Pattern of Bacteriuria in Patients with Sickle Cell Disease in Qatif Central Hospital

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Of 420 sickle cell disease patients admitted to Qatif Central Hospital who were investigated for bacteriuria, 49 showed significant bacteriuria, giving a bacteriuria rate of 11.6%. The highest incidence of bacteriuria was in patients under 20 years. The commonest organisms isolated were E. coli, Klebsiella-Enterobacter, Acinetobacter and Pseudomonas. The sensitivity pattern showed a high rate of resistance to ampicillin. Amoxycillin clavulonate, nalidixic acid and norfloxacin are recommended as the drugs of choice for ‘blind’ therapy of suspected urinary tract infection in patients with sickle cell disease in this hospital. Complications of urinary tract infection in sickle cell disease patients may be fatal, therefore a knowledge of the pattern of bacteriuria and antibiotic susceptibilities in the hospital population is vital in the management of patients with this haemoglobinopathy.

Qatif Central Hospital (QCH: 385 beds) is the major referral hospital for the inhabitants of Qatif, an area which has the highest incidence of the sickle cell gene in Saudi Arabia.1,2

Urinary tract infection is an important cause of morbidity among patients with sickle cell disease (SCD)3,4 and it precipitates crises5 or leads to septicemia.6 Furthermore, urinary tract infection in these patients may also aggravate the severity of the anaemia by suppressing the marrow.7

A computer search conducted by the on-line search service of King Abdulaziz City of Science and Technology revealed a dearth of information globally on the pattern of bacteriuria among patients with SCD. These data are part of an ongoing project on bacteriuria in QCH from August 1988 through September 1989 and the aim is to provide information that will help in the management of this important genetic disease which is prevalent among the people of Qatif.

Material and Methods

Patients with SCD were identified on the basis of a positive sickling test and haemoglobin electrophoretic pattern using Helena Laboratories (1530 Lindbergh Drive, PO Box 752, Beaumont TX 77704, USA) Super Z electrophoresis kit. A drop of packed red blood cells was haemolysed with Haemolysate Reagent, applied to a Titan III Cellulose Acetate (Helena Laboratories) plate and electrophoresed in Supre Heme Buffer (pH 8.2-8.6) (Helena Laboratories) for 25 minutes. The plate was stained in Ponceau S, cleared and the patterns quantified using a Helena Quick Scan densitometer (Helena Laboratories).
Clean catch mid-stream specimens of urine were collected in sterile universal containers and sent to the microbiology laboratory within 20 min of collection and processed on arrival within 30 min.

Culture of urine and determination of significant bacterial count were performed by the semiquantitative method using standardized loops. Urine samples were plated on blood agar and CLED (cystine lactose electrolyte deficient) agar (Oxoid Ltd, Wade Road, Basingstoke, Hants RG24 0PW, UK) incubated overnight at 37 °C and examined after 18–24 h. The colonies were counted and if over 100 colonies were present, the urine sample was considered to have contained greater than $10^5$ colony forming units per millilitre, indicating significant bacteriuria.  

Standard diagnostic microbiological methods of identification of the isolates were used. Gram-negative bacilli were identified using AP-120E (La Balme Les Grottes-38390 Montalieu, Vercion, France).

Antibiotic susceptibility tests were performed on significant isolates using Stokes' method. The concentration of antibiotics in the discs used were as follows: ampicillin 25 µg, co-trimoxazole 25 µg, nitrofurantoin 200 µg, nalidixic acid 30 µg, mecillinam 25 µg, norflaxacin 10 µg, amoxyclillin clavulanate (Augmentin®) 30 µg, ceftriaxone 30 µg, gentamicin 10 µg, piperacillin 100 µg, cefuroxime 30 µg. The statistical method used was the null hypothesis using the standard error of difference between percentages.

**Results**

During the 13-month period a total of 8795 specimens of urine were collected: 669 specimens (7.6%) showed significant bacteriuria. There was a total of 420 patients with sickle cell disease and 49 of them showed significant bacteriuria, giving a bacteriuria rate of 11.6%. There were 40 females and nine males giving a sex ratio of 4.4:1. The sex ratio of the total hospital patients with bacteriuria was 1.8:1.

