

Evaluation of Dietary and Biochemical Risk Factors Involved in the Pathogenesis of Bladder Stones in Children of Below Ten Years Age at Hyderabad Sindh

1. Mubeena Laghari 2. Fatehuddin Khand 3. Naseem Aslam Channa 4. Haji Khan Khoharo

1. Asstt. Prof. of Biochemistry, Isra University, Karachi 2. Prof. of Biochemistry, Isra University, Karachi 3. Asstt. Prof. of Biochemistry, University of Sindh 4. Asstt. Prof. of Medicine/Physiology, Isra University Hyderabad

ABSTRACT

Background: Bladder stones in children of below ten years age continue as a major pediatric health problem in Hyderabad-Sindh.

Objective: To investigate dietary and metabolic risk factors involved in the pathogenesis of bladder stones in children of below ten years age.

Study Design: Case control study

Place and Duration of Study: This study was conducted at the Biochemistry and Surgery Departments, Isra University, Hyderabad from January 2011 to December 2011.

Materials and Methods: Thirty four children with bladder stones admitted for treatment in the pediatric surgery unit, Liaquat Medical College Hospital Jamshoro during 6 months and 30 normal controls were examined. Information regarding diet and dietary habits of the subjects were obtained through standard questionnaire developed for that purpose. Biochemical aspect of bladder stone disease was studied by measuring creatinine, urea, uric acid, sodium, potassium, calcium, magnesium, phosphate, chloride and bicarbonate levels in serum samples of bladder stone patients and control subjects.

Results: The results of present study show that although, average intake of water and milk by patients and control subjects were comparable, majority (73.5%) of the bladder stone patients admitted to drink water when they felt thirsty, contrary to control subjects who used to take water at regular intervals.

The mean tea intake by bladder stone patients was significantly ($P < 0.05$) greater than that of the control subjects. Same was true for the intake of green leafy and seedy vegetables ($P < 0.05$).

From the blood parameters measured in bladder stone patients and control subjects, the levels for potassium, magnesium and phosphate were found to be significantly ($P < 0.05$) higher in bladder stone patients compared to control subjects, whereas reverse was true for creatinine, chloride and bicarbonate levels.

Conclusion: Children with bladder stones were noted to have serum creatinine levels significantly lower than the control subjects. Their dietary and fluid intake habits were also found to be quite different from that of the control subjects. These observations suggest that malnutrition and poor dietary habits are the major risk factors involved in the pathogenesis of childhood vesicallithiasis at Hyderabad-Sindh.

Key Words: Vesicallithiasis, Bladder stones, Dietary risk factors, Metabolic risk factors

INTRODUCTION

The urinary stones are composed of crystalline constituents and organic matrix.^{1,2} Childhood vesicallithiasis is a very common urological finding in Hyderabad (Sindh) and adjoining areas^{1-3,16,17}. From antiquity to the early twentieth century American and European children were also prone to develop endemic bladder stones^{4,5,16}. However, at the turn of the twentieth century these stones become nihilistic in European children. The disappearance of endemic bladder stones in European children had been linked with improvement in the diet and hygienic conditions of the population^{6,7}. However, this observation lacked biochemical proof of its precise nature. One thing which is quite obvious is that genesis of the endemic bladder stones in children in Pakistan could be

prevented if dietary and metabolic causes of their formation are ascertained. Thus by properly addressing the risk factors involved in the causation of endemic bladder stones in children, this disease can also be effectively eradicated from Pakistan.

MATERIALS AND METHODS

Thirty four bladder stone patients (26 males and 8 females) with ages ranging from 1-10 years age and thirty controls (21 males and 9 females) matched for age and gender and with no personal or family history of bladder stones were included in the study, after getting informed consent in Urdu/Sindhi from one of their parents.

The ethical approval of the study was granted by the ethical committee of Isra University. Information regarding diet and dietary habits of bladder stone

patients and control subjects were obtained through standard questionnaire developed for that purpose. Serum creatinine, uric acid and calcium levels were determined by using MERCK micro lab 300LX; Inorganic phosphate and urea levels by Automatic analyzer A25; potassium, sodium, chloride and bicarbonate levels by Electrolyte 4 Analyzer (Nova Biomedical); while magnesium by Perkin Elmer Analyst 700 atomic absorption spectrophotometer.

RESULTS

Table 1 shows comparison of age and weight between children with bladder stones and controls. The age range for both cases and controls were 1-10 years. The mean age for cases (4.48 ± 2.69) and controls (5.23 ± 2.95) were comparable. Similarly no significant difference ($P > 0.05$) was seen in the mean body weights of bladder stone patients and control subjects.

Table No.1: Comparison of age & weight between bladder stone patients and control subjects.

Characteristics	Bladder stone patients (n=34 26 ♂ & 8 ♀)	Control subjects (n=30 21 ♂ & 9 ♀)	P. Value
	Mean \pm S.D	Mean \pm S.D	
Age (years)	4.48 ± 2.69	5.23 ± 2.95	0.35
Weight (Kg)	13.23 ± 5.66	15.72 ± 7.04	0.13

Table 2 shows comparison of serum variables between bladder stone patients and controls. Bladder stone patients in comparison to control subjects had significantly higher ($P < 0.05$) serum potassium, magnesium and phosphate levels, whereas reverse was true for serum creatinine, chloride and bicarbonate levels. Interestingly, the mean serum creatinine concentration in bladder stone patients was found to be lower than the lower normal limits for creatinine.

