method along with Clinical Laboratory Standards Institute (CLSI) guidelines were used for anti-microbial susceptibility testing [5].

Positive results were informed telephonically to the rural unit. Negative results were informed after 48–72 h so that antibiotics could be discontinued. The final reports generated at the end of 7 days were sent by electronic mail. The hard copies of the reports were handed over, to the transport personnel, on the next trip.

Sepsis was clinically diagnosed for around one-third of admitted babies (181 out of 589). The culture positivity rate was 41.7%. Klebsiella pneumoniae was the most common cause of sporadic sepsis in the unit. Gram-negative organisms exhibited complete resistance to WHO recommended first- and second-line antibiotics such as ampicillin, gentamicin and cefotaxime, which were empirically used in the unit. Emergence of carbapenem resistance was documented.

The system ensured that timely and appropriate treatment was provided to the septic neonates. Our study faced some specific problems. Natural disasters and political unrest disrupted and delayed transport of specimens. Limited resources meant that specimens of a few babies were missed. Due to lack of facilities for septic screen, clinical features alone were used for presumptive diagnosis of sepsis.

In conclusion, the present study suggests that despite the distance between the two centres and the problems faced, the system could help in providing quality microbiology support in regions where it is not available and to a population for whose care it is essential.

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Urinary screening for renal disease among apparently healthy school children in Qatar

Introduction

The increasing incidence of chronic kidney disease (CKD) among both children and adults is a global health problem. Urinalysis using dipstick method is the most common screening procedure for the early detection of renal diseases among asymptomatic subjects at a relatively low cost that may lead to the reduction of CKD [1–3].

This study was conducted to determine the prevalence of kidney disease among apparently healthy school children in Qatar and to address a urinary screening strategy in this locality.

Subjects and methods

To ascertain the prevalence of urinary abnormalities, 3645 apparently healthy primary school children in the state of Qatar from November 2006 to May 2008 were screened. Approval to conduct this study was obtained from the Ethical and Research Committee of Hamad Medical Corporation. Children with age range from 6 to 12 years were included in this study using a random sample, stratified by age and sex. Students with known renal conditions and/or on medications that affect the results of urinalysis were excluded from screening. Informed consent was obtained from the children’s parents or caregivers and school directors. First morning urine samples were collected from children at home and subjected to urinalyses at school clinic using the dip-and-read reagent strips (Combur 10-Test M strips and Urilux-S instrument for reading and printing the results of urine test strips, Roche Diagnostics, Germany). A
second repeat urinalysis was obtained after 1 week for children with dipstick abnormalities. A third repeat urinalysis was obtained for children with abnormalities on the initial two screens after another 1 week. Children with persistent abnormalities were referred to the pediatric nephrology clinic at Hamad General Hospital for further evaluation. Investigations that enabled a final diagnosis were done for children with persistent abnormalities, which included the followings: renal function tests, serum complements, anti-nuclear antibody, anti-double-stranded DNA, serum Immunoglobulin A (IgA) level, anti-streptolysin O titer, urine protein/creatinine ratio, urine calcium/creatinine ratio, urine culture and renal ultrasound, in addition to the routine blood-work panel and urine microscopy. Follow-up for a period of 6–12 months was done for children with renal disorders.

**Statistical analysis**

The results of the study were analyzed using the SPSS 16.0 software.

**Results**

A total of 3645 children were screened for urinary abnormalities. Their mean (±SD) age was 8.5 ± 1.7 years; 1651 (45.3%) were boys and 1994 (54.7%) were girls. Third urinalyses were performed in 612 children with abnormalities on the initial two screens (Table 1).

A total of 432 (11.9%) children had persistent abnormalities. Ninety-four children with persistent urine abnormalities were lost to follow-up. The remaining 338 children with persistent abnormalities were investigated at the pediatric nephrology clinic. One hundred and ninety-nine children were found to have no abnormal renal findings and were discharged home. Remaining 139 children remained with a final diagnosis of renal disorder, either benign conditions or renal diseases (Fig. 1).

Miscellaneous renal disorders found in our children were two (0.05%) isolated renal glucosuria, one (0.03%) hematuria with renal stone, one (0.03%) proteinuria with renal cyst, one (0.03%) hematuria due to factor VIII deficiency, one (0.03%) hematuria secondary to genital trauma, three (0.08%) hematuria and pyuria with cystitis (two with bladder debris and two with increased bladder wall thickness by ultrasound), one (0.03%) hematuria with low C3 and C4, one (0.03%) hematuria with positive anti-nuclear antibody. There was no statistically significant difference in the prevalence of renal disorders among our children regarding their age, gender or nationality except for asymptomatic hematuria which was more prevalent in girls (Table 2).

