



Original Research Article

RISK FACTORS ASSESSMENT FOR THE PRIMARY VESICAL STONES AMONG THE CHILDREN IN LOCAL POPULATION: A CROSS-SECTIONAL STUDY

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Abstract: Introduction: The origins of stone disease can be traced to the ancient Egyptian era. Stones affecting the urinary bladder usually constitute 5% of the total disease burden. Although the prevalence of bladder stones has markedly declined in Europe/America recently, it remains prevalent in developing countries, including Pakistan.

Materials and methods: We gathered data retrospectively from the files of children. We performed comprehensive interviews during history taking about the child's water consumption, the amount and type of milk administered, and the types of food provided. **Results:** We admitted 210 children with the diagnosis of primary vesical stones. Ages ranged from 1 to 14 year. Children in group A were 141 (67.14%) and in group B were 69 (32.86%). Of the total, 170 (80.95%) children were male while 40 (19.05%) children were female. The size of the stones ranged from 7 mm to 28 mm, with a mean size of 17 mm. The majority of patients, 190/210 (90.47%) were from rural regions. Within the group A, 127 (90.07%) children were having risk factors while in group B, 4 (5.80%) children were risk factors positive. Weaning started at 7 to 8 months, during which wheat bread, tea, and potatoes were added to the child's diet. As the children aged, their diet was supplemented with pulses and vegetables. We also observed that 70% of children were not using adequate amount of water. **Conclusion:** Bladder stones in children are influenced by multiple factors. Significant risk factors include dehydration, inadequate protein intake, and a diet low in phosphate.

Keywords: Primary vesical stones; Children; Pakistan; Risk Factors.

INTRODUCTION

Background: The condition of urinary stones, commonly referred to as nephrolithiasis has been recognized since the era of ancient Egypt. This disease affects different races differently, and America, its prevalence ranges from 1% to 15%.¹ Stones in the urinary bladder make up about 5% of

the disease load. In areas where the disease is common children are particularly at high risk for developing bladder stones.² Urinary bladder stones were highly prevalent in Europe, Urinary bladder stones were highly prevalent in Europe affecting approximately 80% of individuals during the nineteen and twentieth centuries but are now relatively uncommon. Likewise, the

prevalence of urinary bladder stones has decreased in America in recent years. The incidence of increased in economically disadvantaged countries, such as those in North Africa, Indonesia, and India. This health issue is also widespread in the Middle East, certain nations within Southeast Asia. In these areas, boys are more likely to be affected than girls, and this condition usually peaks around age 5 in adults, the bladder stones are primarily made up of uric acid.

A less common type of bladder stone is the mixed type, this includes calcium oxalate ammonium urate or phosphate, the calcium phosphate, and is typically associated with urinary tract infections. In pediatric cases, bladder stones predominantly consist of calcium oxalate and ammonium urate, frequently combined with calcium phosphate. In pediatric cases bladder stones predominantly consist of calcium oxalate and ammonium urate frequently combined with calcium phosphate. In these endemic areas, the more contributing factors include infant feeding practices that consist of mother's milk combined with polished rice and vegetables. The consumption of these foods, which are low in phosphorus is associated with more ammonia excretion in the urine. These foods are characterized by lower animal protein content, contributing to hypocitraturia, there are also rich in oxalates as found in vegetables, leading to elevated oxalate excretion. The exact mechanisms underlying the pathogenesis are not fully understood, but it is considered to be multifactorial. The increased prevalence observed in hot and arid climates the likely attributable to dehydration. The prevalence of this condition is more in malnourished children who have a low body mass index (BMI).

In both India and Pakistan, there is also a link between in vegetarian diet and the formation of idiopathic bladder stone. As we have discussed, deficiencies in diet or nutrition contribute to stone formation. The diet of these children mainly consists of mother's milk, cereals and vegetables like potatoes, which are low in phosphorus.

Additionally their intake of cow's/buffalo's milk is minimal, leading to a deficiency in animal protein. In our regions, wheat flour, rice, and millet are the primary cereals used.

