Asymptomatic urinary abnormalities among primary school children in Egypt

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Background: **Mass urinary screening is a useful way to detect the prevalence of renal diseases and to improve its outcome. This study was undertaken to detect the prevalence of asymptomatic urinary abnormalities among primary school children in Egypt.**

Methods: **A total of 1670 healthy children were included in this study. Urinary screening was performed with the dipstick method.**

Results: **Twenty-two children (1.3%) had urinary abnormalities at the first screening and only 12 (0.72%) had urinary abnormalities at the second screening. Of the children who had urinary abnormalities, 6 (0.36%) had isolated hematuria (IH), 2 (0.12%) had isolated proteinuria (IP) and 4 (0.24%) had combined hematuria and proteinuria (CHP). Renal biopsy was performed on 4 children (2 with CHP, 1 with IH and 1 with IP). Post streptococcal acute glomerulonephritis (PSAGN) was identified in 3 of the 6 IH children, hypercalciuria and renal stone in 2, and no abnormality in 1. One of the IP children had orthostatic proteinuria and the other had focal segmental glomerulosclerosis. The pattern of renal diseases in CHP children was PSAGN in 2, diffuse mesangial proliferation in 1 and IgA nephropathy in 1.**

Conclusions: **Asymptomatic urinary abnormalities were detected in a small number of primary school children in Egypt and PSAGN was the leading cause for these abnormalities. Only 3 children had evidence of chronic kidney disease. The study raises question about the cost-benefit ratio for the national implementation of the urine screening program.**

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Introduction

Urinalysis, a simple and inexpensive test, remains to be a cornerstone in the evaluation of the kidney. It can be easily employed in screening of renal abnormalities. Several urinary screening programs have been carried out using reagent strips, and their effectiveness in detecting urinary abnormalities at relatively low cost.[1,2] Mass urinary screening helps to determine the prevalence of renal diseases[3] and to improve the outcome in the population.[4]

Since the prevalence of renal diseases in Egyptian children is not known, this study was designed to screen the urine of primary school children in Dakahlia governorate by the dipstick method for detecting silent urinary abnormalities and their underlying diseases.

Methods

This cross section study was carried out from February 2002 to April 2004 on 1670 primary school children from Dakahlia governorate which locates in the northeast part of Egypt. The current population of primary school children in Dakahlia governorate is 507 795, 60% live in rural areas and 51% are boys. The children were recruited randomly from 32 primary schools: 22 in rural areas and 10 in urban areas.

Of the 1670 children, 870 (52.1%) were from rural areas whereas 800 (47.9%) from urban areas. Among them, 910 were boys and 760 girls. Their ages ranged from 6 to 13 years. None of the children had clinical evidence of renal or systemic diseases. The study was approved by the local Institutional Ethics Committee. Informed consent was obtained from the children's parents and school managers.

Participants were instructed to void a clean urine specimen into a 200 ml vessel, which was sent

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to a clinical pathology laboratory. A dipstick test (Multistix, Bayer Diagnostics, Miles Inc., USA) was performed on the unspun urine specimen by trained laboratory technicians, with reagent strip designed to react progressively producing color changes in given intervals. The results were decided by visual comparison of the test strip with a color chart provided on the bottle label. Urine samples were then prepared for microscopic analysis by centrifuging 10 ml of well-mixed urine at 1500 g for 5 minutes in a graduated plastic conical centrifuge tube. Most of the supernatant was poured off by inversion of the tube, and the sediment was thoroughly re-suspended in the remaining supernatant. One drop of this suspension was placed on a glass slide, cover-slipped, and examined by subdued bright-field illumination at ×100 and ×400 under a light microscope.

A red blood cell count of five or more per high power field and one or more plus protein were considered as abnormal urine findings. Children who were tested positive received a second urinary screening 10-15 days later. Those with persistent urinary abnormalities were subjected to further evaluation. Needle renal biopsy was done if hematuria and/or proteinuria persisted for more than 6 months. Specimens were analyzed by light and immunofluorescence microscopy.[5] The lesions were histologically diagnosed according to the World Health Organization (WHO) Classification.[6] Post streptococcal acute glomerulonephritis (PSAGN) was diagnosed if hematuria with or without proteinuria, low C3 and evidence of recent streptococcal infection were present. Hypercalciuria was defined as a calcium/creatinine ratio ≥0.2.

Statistical analysis

Statistical analysis was done by using statistical package for social science (SPSS) version 11. Qualitative data were expressed in the form of numbers and percentages. Comparison between data was performed by using the Chi-square test. A *P* value less than 0.05 was considered statistically significant.

Results

At the first screening, 22 children (1.3%) had urinary abnormalities, however only 12 (0.72%) of them had urinary abnormalities at the second screening.

No significant difference was observed in the prevalence of urinary abnormalities between boys and girls, older and younger children, or rural and urban ones (Table 1). Of the children with urinary abnormalities, 6 (0.36%) had isolated hematuria (IH), 2 (0.12%) had isolated proteinuria (IP), and 4 (0.24%) had combined hematuria and proteinuria (CHP).

Renal biopsy was performed on 4 children (2 with CHP, 1 with IH, and 1 with IP). No abnormalities were detected in one child whereas focal segmental glomerulosclerosis (FSGS), diffuse mesangial proliferation (DMP) and IgA nephropathy (IgAN) were detected in the other 3 children.

PSAGN was identified in 3 of the 6 children with IH, hypercalciuria and renal stone in 2, and no abnormality in 1. One of the two IP children had orthostatic proteinuria and the other had FSGS. In the four CHP children, 2 had PSAGN, 1 had IgAN and 1 had DMP (Table 2).