Comparison of socioeconomic status and of average fluid intake between bladder stone patients and control subjects are shown in Tables 3 and 4 respectively. Although, the subjects of the two groups were comparable with respect to socio-economic status, they were considerably different in their dietary and fluid intake habits. Bladder stone patients in comparison to control subjects had high intake of tea, green leafy and seedy vegetable and less intake of animal protein. Water drinking habits of bladder stone patients and control subjects (Table 5) disclosed that majority (73.5%) of the bladder stone patients admitted that do not drink water at regular intervals, and only take water when they feel thirsty. On the contrary, control subjects used to drink water at regular intervals.

Table No.2: Comparison of serum variables between bladder stone patients and control subjects.

Variables in serum	Bladder stone patients (n=34)	Control subjects (n=30)	P. Value
	Mean \pm S.D	Mean \pm S.D	
Creatinine (0.7-0.9 mg/dl)	0.59 ± 0.21	0.89 ± 0.38	0.001
Urea (11-36 mg/dl)	24.27 ± 8.44	21.50 ± 5.93	0.07
Uric acid (2-7 mg/dl)	3.21 ± 0.91	3.74 ± 1.59	0.06
Sodium (135-148 mmol/L)	141.53 ± 5.00	142.37 ± 5.97	0.28
Potassium (3.5-5.8 mmol/L)	5.60 ± 1.40	4.75 ± 1.24	0.006
Calcium (1.2-1.4 mmol/L)	1.99 ± 0.36	2.09 ± 0.19	0.08
Magnesium (0.7-1.00 mmol/L)	1.26 ± 0.59	0.89 ± 0.35	0.001
Phosphate (1.16-1.81 mmol/L)	1.94 ± 1.20	1.27 ± 0.44	0.02
Chloride (98-105 mmol/L)	100.53 ± 6.02	102.73 ± 4.39	0.05
Bicarbonate (18-25 mmol/L)	18.07 ± 3.25	19.47 ± 2.99	0.04

*P value is calculated by using Students "t" test. $P < 0.05$ is considered statistically significant

Table No.3: Comparison of socio-economic status between bladder stone patients and control subjects.

Socio-economic	Bladder stone patients (n=34)	Control Subjects (n=30)	P. Value
Poor	31 (91.2%)	27 (90.0%)	0.60
Affordable	03 (8.8%)	03 (10.0%)	

*Chi-square test applied to calculate P. Value

Table No.4: Comparison of average fluid intake between bladder stone patients and control subjects

Fluid intake	Bladder stone patients (n=34)	Control subjects (n=30)	P. Value
	Mean \pm S.D	Mean \pm S.D	
Average water intake (ml)	590.62 \pm 280.75	648.75 \pm 272.21	0.40
Average tea intake (ml)	430.00 \pm 200.34	240.38 \pm 142.14	0.05
Average milk intake (ml)	120.59 \pm 108.09	123.33 \pm 131.78	0.926

*P. Value is calculated by using Students "t" test.

Table No.5: Comparison of frequency of water drinking habits between bladder stone patients and control subjects.

Frequency of water drinking	Bladder stone patients (n=34)	Control subjects (n=30)	*P-value
Regular interval	9 (26.5%)	18 (60%)	0.004
When feel thirsty	25 (73.5%)	12 (40%)	

*Chi-square test applied to calculate P. Value.

DISCUSSION

The majority of the bladder stone patients in present study were males. This observation is in agreement with the published reports for Pakistan and other developing countries where this disease is endemic⁸⁻¹¹. The examination of various organic and inorganic constituents in serum samples of bladder stone patients and control subjects disclosed that bladder stone patients had significantly higher levels for potassium, magnesium, and phosphate and lower levels for creatinine, chloride and bicarbonate than did the control subjects. The mean values for creatinine in bladder stone patients were even lower than the lower normal

limits for creatinine. This suggests that the kidneys of the bladder stone patients are functioning normally and that the only reason for their low levels of creatinine could be their lower muscle mass. This is also supported by the finding that bladder stone patients had lower body weights as compared to control subjects. This situation is closely related to a diet poor in animal protein. However, animal protein deficiency may not be the only dietary risk factor. This is suggested because of the absence of bladder stones in communities living in equally poor economic circumstances and presumably as short of animal protein. Thus, it has been proposed that a diet low in animal protein, calcium and phosphate and high in oxalate is associated with the development of bladder stones in children¹²⁻¹⁴.

Present study has demonstrated that increased intake of tea (a rich source of oxalates) during early ages is one of the most important risk factors identified in bladder stone patients. The other variables which differed between cases and controls were drinking water habits of the two groups. Bladder stone patients used to drink water most often when they felt thirsty. On the contrary, control subjects used to take water at regular intervals. This is important for voiding of crystals that form in the urinary system.