Animal-origin protein accounts for less than 25% of the overall protein consumption in our countries. Due to the hot climate in our regions, dehydration is common, which heightens the risk of stone formation. Children often present with vague lower abdominal pain, a mix of lower urinary tract symptoms, and discomfort involving pulling in the penis.

Some children may have sudden disruptions in urination, and others with small bladder stones might present with acute urinary retention, which occurs when the stone

migrates and becomes lodged in the urethra. Surgery for primary vesical stones rarely leads to recurrence. This study seeks to determine the risk factors associated with primary vesical stones formation within our population. It will facilitate future education efforts, helping our community to adopt preventive measures.

MATERIAL AND METHODS

2.1 Design, Setting, Duration, Population & Sampling:

This multicenter retrospective cross-sectional study was performed at Gomal Medical College, DHQ Hospital D.I. Khan. Nishter medical university Multan & Bakhtawar amin medical and dental college, Multan. With ethical clearance obtained from MTI GMC Dera Ismail Khan, Pakistan (letter No.205/GJMS/JC/2024). We carried out a retrospective study on patients admitted in urology ward over the period from January 2024 to December 2024. We calculated our sample size of 210 patients by an online calculator Raosoft. We used convenience sampling method in our study. The inclusion criteria was children with and without primary vesical stones i.e. the stones that form in the bladder without any obstruction, infection and neurogenic bladder dysfunction. Our exclusion criteria was adults, patients who have stones secondary to infection or bladder outflow obstruction. Similarly patient who have neuropathic bladder dysfunction were also excluded from the study. After obtaining the informed consent, we gathered retrospective data including the child's age, gender, address, breastfeeding duration, age at which weaning began, types of food introduced after weaning (cereals, vegetables, proteins), milk type (cow or buffalo), amount of milk and water intake. Other factors such as vaccination status, the child's growth and weight, any history of recurrent diarrhea or chest infections and the family's socioeconomic status were also inquired. A detailed diagnostic workup was conducted for the patient. Subsequently, treatment involved vesicolithotomy for the larger stones and ureteroscopic surgery (URS) with intracorporeal lithotripsy for smaller stones.

2.2 Conduct of procedure: We conducted a retrospective data collection by reviewing the files of the children admitted in the urology ward in the above mentioned period.

2.3 Data Collection and Analysis Plan: We analyzed all the gathered data in detail. Demographic data (sex: male or female) and information on risk factors of primary vesical stones (yes or no) in the two groups were displayed as frequency counts and percentages. Means and standard deviations were used to present the quantitative data, including age (in years) and stone size.

RESULT

A total of 210 admitted children in the Urology Department with ages ranged from 1 to 14 year were evaluated. We divided the children into two groups according to the presence of primary vesical stones, group A containing children with primary vesical stones and group B containing children without primary vesical stones. Children in group A were 141 (67.14%) and in group B were 69 (32.86%). Of the total, 170 (80.95%) children were male while 40 (19.05%) children were female. The size of the stones ranged from 7 mm to 28 mm, with a mean size of 17 mm. The majority of patients, 190/210 (90.47%) were from rural regions.

Within the group A, 127 (90.07%) children were having risk factors while in group B, 4 (5.80%) children were risk factors positive. The interviews

during history with the parents revealed that the duration of breastfeeding was generally between 12 and 15 months. The shorter duration of breastfeeding was attributed to the arrival of a second child. They commenced weaning at Seven to Eight months, but the quality of the food was compromised by their financial situation. The weaning diet mostly consisted of wheat bread (made of fine Aata), tea, and potatoes being added as well. With age, pulses and vegetables were introduced into the child's diet. Adequate amount of meat, eggs, and milk were missing in the diet of the children having risk factors positive. We investigated the amount of water the children drank daily and discovered that 147 (70.00%) were consuming insufficient amounts for their age and weight. Similarly malnourished 127 children (60.47%) patients exhibited anemia (Hb < 10 gm %).

