis of urinary tract infection is related to quick diagnosis, appropriate treatment and the diagnosis of possible complications (9). One of the methods that helps to diagnose and treat urinary infections is ultrasound (sonography). Ultrasound (sonography) of the kidneys and urinary tract is performed in case of urinary infections. Most studies reveal a high prevalence of urinary infections and serious complications, especially at an early age (10, 11). The rates of these complications are higher, especially when urinary infections are associated with predisposing conditions such as bladder reflux and anatomical disorders (12). According to various reports, the epidemiology of childhood urinary infections from different parts of the world has been due to geographical, racial and socioeconomic differences (2, 18-13). The aim of this

study was to investigate the epidemiology of infectious diseases based on ultrasound (sonography) results obtained from children with calculus stones in a hospital in Tehran during 1397.

2.Method

This cross-sectional study was conducted on children who were in a nephrology hospital in Tehran due to problems with urinary infections in 1397. First, all children who were in the nephrology section were recorded. Subjects were then selected randomly from among who had all necessary conditions, and the required explanations were given to the family, and after consent, the children entered the study. The criteria for entering the study included:

1. Urine analysis of more than 10 WBC cells in HPD in optical microscope
2. Growth of a kind of microorganism in a fertilized situation more than 105 colonies
3. Unexplained urinary symptoms and unexplained fever

At the end, 31 children were entered in the study. All children underwent ultrasound (sonography) of the kidneys and the bladder to identify kidney and urinary system anomalies. Chronic clinical features were recorded in special forms. Stone detection based on the observation of occlusion points with posterior shadow in the kidney and urinary system was given in cases of 3 mm or more stones. If the stone was less than 3 mm, the diagnosis was done based on clinical and associated laboratory signs. In this study, Chi-square test was used to compare the urinary and bladder ultrasound (sonography) findings. All collected data were subjected to statistical analysis using SPSS23 software.

3. Findings

The children in hospital were examined in the nephrology department, which was 58.685 girl and 41.49% boy, ranging from 1 day to 12 years old. Among them, the age group less than 2 months was (25/80%), 12 to 36 months (35/48%), 36 to 72 months (16/12%), and 73 to 144 months (22/58%) (table1). The prevalence of clinical signs has been reported in Table 2, according to this table, enuresis was 48%, and in 51% of patients, there were three clinical signs or more simultaneously. In the study of bladder and kidney ultrasound (sonography), (48.38%) and (22.58%) were abnormal (table3). In these findings, an increase in the thickness of the bladder wall was 30.08%, stasis in the pilocalysis system was 9.26%, 21.21% of the remaining urine volume, 9% of the kidney anomalies and 4.5% of the stone.

Table 1. Frequency of basic variables

Variable		Number	Percentage
Sex	Male	13	**41.94**
	female	18	**58.06**
Age	Under 2 months	8	**25.80**
	12 to 36 months	11	**35.48**
	36 to 72 months	5	**16.12**
	73 to 144 months	7	**22.58**

Table 2. Relative frequency of clinical signs in children under study

Clinical symptom	Percentage
Burning urine	**59**
stomach ache	**71**
emergency	**60**
Enuresis	**48**
Constipation	**29**
Three symbols simultaneously	**51**

Table 3. Findings from ultrasound (Sonography) results

	normal	abnormal	P	Total
Kidney	24 (77.41)	7 (22.58)	0.001	31 (100)
Bladder	16 (51.61)	15 (48.38)	0.003	31 (100)

4. Discussion. The aim of this study was to investigate the epidemiology of infectious diseases based on ultrasound (sonography) results obtained from children with calculus stones in a hospital in Tehran during 1397. The results of this study showed that 42% of the children had urinary infections. In the Konin et al. study (19, 20), 50%, and in Talebian et al. (21), 39% of the children had urinary infections that were consistent with the present study. In this study, females were 58.06% of whom 32% had urinary infections and this percentage was 22% in boys and the findings shows that girls had more urinary infections than boys and is almost twice as them. This ratio was confirmed in other studies (2, 22-24). But in several other studies, the proportion of urinary infections in boys was higher than girls (25, 27). In this study, most of the participants was under 12 and 36 months. The presence of chronic and intermittent clinical signs, including emergency, enuresis, constipation and stomachache, especially their synchronization and association with each other, were responsible for bladder malfunction (28, 29). In ultrasound (sonography), an increase in the thickness of the bladder wall and a large volume of urine show bladder malfunction. In this study, the prevalence of kidney stones was 4.5%, the Wasson et al. (30) reported a prevalence of kidney stones 44%, and Edward Saun (31) reported kidney stones 5.6%. It was also shown that 23% of children with kidney stones, or urinary infections, and in ultrasound, 20% of patients had anatomical disorder.

