

Causes of the Primary Urinary Bladder Stones in Children and their Prevention in Population of Dera Ismail Khan, KPK, Pakistan

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ABSTRACT

Introduction: History of the stone disease dates back to ancient Egyptian era. Stones involving the urinary bladder are usually 5% of the disease burden. In the Europe and America prevalence of primary bladder stones is decreased significantly in the recent era but it is still common in developing nations including Pakistan.

Materials and methods: We retrospectively collected the data from the parents of the affected children during the follow up. We took the detailed interview regarding the amount of water used by the child, amount and type of milk given and type of food given to the child.

Results: We were operated 148 children with the bladder stones in the department of urology DHQ-TH D.I. Khan. There were 117 (79.05%) boys and 31 (20.94%) girls. The children below the 5 years of age were 101 (68.24%). 139 (94%) of the patients belonged to the rural areas of the D.I. Khan. There were 132 (89.19%) children those were malnourished. The duration of breast feeding was approximately 12 to 15 months. They started the weaning at 7–8 months with the wheat bread and tea and also added the potatoes in the diet. With increasing age they added the pulses and the vegetables. Only 10.81% of the parents given the child meat, eggs and milk in the diet. 104 (70.27%) of the children were dehydrated.

Conclusion: The risk factors for primary bladder stones in the children are multifactorial. Important factors are dehydration, low protein diet and foods deficient in phosphate contents.

Keyword: Primary Bladder Stones; Children; Pakistan; Risk Factors.

INTRODUCTION

History of the stone disease involving the urinary system is one of the common diseases that date back to ancient Egyptian era with different prevalence in different races and in America it is between 1 and 15%.¹ Stones involving the urinary bladder are usually 5% of the disease burden. In the endemic regions the high risk populations are the children for developing the bladder stones.² Endemic or primary urinary bladder stones are that which form without any obstruction, infection or neurogenic disease involving the bladder.³ Till the nineteenth and the twentieth century urinary bladder stones occurred very frequently in the Europe but rare now a days.⁴ Similarly their prevalence also dropped significantly in the American the recent era.⁵ Their occurrence is now more common in the poor countries e.g. North Africa, Indonesia and India.⁶ It is also a common health problem in the Middle East and some other countries of South East Asia.^{7,8} In the above mentioned areas boys are more affected as compared to the girls and usually the peak occurs around the age of 5 years.⁹ The secondary bladder stones that occurs in the adults are mostly composed of uric acid. Less frequent type of bladder stones are of mixed type and are usually associated with the infection.¹⁰ In the children the stones are mainly composed of calcium oxalate and the ammonium acid urate or a mixture with the of the calcium phosphate.¹¹ The probable association in these endemic regions seems to be the feeding of the baby by mother's milk and polished rice and vegetables. These foods have low phosphorus contents which lead to increased ammonia excretion in the urine. These foods also have low animal proteins and also contain high oxalate contents as in the vegetables.¹² Exact pathogenesis is unclear but seems to be multifactorial.

In India and the Pakistan there is also an association between vegetarian diet and primary bladder stones. These children are primarily fed on the mother's milk, cereal based diet and vegetables containing the low phosphorus contents and deficient quantity of cow's and buffalo's milk have been included in the diets of these children.⁸ The cereals commonly used in our countries are wheat flour, rice and millet. In our countries the protein intake of the animal origin is <25% of the total protein consumption. Also the weather is hot in our areas that lead to dehydration. The objective of this study was to evaluate the risk factors of primary bladder stones in children of District Dera Ismail Khan, Pakistan.

MATERIALS AND METHODS

This was a retrospective cross-sectional study, conducted in the Department Of Urology, Gomal Medical College and DHQ T Hospital D.I. Khan from May 2019 to June 2021. After obtaining Ethical committee approval, we retrieved data of 148 children on the follow up in the OPD of our institute admitted with the Primary Bladder stones age <10 years of age treated with the vesicolithotomy (for larger stones) and URS with intracorporeal lithotripsy (for small stones). While patient with history of UTI and bladder outlet obstruction were excluded. Data including demographic features, clinical features, type and quantity of milk and previous history was retrieved retrospectively. Data from the parents of the affected children on the follow up in the OPD of our institute was collected regarding the amount of water used by the child, amount and type of milk given and type of food given to the child was conducted. All the collected data was analyzed by SPSS version 25.

RESULTS

We operated 148 children with the bladder stones in the department of urology DHQ-TH D.I. Khan. Age range is between 1 to 10 years (mean age 5.6±1.9 years). The children with the primary bladder stones below the 5 years of age were 101 (68.24%). There were 117 (79.05%) boys (male) and 31 (20.94%) girls (female). On the X-ray KUB there was a single radiopaque shadow in all the patients. Range of the size of the stone was 7mm to 38 mm, mean size of the stone was 19mm. Pre-operative 146 (98.64%) patients have a single stone in the urinary bladder. Only 2 (1.36%) patients had 2 bladder stones. We came to know that during operative procedure there was a single shadow i.e. overlapped.