Case	Control			Total	Chi square value	Degree of freedom	p-value
		Yes	No				
	Yes	127	14	141			
	No	04	65	69	4.500	1	0.0339
Total		131	79	210	Null hypothesis was rejected		

We performed vesicolithotomy in 97 patients while in 44 patients stones were broken by using URS and an intracorporeal lithotripter. We conducted regular follow-ups to track post-operative complications and the recurrence of stones. The post-operative complications were as follows: wound infection in 10 patients, hematuria lasting 48 hours in 2 patients, and urinary retention in 3 patients after catheter removal. During the one to two years of follow-up, our study found no evidence of stone recurrence.

DISCUSSION

In our area, there have been no studies examining the etiology of primary vesical stones disease. According to our study, 67.14% of the children were below 7 years of age. The study of Rizvi et al.'s results were consistent with our findings, in their study the children with primary vesical stones 64% were younger than 5 years old. In our study, 80.95% children were male and 19.05% children were female. Our study results are consistent as the study conducted by Huffman et al. Similarly, Banner et al. reported that males (boys) are more frequently affected by primary vesical stones than females (girls) in endemic regions. Children with bladder stones most often came to the OPD with painful urination and occasionally to the emergency department with critical urinary retention. A significant 90.47% of our patients are from rural backgrounds with low socioeconomic status, which contributes to prevalent issues of protein malnutrition and low phosphate intake. The occurrence of vesical stones in children is slowly decreasing, even in endemic area. This trend is due to improved nutrition, increased water intake, and greater public awareness of the problem's causes. Although this disease was highly prevalent in the West during the 19th and 20th centuries and has become rare in recent times, it continues to be common in our region, as demonstrated by our

study. This improvement is due to increased public awareness of children's nutrition and better hydration resulting from improved socioeconomic conditions (Hussain et al).

Research conducted in 2001 indicated that endemic bladder stones occur more frequently in rural and lower-income areas compared to more affluent and educated urban residents in this country.

Our study found that 90.47% of children were from rural and economically deprived backgrounds, with only <10% from urban areas. These findings align with those reported by Hussain et al. The primary health concerns in our country are protein malnutrition, repeated bouts of diarrhea resulting in the dehydration, inadequate water consumption, recurrent chest infections, low socioeconomic status and general unawareness.

Routh et al. (20) demonstrated that the frequency of stone disease in children was not studied using a population-based approach, and case reports from institutions show regional variations.

Hussain et al. (21) showed a high prevalence of stone disease, and recent trends suggest a shift in the illness pattern. According to Routh et al. (20), the frequency

of stone disease in children was not examined through a population-based study. Additionally, case reports from different institutions reveal regional variations. The variations in primary vesical stones observed in our study across different regions and institutions are consistent with the findings reported by Routh et al.

Waheed et al. (22) found that a low intake of water and fluids causes urine to become concentrated, which significantly increases the risk of stone formation. In our study, 90.47% of the patients lived in rural and remote areas, where clean drinking water is not readily available.

Stone formation in children can result from a diet lacking in adequate amounts of proteins, vitamins, and phosphates. According to our study, approximately 90% of the children were found to be malnourished, and only <10% were consuming a balanced diet. About 70% of the children consumed less water than the required amount. The risk factors we observed in our study are similar to those outlined by Rizvi et al. and corroborated by various other studies in the literature. Rizvi et al. (24) reported a decrease in the prevalence of bladder stones over time. The occurrence of bladder stones was 60% in the 1980s, decreasing to about 15% after a 10-year period. This change can likely be attributed to enhanced awareness regarding the disease's causes and the provision of well-balanced diets to children. Our results are consistent with those of Lal et al. (25), who, in their 2015 study from Mithi, Sindh, observed a zero rate of bladder stone recurrence.

CONCLUSION

Our findings lead us to conclude that the formation of primary vesical stones in children is influenced by multiple risk factors. Important factors are dehydration, low protein diet and diet deficient in phosphate contents. Educating the population in our region about these risk factors is essential for preventing the high prevalence of this disease. To address the high occurrence of this disease, it is crucial to educate people in our region about the relevant risk factors.

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