Original Article

Kidney Diseases Screening for Asymptomatic School Children by Urine Dipstick Method

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Abstract

Background: Screening of urine is a useful tool to identify school children with renal diseases who are asymptomatic. A dipstick urinalysis screening was conducted on World Kidney Day to determine the kidney disease from asymptomatic school going children.

Methods: A cross sectional study was carried out in a secondary school in Kathmandu, Nepal. 579 asymptomatic children were enrolled. Morning mid-stream urine samples were obtained from students and tested by dipstick method.

Results: Seventy (12.08%) children had urinary abnormalities at the screening in the form of proteinuria, none had glycosuria. Urinary abnormalities were more common in females than in males. Children with hypertension were more likely to have proteinuria than normotensive children. Most positive results were detected in the age group 9-12 years. Body mass index had no correlation with proteinuria.

Conclusion: The study found that there is high burden of proteinuria (>12%) indicated asymptomatic urine abnormalities. Hence only early detection of renal disorders in childhood will lead to effective interventions and reduction in the number of individuals with renal disease.

Key words: Proteinuria, Dipstick method, Body mass index, glomerulonephritis

Introduction

Urinalysis is a simple, non-invasive and inexpensive laboratory test. However, it remains to be the cornerstone in the assessment of the renal dysfunction.

Screening programs for kidney diseases in healthy adults are performed in several countries. However, there is little information on such programs performed among children. Proteinuria and/or hematuria may be the only early signs of chronic renal disease or glomerular diseases like post infectious and membranoproliferative glomerulonephritis; IgA, membranous nephropathy. Hypertension and proteinuria are the factors that contributed to progressive renal deterioration in children with chronic kidney disease, as validated by several studies[1,2,3]. The screening of children may provide an early opportunity for the detection of these glomerulonephritis with possible early therapeutic intervention, and hence prevention of kidney diseases.

On the occasion of World Kidney Day, we conducted a cross-sectional study to examine the prevalence of abnormal urinary findings in asymptomatic children. A dipstick urinalysis screening was done to detect such prevalence among school children.

Methods

A cross-sectional study carried out on 579 students between ages of 9 and 16 years at a secondary school in Kathmandu, Nepal. On World Kidney Day in 2016, medical staff from Tribhuvan University Teaching Hospital set up screening stations at Bhanubhakta Memorial School, Kathmandu. The screening team included nephrologists, nephrology fellows and medical students.

Those apparently healthy students were screened for asymptomatic urinary abnormalities. None of the children had clinical evidence of kidney or systemic diseases.

The screening program staff used a standard form to collect data. All screening staff were instructed on how to read urine dipsticks and take blood pressure measurements prior to start of screening. Baseline data obtained from each participant included age, gender and personal and family history of diabetes mellitus or hypertension. Height (in centimeters) and weight (in kilograms) were measured and used to calculate body mass index (in kg per m^2). Systolic and diastolic blood pressures were measured with manual sphygmomanometers.

All students in this study were instructed to collect a sample of urine by voiding a mid stream urine specimen. Aseptic precaution was explained to them for collection of urine sample. A urinary dipstick test was performed on the collected urine for the presence of albuminuria and glycosuria. The results were decided by visual comparison of the test strip with a color chart provided on the bottle label.

Abnormal urinary findings were defined as the presence of albuminuria or glycosuria on dipstick method. The study population was divided into two groups, one with urinary abnormality and the other without.

Students and their teachers were informed about abnormal urinary findings and were advised follow-up in the hospital for further evaluation.

Statistical analysis

Statistical analysis was performed by using statistical package for social sciences (SPSS) version 20.0. Qualitative data were expressed as numbers and percentages (%). Comparison between data was performed by using the Chi-square test (X^2). A *p* value less than 0.05 was considered statistically significant.

