videos before COVID [6]. Young children were also exposed to screen-based media for parental break as most parents were working from home and used screen based media as a tool to engage children. IAP screen time guidelines 2021 recommends that screen use should not be used as a way out for calming uncomfortable children by parents [1]. UNICEF recommends media use for positive outcomes like educational or socializing as a quality measure of screen use [7]. As per interactional theory of childhood problematic use (IT-CPU model), parents can play a crucial role in positive assumptions for quality of media use [5,8]. Parents can be an active mediator where they can discuss the media content with children or co-view with children where they can just be an observer or a restrictive moderator where they just restrict some unsuitable content [1,8]. It is important to regulate the use of screen-based media in children as increased usage is associated with psychological issues, abnormal eating patterns, sedentary lifestyle and excessive weight gain [9,10].

The main limitation of our study was the possibility of recall bias. We conclude that online classes among school going children and cartoons and YouTube videos in pre-school children were main reason for screen-based media usage. The usage of screen-based media needs to be regulated among children with parental supervision.

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Note: Additional material related to this study is available with the online version at *www.indianpediatrics.net*
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RACHNA PASI,[1] THIRUNAVUKKARASU ARUN BABU,[1]* LIMALEMLA JAMIR,[2] KUMAR SATISH RAVI[3]
[1]Departments of Pediatrics, and
[2] Community and Family Medicine, AIIMS, Mangalagiri, Andhra Pradesh;
[3]Department of Anatomy, AIIMS, Rishikesh, Uttarakhand.
**babuarun@yahoo.com*

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Diet, Fluid Intake, Urine Output and Urinary Sodium/Potassium Ratios in Children With Urolithiasis

We performed a cross-sectional study on 25 children (17 boys) with urolithiasis with normal glomerular functions at a tertiary care teaching hospital between March, 2018 to March, 2019. Dietary assessment showed that caloric intake was below recommended dietary allowance (RDA) in 68% patients while the median protein intake was 34.3% more. The fluid intake was below the recommended standards in 56%, and 48% of the children had urine output below 1.5 mL/kg/hour. The urinary sodium was elevated in 96% of the children, urinary potassium was low in 40%, and hypercalciuria was seen in 28%. While metabolic causes predominate in childhood urolithiasis, other factors like dietary changes, liberal fluid and low sodium intake are advised for prevention of recurrences as they have a contributory role too.

Key words: *Dietary assessment, Nephrolithiasis, Salt intake*.
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Childhood urolithiasis constitutes about 2-3% of all stone formers. Metabolic causes play an important role and also increase the risk of recurrence; hypercalciuria and hypocitraturia being the commonest causes (present in almost 34-97%) [1,2]. A diet rich in carbohydrates and animal proteins has been associated with an increased risk of urolithiasis in predisposed individuals. On the other hand ingestion of fresh fruits and vegetables and low salt diet has a protective role [3].

A liberal fluid intake is often recommended for preventing stone recurrences and urine output is a good way of assessing intake in presence of normal glomerular functions. Dietary assessments for sodium and potassium intake are often cumbersome and use of urinary sodium and potassium excretion as a surrogate appears to correlate well [4].

This cross-sectional study was done at a tertiary care teaching hospital between March, 2018-March, 2019. All new confirmed cases of pediatric urolithiasis between 2-18 years and old cases of urolithiasis, where specific therapies had been stopped for two weeks prior to evaluation were included in the

study after obtaining consent; the study was approved by the institute's ethical committee. Children with underlying tubulopathies, chronic kidney disease (CKD) stages 3 or more or those with secondary causes of stones were excluded.

The primary objective of the study was to assess the dietary intake of macronutrients (carbohydrates, fats, proteins), micronutrients (sodium, potassium, calcium, phosphate, oxalates), fluid intake and 24-hour urinary volume in children (2-18 years) with urolithiasis with normal glomerular functions. The assessment of 24-hours urinary electrolytes including urinary sodium/potassium (Na/K) ratios was the secondary objective.

A total of 25 children (17 boys) were enrolled; baseline information like age of presentation, symptoms at diagnosis, family history of stones, site of urolithiasis were recorded and detailed examination was done. A dietary assessment was done under the guidance of a skilled pediatric dietician; data from three 24 hours dietary recalls (2 of weekdays and 3rd on weekend) was taken over a span of one month. Each dietary assessment lasted for approximately 30-45 minutes and an average of the three dietary intakes was recorded. A software programme DIETSOFT (National Institute of Nutrition Standards, ICMR-2017) based on Indian diets was used for calculation of dietary components. These values were compared to standard charts for RDA and percentage intake of macronutrients and micronutrients was calculated.

The European Food and Safety Authority recommends use of 24-hour recall method on two non-consecutive days as the preferred methodology for fluid intake assessment [5]. Hence a diary was provided to the enrolled patients to record their fluid intakes which included water and any other beverages. This was done on two non-consecutive days over a 1-month span and an average of the two was taken. The fluid intake among children was compared to the standards given by the British Dietic Association (BDA), in the absence of Indian standards [6]. During the same period, 24-hour urinary volume collections were done; samples were sent for estimation of sodium, potassium, calcium and creatinine.

The data was compiled in an Excel sheet and analyzed using the SPSS v 25 software. Chi square test, Student *t*-test or one way analysis of variance was applied for comparisons, and *P* values <0.05 were considered significant.