Discussion

This is the first report on the prevalence of asymptomatic renal diseases among children in Egypt. Only 1.3% of the samples studied had urinary abnormalities at the first screening, and these abnormalities persisted in 0.72% at the second screening. Plata et al[7] screened 14 082 Bolivian subjects (80% of them under the age of 15 years) and reported that urine abnormalities were detected in 4261 (30.3%) at the first screening and in only 1019 (7.2%) subjects at the second screening. In a Malaysian study, screening of 45 149 primary school children for proteinuria and hematuria showed that 1.9% of those screened had positive results but only 0.12% were found to be positive on further evaluation.[8] Mass

Table 1. Demographic characteristics of the studied children

	Urinary abnormalities			
	Positive (*n*=12)	Negative (*n*=1658)	Total (*n*=1670)	*P*
Males/females	5/7	905/753	910/760	NS
<10 y/≥10 y	5/7	887/761	902/768	NS
Rural/urban	6/6	864/794	870/800	NS

NS: no significance.

Table 2. The patterns of renal diseases in children with persistent urinary abnormalities

	IH (*n*=6)	IP (*n*=2)	CHP (*n*=4)
Hypercalciuria	1	-	-
Renal stones	1	-	-
PSAGN	3	-	2
FSGS	-	1	-
DMP	-	-	1
IgAN	-	-	1
Orthostatic proteinuria	-	1	-
Undermined causes	1	-	-

IH: isolated hematuria; IP: isolated proteinuria; CHP: combined hematuria and proteinuria; FSGS: focal segmental glomerulosclerosis; DMP: diffuse mesangial proliferation; IgAN: IgA nephropathy.

urine screening showed urinary abnormalities in 0.62% of elementary school children in Japan,[9] in 0.3% in Taiwan,[4] and in 5.25% in Nigeria.[10]

In our study, gender, age or socioeconomic status had no impact on the prevalence of urinary abnormalities. Among the affected children, the male to female ratio was 0.71:1. Au-Vehaskari et al[11] found that the prevalence of urinary abnormalities was not age or sex dependent. Park et al[4] reported a male to female ratio of 0.94:1 in Korean children but a ratio of 1.08:1 in Taiwan children.[12] Oviasu[10] showed that microscopic urinary abnormalities were more common in girls than in boys in Nigeria.

In this study, IH was found in 0.36% of the screened children while IP and CHP were found in 0.12% and 0.24% respectively. Zainal et al[8] demonstrated that IP was the most common urinary abnormality (0.12%) followed by IH (0.03%) and CHP (0.02%) on screening primary school children in Malaysia. The prevalence of IH and IP in Japanese[13] and Korean[14] elementary school children was 0.54% and 0.05%, and 0.64% and 0.48% respectively. Of 573 Taiwanese children with silent urinary abnormalities, 46.4% had IH and 14.3% had CHP.[12] On the first urinary screening of 2325 twelve-year-old school children in Singapore, IH, IP and CHP were positive in 6.8%, 1.2% and 2.3% of the children respectively.[15]

Evaluation of children with persistent urinary abnormalities showed that glomerulonephritis (GN) was the most common responsible underlying cause in this study. Of the 12 children with persistent urinary changes, 8 (66.7%) had evidence of GN. Hypercalciuria, renal stone and orthostatic proteinuria were the other underlying causes. No obvious cause was identified in one child who had no family history of hematuria nor electron microscopic examination. Studies showed that GN is the major cause of urinary abnormalities.[4,12,16] However, Bergstein et al[17] reported that no cause was discovered in 274 of 342 children with microscopic hematuria and the most common cause of the disease was hypercalciuria (16%). Similarly, Chander et al[18] found that 52.1% of children who were found to have silent abnormal urine analysis had no definite diagnosis, but organic kidney diseases and hypercalciuria accounted for 14.9% and 14.4% respectively.

PSAGN was the most common form of GN encountered in this study (5/8; 62.5%). Three children had FSGS, DMP and IgAN. Systemic lupus erythematosis is the most common cause of GN as shown by a mass urine screening for primary school children.[12] On the other hand, IgAN is the leading cause in Japan[19] and Korea.[4] PSAGN is prevalent in Egypt as β-hemolytic streptococci are still endemic.

Renal biopsy was performed in 4 children in this study (2 with CHP, 1 with IP and 1 with IH). No abnormality was detected in the children with IH but FSGS, DMP and IgAN in the others. Asymptomatic hematuria is recognized as a common problem in children and adolescents and it is likely to have a favorable prognosis.[15] Extensive evaluation is usually not necessary in such cases that can generally be followed up after a careful evaluation for ruling out urinary tract infection, hypercalciuria, PSAGN, and structural abnormalities.[20,21] The most common causes of persistent non-orthostatic, non-nephrotic pathological proteinuria in children include FSGS, IgAN and membranoproliferative GN.[22] Renal biopsies in children with silent urine abnormalities revealed more pathological changes in patients with CHP than in those with IH or IP.[4,23] Hematuria co-existing with proteinuria is correlated well with the severity of morphological alterations of glomeruli in the school-age population with asymtomatic proteinuria and hematuria.[24,25]

In conclusion, silent urinary abnormalities are not present in considerable percentage among primary school children in Egypt, and PSAGN is the leading cause for these abnormalities. In this study, only 3 children showed evidence of chronic kidney disease. This study also raises a question about the cost-benefit ratio for the national implementation of the urine screening program.

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