The prevalence of bacteriuria by age is shown in Table 1. The corresponding figures for the general hospital population are shown in parentheses for comparison. The highest incidence among the SCD patients was in the second decade age group and over half of the patients (59.2%) were under 20 years. No bacteriuria was detected in patients under 1 year or above 49 years.

The types of organism isolated and their frequency are shown in Table 2 and the corresponding figures for the general hospital population are shown in parentheses. *Escherichia coli* was the commonest organism isolated and its frequency is identical to that in the general population. However, there was a relative increase in the frequency of *Klebsiella—Enterobacter* and *Acinetobacter* in the SCD patients. The relative frequencies of *Pseudomonas* and *Strep. faecalis* were less.

Table 3 shows the antibiotic sensitivity patterns of organisms isolated from SCD patients with bacteriuria in this hospital. With the exception of *Strep. faecalis* there was a high incidence of resistance to ampicillin.

**Discussion**

This study shows that the bacteriuria rate among patients with sickle cell disease in QCH is about 1.5 times the rate in the general hospital population and lends credence to the observation that SCD patients are more susceptible to infection than patients without this disorder. Various mechanisms for this increased susceptibility have been documented and include defective opsonization, defective neutrophil function and abnormal immunoglobulin levels. The marked female preponderance of 4.4:1 may be explained by synergistic effect of the increased susceptibility of the SCD patient to infection and the already documented female susceptibility to urinary tract infection.

The absence of patients, under 1 year of age, with bacteriuria may be explained by a low index of suspicion for SCD in this age group in Qatif because of the rarity of sickle cell dactylitis in this area. Moreover, there is no neonatal screening.
Table 3
Percentage of susceptibilities of organisms isolated from urine in SCD patients (corresponding figures for the general hospital population in parentheses)

<table>
<thead>
<tr>
<th>Drug</th>
<th>E. coli</th>
<th>Klebsiella-Enterobacter spp.</th>
<th>Pseudomonas</th>
<th>Acinetobacter</th>
<th>Strep. faecalis</th>
<th>Salmonella group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Augmentin</td>
<td>78 (77)</td>
<td>75.8 (73.7)</td>
<td>—</td>
<td>66 (40)</td>
<td>100 (100)</td>
<td>100 —</td>
</tr>
<tr>
<td>Nitrofurantoin</td>
<td>91 (92.4)</td>
<td>30 (32)</td>
<td>—</td>
<td>33 (58)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Nalidixic acid</td>
<td>88 (86.9)</td>
<td>90 (89)</td>
<td>—</td>
<td>66 (78)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Co-trimoxazole</td>
<td>53 (57)</td>
<td>84 (82)</td>
<td>—</td>
<td>66 (49)</td>
<td>0 (27)</td>
<td>—</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>25 (28.5)</td>
<td>0 (0)</td>
<td>—</td>
<td>0 (0)</td>
<td>100 (100)</td>
<td>100 —</td>
</tr>
<tr>
<td>Mecillinam</td>
<td>78 (77.6)</td>
<td>77 (76)</td>
<td>—</td>
<td>33 (46)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Norfloxacain</td>
<td>97 (96)</td>
<td>84 (86)</td>
<td>100 (80.6)</td>
<td>66 (79)</td>
<td>0</td>
<td>100 —</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>95 (93)</td>
<td>89 (89.8)</td>
<td>66 (72)</td>
<td>66 (77)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>91 (93)</td>
<td>91 (93)</td>
<td>66 (81)</td>
<td>66 (77)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Piperacillin</td>
<td>31 (39)</td>
<td>50 (58)</td>
<td>66 (81)</td>
<td>33 (52)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Ceferoxime</td>
<td>90 (92)</td>
<td>83 (84)</td>
<td>66 (85)</td>
<td>66</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

SCD: Sickle cell disease.

The stakes for SCD patients with urinary infection are high because it may be the forerunner of a potentially fatal crisis, septicaemia or renal parenchymal scarring. 31 A knowledge of the pattern of bacteriuria and antibiotic susceptibilities in the hospital population is therefore vital in the management of patients with SCD.

References