Of the 25 children enrolled, 15 (60%) were already on follow up while 10 (40%) were newly diagnosed with urolithiasis. The median (IQR) age of the onset of the symptoms and enrollment were 8 (6,10) and 9 (7.5,11) years, respectively. Positive family history of urolithiasis was present in 48%; past history of surgical intervention was present in 20%. Cause of stone was established in 11 (44%) patients; 7 (28%) had hypercalciuria, 8% had hyperoxaluria, and 4% each had uric acid and triple phosphate stones.

The dietary assessment showed that median caloric intake was below RDA in 68% while protein intake was 34.3% more. Intake of sodium was more than the RDA in 72%, potassium intake was lower in 96% and both calcium and phosphate intakes were below RDA in 72% children.

When compared to the recommendations for fluid intake given by the BDA-2017, 14 children (56%) had an inadequate intake, with a low urine output (<1.5 ml/kg/hour) in 48% children. Urinary electrolyte estimation showed that urinary sodium was elevated in 96%, of the children while urinary potassium was low in 40%. Mean urinary Na/K ratio was 3.69 and an elevated ratio was seen in 72% of the participants; hypercalciuria was seen in 28% with median 24-hr urinary calcium excretion of 3.2 (1.98,4.1) mg/kg/d. Details of urine output and electrolytes are provided in **Table I**.

There has been an increase in the overall incidence and prevalence of urolithiasis in the last few decades, possibly due to changing lifestyle and dietary habits; in developed countries partly attributed to high animal protein consumption (3-5 times higher than the RDA). The median sodium intake of our patients was 1,873 mg/day (33.1% above the RDA) and overall intake was high; children between 4-8 years had a higher intake. These values were more than those reported from a previous study from Pakistan [9]. Positive correlation was seen between urinary sodium excretion and sodium estimated by dietary intake (r = 0.35; r^2=0.12). The National Academy of Science (USA) has reported that sodium intake in children between 6-11 years of age has increased from just 200 mg in the 1970's to around 3000 mg in year 2000 [10]. Dietary sodium restriction is an important preventive measure for recurrence of urolithiasis, especially in children with hypercalciuria [11]. Also, a high proportion of our children (96%) did not meet the RDA for potassium intake.

Table I Dietary Assessment, Urine Output and Urinary Electrolytes of Children With Urolithrasis (*N*=25)

Variable	*Value*
Daily intake of macronutrients (%RDA)	
Calorie intake	-12.7 (-32.8, 5.85)
Protein intake	34.3 (10.1, 67.45)
Fat intake	11.4 (-1.15, 31.85)
Daily intake micronutrients (% RDA)	
Sodium	+33.1 (4.3, 66.7)
Potassium	-53.9 (-75.6, -32.3)
Calcium	-23.5 (-47.1, 1.25)
Phosphorus	-14.3 (-37.2, 29.1)
Mean urine output	
<1 mL/kg/h	2 (8)
1 - 1.5 mL/kg/h	10 (40)
>1.5 mL/kg/h	13 (52)
24-hr urinary electrolytes	
Na (mEq/d)	66.7 (44.5,106.5)
K (mEq/d)	22.5 (17.15,26.4)
Ca (mg/kg/d)	3.2 (1.98,4.1)
Mean urinary Na/K ratio[a]	
<1	2 (8)
1.1-2	5 (20)
>2	18 (72)

All values in median (IQR) or [a]*no. (%).*

Calcium intake in adequate amounts has a protective role in the prevention of urolithiasis by binding to dietary oxalates; 72% of our children had calcium intake below the RDA. Hypercalciuria was seen in 28% children in this study and has been been reported in 34-97% of pediatric urolithiasis patients [1,2,9].

Assessment of fluid intake showed that as many as 56% of the children did not meet the criteria for adequate fluid intake; three-fourth of those between 4-8 years had an inadequate fluid consumption. Stone formers have a lower urine output when compared to the general population. The average urine output observed amongst our patients was 1.9 mL/kg/hour; 48% showed a low urine output (<1.5 mL/kg/hour). In a previous study on 220 American and 180 Brazilian children showed that 63% of American and 49% Brazilian children had a urine output that was less than 1 mL/kg/hour [12]. The mean urinary Na/K ratio in the present study was 3.69 (>2 in 72%), the normal ratio being two [4]. Patients with a higher urinary Na/K ratio are at a greater risk of developing nephrolithiasis [13].

A limitation of this study was a small sample size and lack of a control group. However, a major strength of the study was that multiple records for diet and fluid assessments were taken rather than a single 24-hour dietary recall, which provided a more reliable snapshot of dietary intakes. Urinary sodium/ potassium spot ratio appears to be a useful simple tool to assess dietary intake of these minerals and could be done at regular intervals to check dietary compliance of nutritional advice. However, more studies are required in future to confirm these findings.

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MUKTA MANTAN,[1*] RUCHI GOEL,[1] DEEKSHA GUPTA,[1] BHAWNA MAHAJAN,[2] MONIKA SETHI[3]
Departments of [1]Pediatrics, [2]Biochemistry and [3]Dietics, Maulana Azad Medical College and associated Lok Nayak Hospital and Govind Ballabh Pant Institute of Postgraduate Medical Education and Research, University of Delhi, New Delhi.
**muktamantan@hotmail.com*

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