Staphylococcus aureus nasal colonisation in HIV-infected individuals in Botswana

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Background
• *Staphylococcus aureus*, an opportunistic pathogen, is a major cause of morbidity & mortality worldwide, including Africa & a leading cause of bacteremia in southern Botswana.
• Individuals with HIV are at high risk of staphylococcal infection; more likely to suffer severe clinical disease forms, i.e. pneumonia & bacteremia; their diseases are often life-threatening & they may fail to respond to treatment.
• S. aureus nasal colonisation is a primary risk factor for disease. Determining those at highest risk of colonisation is critical for identifying those at greatest risk of disease.
• Despite the huge burden of HIV disease in southern Africa, data describing the prevalence of S. aureus nasal carriage in this part of the world, especially in HIV-infected individuals is sparse.

Objectives
To describe the following in healthy HIV-infected individuals in & around Gaborone:
• The prevalence of asymptomatic S. aureus nasal carriage
• The proportion of colonizing S. aureus that is resistant to methicillin
• Risk factors for S. aureus carriage.

Methods
• In this cross-sectional study S. aureus carriage was investigated by collecting 2 nasal swabs, 4 weeks apart, from 418 HIV-positive outpatients attending Princess Marina Hospital (PMH) & Bamelette Lutheran Hospital (BLH) from March to June, 2013.
• Carriers were individuals with at least one test that failed positive for S. aureus by standard microbiologic culture techniques*. Oxacillin E-test was used to determine methicillin resistance (MRSA) & susceptibility (MSSA).

*Microbiologic testing was conducted at the National Health Laboratory in Gaborone & the UT School of Public Health in Houston, Texas.

Results
• S. aureus was detected in 37.8% of study participants, of whom 49% were intermittently & 51% were persistently colonised (S. aureus identified in either one or both swabs, respectively).
• Carriage was highest in young & female patients: sharing of personal hygiene (i.e. bath towels, soap & deodorant) was the leading risk factor for carriage.
• Younger individuals, particularly children (<18 yrs) (PR 2.43, p=0.003) & those who accessed care at BLH (PR 2.19, p=0.005), in households with children (PR 1.36, p=0.06) or had elevated viral load (>399 copies/ml) (PR 1.88, p=0.019) were more likely to be persistent carriers.
• All children with <36% CD4 carried S. aureus (p=0.048) whereas % CD4 was higher in children who were non-carriers (p= 0.017).
• Carriage of MRSA was identified in 3.11%, but there was no ‘persistent’ MRSA carriage.
• MRSA carriers were more likely to be younger, especially <18 yrs (PR 1.88, p<0.001), have eczema (PR 5.72, p=0.001), asthma (PR 3.75, p=0.037), or a history of tuberculosis (PR 3.08, p=0.045).
• MRSA was more common than MSSA in patients who had a history of tuberculosis (PR 3.26, p=0.030) or pneumonia (PR 3.60, p=0.029).
• MRSA was not significantly associated with viral load or CD4 count but was more prevalent in participants on 3rd line antiretrovirals (PR 4.52, p=0.08) or with detectable viremia (PR 1.67, p=0.052).

Conclusions
• Younger individuals & women with HIV, as well as those attending healthcare at BLH or who live in larger households, constitute high-risk groups for S. aureus nasal carriage.
• Individuals with persistent viremia or who live with children are most likely to be persistent carriers.
• Children with HIV, especially those with a lower %CD4 cells are at a significantly increased risk of carriage.
• Children & patients with comorbid diseases or a history of respiratory disease constitute major risk groups for MRSA colonisation.
• Being a patient at BLH compared to PMH was a risk factor for S. aureus colonisation which requires further investigation.

Table 1. Characteristics of Study Population

<table>
<thead>
<tr>
<th>Sex</th>
<th>Number (n)</th>
<th>Male</th>
<th>Female</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>116 (27.75%)</td>
<td>302 (72.25%)</td>
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<tr>
<td>Vical Load</td>
<td>&lt;399</td>
<td>378 (95.97%)</td>
<td>33 (8.03%)</td>
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<tr>
<td>24 Cell Count</td>
<td>&gt;=500</td>
<td>205 (49.88%)</td>
<td>200 (49.88%)</td>
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<tr>
<td>HAART</td>
<td>1st Line</td>
<td>204 (52.67%)</td>
<td>195 (47.33%)</td>
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<tr>
<td></td>
<td>2nd Line</td>
<td>80 (19.37%)</td>
<td>35 (8.77%)</td>
<td></td>
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<tr>
<td></td>
<td>3rd Line</td>
<td>13 (3.15%)</td>
<td>5 (1.23%)</td>
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<tr>
<td></td>
<td>Not on HAART</td>
<td>8 (1.94%)</td>
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Table 2. Risk Factors for S. aureus Nasal Carriage

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Prevalence Ratio (95% CI)</th>
<th>p-value</th>
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<tr>
<td>Shares Personal Hygiene Items</td>
<td>1.80 (1.15, 2.83)</td>
<td>0.010</td>
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<tr>
<td>Female</td>
<td>1.79 (1.02, 3.16)</td>
<td>0.043</td>
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<tr>
<td>Attends Care at BLH</td>
<td>1.69 (1.19, 2.40)</td>
<td>0.004</td>
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<td>Household Size &gt;1</td>
<td>1.46 (1.01, 2.11)</td>
<td>0.043</td>
</tr>
<tr>
<td>Months since Last Clinical Visit*</td>
<td>1.02 (1.004, 1.03)</td>
<td>0.014</td>
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<tr>
<td>On ARV Line 1, 2 or 3</td>
<td>0.56 (0.32, 1.05)</td>
<td>0.052*</td>
</tr>
<tr>
<td>Use of Asthma Inhaler</td>
<td>6.53 (3.34, 12.80)</td>
<td>&lt;0.001*</td>
</tr>
</tbody>
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The authors graciously acknowledge the nurses, administrators & other staff of PMH & BLH, especially those in IDCC, MCH clinics & the National Health Laboratories, without whom this research would not have been possible.

References