In the study of ultrasound (sonographic) findings, the most common findings were 21/21% remaining urine volume and 30/80% increase in bladder thickness, after which the stasis in the pilocalysis system was 9.26%, 9% kidney anomalies and 4.5% stones. But in Talebian et al. (21), the most common finding was the presence of pilocalysis in the stasis system, which was 20%. In the Stai study, the most common finding was also stasis (32). In the Mahkam et al. (33) research, the results showed that the prevalence of calculus stones in children in hospital is significant and hypercalciuria in most patients with calculus stone can be considered as one of the underlying causes. The epidemiology of calculus stones in the Mofid hospital of Tehran in 1389 was estimated as 17%. Also, in the research by Momtaz et al. (24), the results indicates that the epidemiology of metabolic disorders in children with calculus stones was 87.2%. Also, the results of Nikkibakhsh et al. (34) showed that the epidemiology of children with urinary infections in bladder ultrasound (sonography) was 41.7% and in kidney ultrasound (sonography) was 24%, which is consistent with the results of the above study or close to each other, but It should be taken into account that the sample size of our study was 31 children and the for the study of Nikiibakhsh it was 58 children. The reason for the difference in percentages with previous studies may be because ultrasound (sonography) is a test based on the person and also depends on the skills of the radiologist.

5. Conclusion. Based on the findings of the present study, the following results were drawn:

1. In this study, in bladder ultrasound (sonography) 48.38% and in kidney ultrasound (sonography) was 22.58% abnormal cases. It is suggested that ultrasound (sonography) be used in all cases of urinary infections.
2. The epidemiology of urinary infections was 32% of girls from 58.6% females and 22% of boys from 41.94% of males, which indicates a high level of urinary infections, especially in the female population.
3. In the study of bladder and kidney ultrasound (sonography) findings, (48.38%) and (22.88%) were abnormal, respectively, indicating a high prevalence of childhood urinary infections.
4. The thickness of the bladder wall, 30.08%, the stasis in the pilocalysis system, 26.9%, 21.21% of the remaining urine volume, 9% of the kidney's anomalies and 4.5% of the stones are the causes of increased urinary tract infections.
5. Ultrasound (sonography) is important in identifying the scars and kidney injuries and it is suggested that DMSA methods be combined with ultrasound (sonography) to find better results.

References

1. DeFoor W, Minevich E, Jackson E, Reddy P, Clark C, Sheldon C, et al. Urinary metabolic evaluations in solitary and recurrent stone forming children. The Journal of urology. 2008;179(6):2369-72.
2. Dursun I, Poyrazoglu HM, Dusunsel R, Gunduz Z, Gurgoze MK, Demirci D, et al. Pediatric urolithiasis: an 8-year experience of single centre. International urology and nephrology. 2008;40(1):3-9.
3. Naseri M. Urolithiasis in Asian children: evaluation of metabolic factors. Journal of Pediatric Biochemistry. 201
4. Rizvi SA, Sultan S, Zafar MN, Ahmed B, Faiq SM, Hossain KZ, et al. Evaluation of children with urolithiasis. Indian journal of urology: IJU: journal of the Urological Society of India. 2007;23(4):420.
5. Rudolph A. M., Hoffman, Julien IE ,Rudolph, Colin D, 2006. Buku Ajar Pediatri Rudolph Volume.3.