Results

Demographic characteristics of children

A total of 579 students, who fulfilled the inclusion criteria between the ages 9 and 16 years were enrolled in the study. Among them 59.6% were males, and 40.4% were females. In the age-group 9-12 years, the proportion of boys and girls were nearly equal, whereas in the age group 13-16 years, boys constituted nearly two-third of the participants in the screening program as depicted in figure 1 and figure 2.

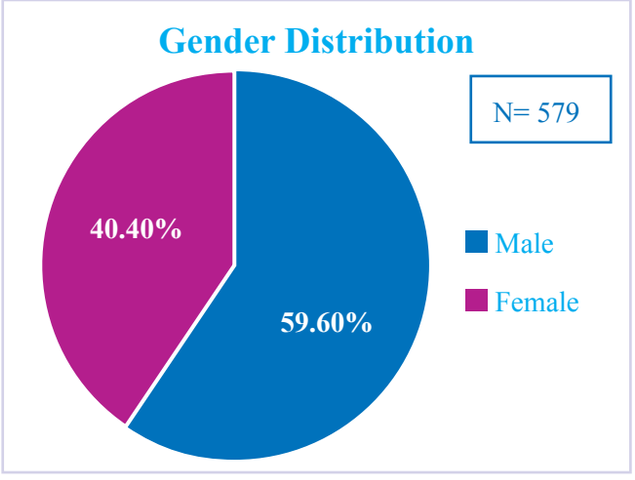

Figure 1 Gender distribution of the participating children

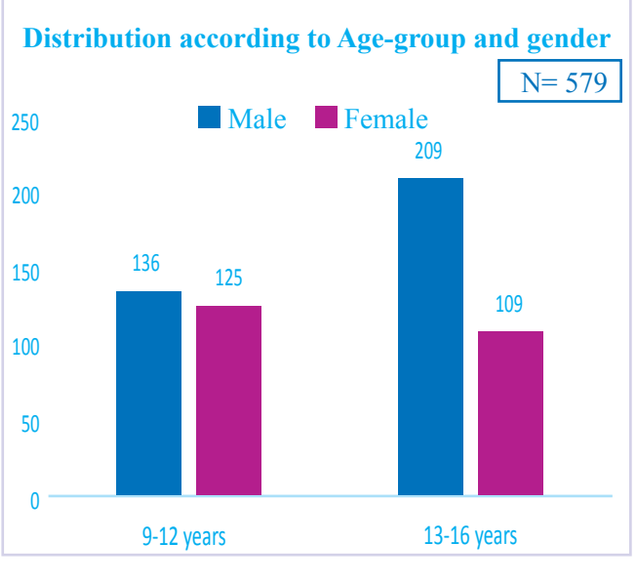

Figure 2 Age distribution of the participating children

Children and blood pressure

Fifty-two (9%) of the participating children had either their systolic BP, diastolic BP or both raised above the 95th percentile. More than three-fourth of the children with raised BP were from the age group 13 – 16 years as shown in table 1.

Table 1 BP according to gender and age

N = 579

		Raised BP	Normal
Gender	Male	31 (9.0%)	314 (91.0%)
	Female	21 (9.0%)	213 (91.0%)
Age Group	9 – 12 years	12 (4.6%)	249 (95.4%)
	13 – 16 years	40 (12.6%)	278 (87.4%)

Among children with raised BP, 30 children had their systolic BP, 11 had their diastolic BP and 11 had both systolic and diastolic BP above the 95th percentile.

Children and body mass index

Thirty-one children had their BMI above the 95th percentiles. More than 5% each of boys and girls were overweight, while more than 80% of the overweight children were from age group 13 – 16 years as depicted in table 2.

Table 2 BMI according to gender and age

N = 579

		Overweight	Normal
Gender	Male	18 (5.2%)	327 (94.8%)
	Female	13 (5.6%)	221 (94.4%)
Age Group	9 – 12 years	6 (2.3%)	255 (97.7%)
	13 – 16 years	25 (7.9%)	293 (2.1%)

Children and proteinuria

Seventy (12.08%) children had proteinuria. Urine abnormalities were more prevalent and significant in females as compared to males (p = 0.00) as shown in table 3.