139 (94%) of the patients belonged to the rural areas of the D.I. Khan. There were 132 (89.19%) children those were malnourished. We interviewed the parents for duration of breast feeding that showed approximately 12 to 15 months duration. It was of less duration because of having the birth of the second baby. They started the weaning at 7–8 months but with the wrong food due to poverty. They started mostly the wheat bread with the tea and also added the potatoes in the diet. As the child increased in the age they added the pulses and the vegetables. Only 10.81% of the parents given the child meat, eggs and milk in the diet. Milk

used was of the cow and goat commonly. We came to know that 104 (70.27%) of the children used less amount of water that was required by the child of that age and weight. Recurrent diarrhea (> 3 episodes per annum) was noted in 90 (61.81%) patients.

Mild anemia (Hb 8–10 gm %) was seen in 70 (47.30%) patients, moderate anemia (Hb 5–8 gm%) was seen in 29(19.59%) and severe anemia (Hb less than 5 gm %) was seen in 2 (1.35%) patients. We done vesicolithotomy in 101 (68.24%) patients while in 47 (31.75%) patients stone was broken with the URS and intracorporeal lithotripter.

We followed the patients regularly for any post op complications and recurrence of stone. Regarding post op complications wound infection occurred in 10 patients, hematuria for 48 hours in 2 patients and 3 patients went into urinary retention after the catheter removal. In our study no recurrence of stone was noted at one to two years of follow up.

DISCUSSION

In our region no studies have been conducted on the etiology of the primary bladder stone disease.¹³The results of our study show that 68% of the children were < 5 year age. Similar results were shown by the study done by Rizvi, et al.¹⁴ 64% of the children were < 5 years age having primary bladder stones.

Our study showed that 117(79.05%) children were male and 31(20.94%) was female. These are also comparable with the Huffman, et al.¹⁵and the Banner, et al.⁶ that males (boys) are affected greater than the females (girls) in the endemic regions by the primary bladder stones.

The children with the bladder stones most commonly presented to us with the painful urination and sometimes with acute urinary retention in the OPD and emergency respectively of DHQ-TH D.I.Khan. Our 94% of patients are of rural origin and belong to a poor socioeconomic origin and have protein malnutrition and low phosphate diets. Joseph, et al.¹⁶ demonstrated that occurrence of the primary bladder stones in the children is decreasing slowly even in the endemic regions. This is occurring due to the improvement in the nutrition and water intake and also the better awareness of people about the causes of the problem.

In the 19th and 20th century this disease was very prevalent among the west¹⁷ but rare now-a-days¹⁸, but in our region it is still common as shown by the results of our study.

This is because of public awareness about the nutrition of the children and better hydration due to improved socioeconomic conditions now. Hussain et al.¹⁹ in 2001 showed that primary bladder stones are more common in the rural and poor communities as compared to well educated people living in the cities of this country.

In our study 94% of the children belonged to the rural and poor population & only 6% were from the urban regions i.e. city similar to the factors described by the above study by Hussain et al.¹⁹Protein malnutrition, recurrent episodes of diarrhea resulting in dehydration, less amount of water given to the child, recurrent chest infections, poor socioeconomic status and the unawareness are main health issues concern our country.

Routh et al.²⁰ showed that the frequency of the stone disease in children was not done by a study based on a population. Case reports of institution have regional variations.

Hussain et al.²¹ demonstrated that prevalence of stone disease is high. Recently a change in the disease pattern has occurred. In 1980 76% of all stones were bladder stones but recently 85% of the patients have the renal stones. The results of our study also indicate that there are regional and institutional variation regarding primary bladder stones as shown by the studies of Routh, et al.²⁰ even in the twenty first century.

Waheed et al.²² demonstrated that low amount of water and fluids consumed by the patient leads to concentrated urine production and has a strong association with the stone formation. In the study we conducted has 94% patients belonging to the rural and far-flung areas in which most of the people don't have abundant clean drinking water.

A diet lacking in significant quantity of proteins and vitamins and phosphates results in stone formation in the children.^{7,23} In the study we conducted showed that 89.19% of the children were malnourished and only 10.81% have a proper balanced diet. Approximately 70% of the children used to drink less amount of the water than the required amount. The Risk factors we observed in our study are comparable with risk factors that were described by the Rizvi, et al.¹⁴ and the several other authors in the literature.^{8,11,12}

Similar to our results, Rizvi, et al.²⁴ showed that prevalence of bladder stones decreased with time. There were 60% cases of bladder stones in 80s which decreased to approximately 15% after 10 years. This is probably due to the people's awareness about the causes of the disease and provision of proper balanced diet to the children.

Similar to our results Lal et al.²⁵ from Mithi, Sindh in 2015 showed in their study that rate of recurrence of bladder stones was zero.

CONCLUSION

We conclude that the risk factors for the formation of primary bladder stones in the children are multifactorial. Important factors are dehydration, low protein diet and diet deficient in phosphate contents. It is recommended that people of our region should be educated about these factors in order to prevent the high prevalence of this disease.

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