6. Winberg J, Andersen H, Bergström T, Jacobsson B, Larson H, Lincoln K. Epidemiology of symptomatic urinary tract infection in childhood. Acta Paediatrica. 1974;63:1-20.
7. Farris PJ. Elementary and middle school social studies: An interdisciplinary, multicultural approach: Waveland Press; 2015.
8. Keren R, Shaikh N, Pohl H, Gravens-Mueller L, Ivanova A, Zaoutis L, et al. Risk factors for recurrent urinary tract infection and renal scarring .Pediatrics. 2015;136(1):e13-e21.
9. Karavanaki KA, Soldatou A, Koufadaki AM, Tsentidis C, Haliotis FA, Stefanidis CJ. Delayed treatment of the first febrile urinary tract infection in early childhood increased the risk of renal scarring. Acta Paediatrica.54-149:)1(106;2017 .
10. Infection UT. Working Group of the Health Care Office (HCO) of the European Association of Urology (EAU). EAU guidelines for the management of urinary and male genital tract infections. Eur Urology. 2001;40:576-88.
11. Lin K-Y, Chiu N-T, Chen M-J, Lai C-H, Huang J-J, Wang Y-T, et al. Acute pyelonephritis and sequelae of renal scar in pediatric first febrile urinary tract infection. Pediatric Nephrology. 2003;18(4):362-5.
12. Hansson S, Dhamey M, Sigström O, Sixt R, Stokland E, Wennerström M, et al. Dimercapto-succinic acid scintigraphy instead of voiding cystourethrography for infants with urinary tract infection. The Journal of urology. 2004;172(3):1071-4.
13. Baştuğ F, Gündüz Z, Tülpar S, Poyrazoğlu H, Düşünsel R. Urolithiasis in infants: evaluation of risk factors. World journal of urology. 2013;31(5):1117-22.
14. Zafar MN, Ayub S, Tanwri H, Naqvi SAA, Rizvi SAH. Composition of urinary calculi in infants: a report from an endemic country. Urolithiasis. 2018:1-8.
15. Sarica K, Narter F, Sabuncu K, Akca A, Can U, Buz A, et al. Factors affecting the course of body and kidney growth in infants with urolithiasis: A critical long-term evaluation. Archivio Italiano di Urologia e Andrologia. 2016;88(4):249-54.
16. Ergon EY, Akil İO, Taneli F, Oran A, Ozyurt BC. Etiologic risk factors and vitamin D receptor gene polymorphisms in under one-year-old infants with urolithiasis. Urolithiasis. 2017:1-8.
17. Issler N, Dufek S, Kleta R, Bockenhauer D, Smeulders N, van't Hoff W. Epidemiology of paediatric renal stone disease: a 22-year single centre experience in the UK. BMC nephrology. 2017;18(1):136.
18. Lal B, Paryani JP. Childhood bladder stones-an endemic disease of developing countries. Journal of Ayub Medical College Abbottabad. 2015;27(1).21-17:
19. Kunin CM. Detection, prevention, and management of urinary tract infections: Lea & Febiger; 1987.
20. Kunin CM, Deutscher R, PAQUIN JA. Urinary tract infection in school children: an epidemiologic, clinical and laboratory study. Medicine. 196.130-43:91;4
21. Ahmad Te, Ali. Evaluation of imaging (sonography and VCUG) in urinary tract infections in the second half of 1998 in Kashan.
22. Mortazavi F, Mahbubi L. Clinical features and risk factors of pediatric urolithiasis. Iranian Journal of Pediatrics. 2007
23. Ghane Daf. Frequency of metabolic disorders and response to medical treatment in infants less than 3 months with urinary stones. First National Congress on Neonatal and Pediatric Care. 2012
24. Hossein A, Farzaneh Ave. Frequency of metabolic disorders in children with urinary stones in Hamedan.
25. Alpay H, Ozen A, Gokce I, Biyikli N. Clinical and metabolic features of urolithiasis and microlithiasis in children. Pediatric Nephrology. 2009;24(11):2203.
26. Kamoun A, Daudon M, Abdelmoula J, Hamzaoui M, Chaouachi B, Houissa T, et al. Urolithiasis in Tunisian children: a study of 120 cases based on stone composition. Pediatric Nephrology. 1999;13(9):920-5.
27. Al-Eisa A, Al-Hunayyan A, Gupta R. Pediatric urolithiasis in Kuwait. International urology and nephrology. 2002.
28. McKenna PH, Herndon CA. Voiding dysfunction associated with incontinence, vesicoureteral reflux and recurrent urinary tract infections. Current opinion in urology. 2000;10(6):599-606.
29. Canning D. High-pressure bladder: an underlying factor mediating renal damage in the absence of reflux? The Journal of urology. 2003;169(4):1602.
30. Wason M, Hansen A. Renal and urinary calculi in children. Ugeskrift for laeger. 2005;167(40):3786-9.
31. Edvardsson V, Elidottir H, Indridason OS, Palsson R .High incidence of kidney stones in Icelandic children. Pediatric Nephrology. 2005;20(7):940-4.
32. Sty J, Wells R, Starshak R, Schroeder B. Imaging in acute renal infection in children. American Journal of Roentgenology. 1987;148(3):471-7.
33. Masoumeh M., Fereshteh M., Babak A., Mostafa Sh., Reza D., Bijan H., et al. Epidemiologic study of urinary stones in children admitted to Mofid Children's Hospital during 5 years.
34. Ahmad Ali, Mahmoudzadeh, Hashem, Yar K, Ghaffari, et al. Comparison of kidney and urinary tract imaging techniques in children with recurrent urinary tract infection. Urmia Medical Journal. 2008; 18 (5): 48-51.