Table 3 Proteinuria according to gender

Gender	Present	Absent	p-value	Unadjusted OR (95% CI)
Male	29 (8.4%)	316 (91.6%)	0.001*	0.43 (0.26 – 0.72)
Female	41 (17.5%)	193 (82.5%)		

** significant at p<0.05*

The age group 9 – 12 years had higher number of children with proteinuria (13.0%) as compared to the age group 13 – 16 years (11.3%) as depicted in table 4.

Table 4 Proteinuria according to age-group

Age-group	Present	Absent	p-value	Unadjusted OR (95% CI)
9–12 years	34 (13.0%)	227 (87.0%)	0.53	1.17 (0.71 – 1.93)
13–16 years	36 (11.3%)	282 (88.7%)		

Body Mass Index of children was not significantly associated with the presence of proteinuria in this study as depicted in table 5.

Table 5 Comparison of BMI & proteinuria

BMI	Present	Absent	p-value	Unadjusted OR (95% CI)
Normal	65 (12.1%)	472 (87.9%)	0.97	1.02 (0.30 – 2.7)
Overweight	5 (11.9%)	37 (88.1%)		

The raised blood pressure in children was significantly associated with the presence of proteinuria in this study. The children with raised blood pressure were twice likely to have proteinuria than normotensive children (OR=2.13, CI: 1.04 - 4.37) as shown in table 6.

Table 6 Comparison of BP & Proteinuria

BP	Present	Absent	p-value	Unadjusted OR (95% CI)
HTN	11 (21.2%)	41 (78.8%)	0.04*	2.13 (1.04 – 4.37)
Normal	59 (11.2%)	468 (88.8%)		

* significant at p<0.05

None of the participants had glycosuria detected by dipstick method.

Discussion

In our study the prevalence of urinary abnormalities detected by first dipstick test was 12.08%. It was lower than those found by of Plata et al. who screened 14082 Bolivian students and reported that urinary abnormalities were detected in 30.3[4]% and other authors[5,6]. We found it to be higher than those of Bakr et al. who screened 1670 students in Dakahlaia and reported a prevalence of 1.3%[7], and those of Shajari et al. in Iran who reported a prevalence of 4.7%[8]. A lower prevalence rate of 0.12% - 3.56% was reported by studies from Malaysia[9] and Japan[10]. These studies evaluated the presence of

hematuria too which was not included in our study and is likely to detect even more children with urinary abnormalities if hematuria is also evaluated.

Females significantly had more proteinuria than males. This was similar in findings to those found by Park et al[11] and Oviasu et al[12] but opposite to the findings by Lin et al[13].

This study found an association between blood pressure and proteinuria. The children with raised blood pressure were twice as likely to have proteinuria as children who were normotensive. This likely points an etiology of proteinuria to glomerulonephritis or chronic kidney disease. The proportion of children with raised blood pressure was significantly higher than found by Anand et al[14]. This might be due to a single BP recording in our study and proportion of children with hypertension might be lower if repeated measurements are taken.

High BMI was found in five percent in children of both gender in our study. It was similar to the study found by Ogden et al[15,16,17]. Our study found no association between BMI and proteinuria. It was in contrast to findings by some authors who found that children with higher BMI were more likely to have proteinuria than with normal BMI.

Conclusion

We concluded that dipstick urine screening is the simple and feasible method for diagnosis of urinary abnormalities in asymptomatic children. It might help in early detection of kidney diseases and early intervention might lead to prevention of progression of the disease. We suggest that routine urinalysis should be part of screening of children at the school entry in Nepal, and that further follow-up should be offered to determine the exact etiology of any abnormal finding.

Conflict of Interest: None declare

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