Thus, a dietary advice to increase the intake of both animal protein and milk, and decrease the intake of oxalate rich foods including tea along with regular frequent intake of water is hoped to decrease the chances of occurrence as well as recurrence of bladder stones in children in this area.

CONCLUSION

In the light of above discussion, it can be concluded that a dietary advice to increase the intake of milk and animal protein and decrease the intake of tea and seedy and leafy vegetable diet along with regular intake of fluids (to avoid dehydration or over-saturation of urine) might provide a good protection against the bladder stone disease in children in this area.

REFERENCES

1. Khaskheli MH, Sherazi STH, Ujan HM, Mahesar SA. Transmission FT-IR spectroscopic analysis of human kidney stones in the Hyderabad region of Pakistan. *Turk J Chem* 2012;36: 477-483.
2. Channa NA, Ghangro AB, Soomro AM, Noorani L. Analysis of kidney stones by FTIR spectroscopy. *JLUMHS* 2007;6(2):66-73.
3. Samo MJ, Khard TU, Memon JM, Khand FD, Ansari AF. The epidemiology and chemical composition of urinary stones: a study at the Liaquat Medical College Hospital, Jamshoro. *Pak J Med Sci* 1995;12 (1):61-7.
4. Sierakowski R, Finlayson B, Landes RR, Finlayson CD, Sierakowski N. The frequency of Urolithiasis

- in hospital discharge diagnosis in the United States. Invest Urol 1978; 15: 438-41.
5. Juuti M, Heinonen OP. Incidence of urolithiasis leading to hospitalization in Finland. Acta Med Scand 1979; 206: 397-403.
 6. LETT H. Urinary calculus with special reference to stone in the bladder. Brit J Urol 1936; 8: 205-32.
 7. Thomas JMR. Vesical calculus in Norfolk. J Urol 1949; 21:20-23.
 8. Aurora AI, Taneja OP, Gupta DN. Bladder stone disease of childhood: An epidemiological study. Acta Paediat Scand 1970; 59: 177-84.
 9. Thault K, Rizal A, Brockis JG, Bowyer RC, Taylor TA, Wisniewski ZW. The endemic bladder stones of Indonesia: Epidemiology and Clinical features. Brit J Urol 1976; 48: 617-21.
 10. Halstead SB. Etiological factors in urinary bladder. In: Van-Reen R, editor. Studies on the epidemiology of idiopathic bladder stone disease. DHEW Publication: NIH USA; 1977.p.77-1063
 11. Naqvi SAN, Rizvi SAN, Shahjehan S. Bladder stone disease in children: Clinical studies. J Pak Med Assoc 1984; 34: 94-101.
 12. Khand FD, Ansari AF, Khand TU, Memon JM. Incidence and chemical composition of urinary calculi in children. Pak J Biochem 1994; 27 (1-2): 69-80.
 13. Valyasevi A, Dhanamitta S. A general hypothesis concerning the etiological factors in bladder stone disease. In: Van-Reen R, editor. Idiopathic Urinary Bladder Stone Disease. DHEW Publication No. (NIH) 77-1063, USA 1977: 345-62.
 14. Valyasevi A, Dhanamitta S, Wathanakasetr S. Prevention of bladder stone disease: Preliminary results. In: Van-Reen R, editor. Idiopathic Urinary Bladder Stone Disease. DHEW Publication: No. (NIH) 77-1063 (USA);1977.p.345-62.
 15. Brockis JG, Bowyer RC, McCulloch RK, Taylor TA, Wisniewski ZS, Kamardi T, et al. Physiopathology of endemic bladder stones. In: Brockis JG, Finlayson B, editors. Urinary calculus. Lettleton PSG Publishing; 1981.p. 225-236.
 16. Mc Carrison R. A lecture on the causation of stone in India. Brit Med J 1931; 1009-15.
 17. Ilahi MA. Urinary calculi-Their incidence and distribution in the urinary tract. Medicus 1967; 34: 149-56.

Address for Corresponding Author:**Dr Haji Khan Khoharo**Faculty of Medicine & Allied Medical Sciences,
Isra University, Hyderabad
Cell No.: 0331-2662500

CORREGENDUM

Captions of figures of article titled "The Effects of Monosodium Glutamate on the Histology of Fallopian Tube in Female Rats" published in Med Forum Volume 25 No.1, January 2014 at Pages 76-79 have been printed wrongly due to typographical mistake which may be read as under:-

Figure No. 1: Micrograph of cross section of fallopian tubes of control group (Group A) Hematoxylin & Eosin staining. (Magnification at x400).

Figure No. 2: Micrograph shows the cross section of the fallopian tubes of treatment group (Group B) that received 1.5mg/kg Hematoxylin & Eosin staining. (Magnification at x400). Atrophic and degenerative changes, cellular hypertrophy and cellular vacuolation are visible.

Figure No. 3: Micrograph shows the cross section of the fallopian tubes of treatment group (Group C) that received 3mg/kg Hematoxylin & Eosin staining. (Magnification at x400). Atrophic and degenerative changes, cellular hypertrophy and cellular vacuolation seen. Lysed red blood cells are visible

Editor