Cost to initially screen children with two dipstick urinalyses was $14,657.5 and it was $9193 for those with persistent abnormalities. Cost of our screening program was $3.11 per one child. Subsequent renal imaging and laboratory work-up were not included in the cost.

**Discussion**

Dipstick urinalyses were repeated three times which resulted in decreasing the number of abnormal urinalysis by ruling out transient urine abnormalities. The prevalence of persistent urine abnormalities in our screening was 11.9% which is higher than the prevalence of 9.6% and 7.2% found by Akor et al. [4] and Plata et al. [5], respectively. The most prevalent renal disorders found in our study were benign microscopic hematuria (2.6%) which was more prevalent in girls than boys (1.9:0.7). In agreement with our study, urinary abnormalities were more common in Nigerian girls than in boys [6]. Controversies were raised about the utility of screening urinalysis for children. East Asian countries have well-established urinary screening programs; however, western countries appear to be moving away from screening asymptomatic children for early

<table>
<thead>
<tr>
<th>Urine abnormalities</th>
<th>First screening urinalysis, N (%)</th>
<th>Second screening urinalysis, N (%)</th>
<th>Third screening urinalysis, N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hematuria, ≥1+</td>
<td>370 (10.2)</td>
<td>192 (5.3)</td>
<td>130 (3.6)</td>
</tr>
<tr>
<td>Proteinuria, ≥1+</td>
<td>77 (2.1)</td>
<td>40 (1.1)</td>
<td>27 (0.7)</td>
</tr>
<tr>
<td>Hematuria with proteinuria, ≥1+</td>
<td>64 (1.8)</td>
<td>39 (1.1)</td>
<td>31 (0.9)</td>
</tr>
<tr>
<td>Pyuria, ≥1+</td>
<td>281 (7.7)</td>
<td>185 (5.1)</td>
<td>115 (3.2)</td>
</tr>
<tr>
<td>Hematuria with pyuria, ≥1+</td>
<td>129 (3.5)</td>
<td>112 (3.1)</td>
<td>100 (2.7)</td>
</tr>
<tr>
<td>Positive nitrite</td>
<td>81 (2.2)</td>
<td>14 (0.4)</td>
<td>13 (0.4)</td>
</tr>
<tr>
<td>Pyuria with positive nitrite</td>
<td>56 (1.5)</td>
<td>25 (0.7)</td>
<td>12 (0.3)</td>
</tr>
<tr>
<td>Glucosuria, ≥1+</td>
<td>10 (0.3)</td>
<td>5 (0.1)</td>
<td>4 (0.1)</td>
</tr>
<tr>
<td>Total</td>
<td>1068 (29.3)</td>
<td>612 (16.8)</td>
<td>432 (11.9)</td>
</tr>
</tbody>
</table>
3645 children subjected to dipstick urinary screening

432 (11.9%) had persistent urinary abnormalities after the 3rd dipstick urinalysis

338 were followed-up at the pediatric nephrology clinic

94 children were lost to follow-up

139 were found to have the following renal conditions:

- Hypercalciuria (0.11%)
- Hyperuricosuria (0.03%)
- UTI (0.3%)
- Hydronephrosis (0.05%)
- Glomerulonephritis (0.08%)
- Proteinuria (0.17%)
- Renal agenesis (0.03%)
- Renal scarring (0.03%)
- Miscellaneous (0.3%)

199 did not have renal abnormalities

Benign conditions:
- Asymptomatic hematuria (2.6%)
- Orthostatic proteinuria (0.11%)
detection of CKD [7]. Most of renal disorders detected among our children were benign conditions. Only 4 (0.11%) children showed evidence of CKD, with diagnosis including glomerulonephritis, hydronephrosis, renal agenesis and recurrent urinary tract infection (UTI) with renal scarring, with a rate of 1 patient of CKD detected per 900 screened children. Although, review of literature revealed lack of information on the incidence and prevalence of pediatric CKD, our incidence is approximately consistent with published data [8]. Compared with no screening, the incremental cost of our screening for CKD was $2802 per patient. We conclude that dipstick urinalysis is inexpensive, but is not cost-effective screening tool based on the current state of epidemiologic information and management of CKD in children. Alternatively, we propose that screening urinalysis is to be targeted for high-risk population, as per guidelines suggested for children and adolescents [9].

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