An epidemiological study on the occurrence of *Staphylococcus aureus* in superficial abscesses of patients presenting for surgery in a teaching hospital in Khartoum, Sudan

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Abstract

A group of patients (n = 86) suffering from superficial abscesses was recruited in the Khartoum Teaching Hospital, Sudan. Detailed clinical and socio-economic data were collected. It appeared that 83% of all patients were younger than 40. Labourers were most prevalent (28%), followed by students (23%) and housewives (16%). The head and neck were most often affected (22%), with hands being second (19%). In 92% of all pus cultures a microbial agent was identified, the large majority being *Staphylococcus aureus* (69%). Among patients, 47% were nasal carriers of *S. aureus*, similar to the carriage rate measured among controls, suggesting that nasal carriage is no risk factor for abscess development. Multivariate logistic regression analysis revealed that a history of abscess, recent traditional medical treatment, poor hygiene and low socio-economic status were significantly and independently associated with the occurrence of superficial abscesses. © 2000 Federation of European Microbiological Societies. Published by Elsevier Science B.V. All rights reserved.

Keywords: Superficial abscess; Nasal carriage; Hygiene; *Staphylococcus aureus*

1. Introduction

Surface injury or disruption by wetness and maceration may allow the skin flora to enter the body and occasionally cause serious infection. Minor trauma that usually passes unnoticed can also provide the predisposing injury for the development of superficial abscesses [1]. Hand involvement is documented most commonly in manual workers and housewives, who, by nature of their work, frequently suffer small abrasions or pricks [2]. Injections, whether of therapeutic or illicit drugs, are among the most important causes of superficial abscesses [3]. Drug abuse is a prime cause of injection-induced abscesses in developed countries [4]. Abscesses are known to complicate insulin injections in diabetic patients and this has led to the use of disposable syringes for insulin administration [5]. In developing countries, abscesses are more frequently secondary to injection involving non-sterile techniques including the use of contaminated needles. Most of these are gluteal abscesses due to intra-muscular injection [6]. In the Sudan, most of the gluteal abscesses are due to chloroquine injection.

Sometimes no obvious cause or lack of predisposing factors can be noted among patients presenting superficial abscesses [1,7]. In a series of 391 children with soft tissue infection, clearly predisposing factors were identified in only 38.4% of the cases. The infections were mainly due to trauma or adjacent skin sepsis [7]. Major risk factors for superficial abscesses include malnutrition, obesity and metabolic diseases such as diabetes, uraemia and jaundice. Disseminated malignancy may also be included, together with immuno-suppression caused by radiotherapy, chemo-
therapy or AIDS. These host factors increased the risk of sepsis and abscess formation postoperatively, even after minor operations [8,9], but their link with community-acquired superficial abscesses is still not clear. In abscesses with an infectious aetiology, *Staphylococcus aureus* is by far the most frequent cause in anatomical sites such as the axilla, groin, perineum and post partum breast as well as injection sites [3]. The proportion of positive pus cultures from superficial abscesses varied from 64% to 96% depending on the nature of the patients and the types of abscesses [10–14].

Acute superficial abscesses are among the most common clinical syndromes requiring surgical treatment at the Accident and Emergency Department of Khartoum Teaching Hospital (Khartoum, Sudan). A large number of individuals seek this type of acute surgical care [15]. The present study was designed to determine clinical and epidemiological characteristics of these patients and to identify risk factors that predispose to the development of this pyogenic infection by *S. aureus*.

2. Materials and methods

2.1. Patients and clinical records

Khartoum Teaching Hospital is the main referral hospital in Khartoum, Sudan. Its emergency department is the biggest one in the country and visited by patients from the entire Khartoum State and adjoining rural areas. In the emergency department, patients with superficial abscesses are usually seen and treated as day cases, unless prolonged hospital stay is indicated. In the period from May 1997 to April 1998, 86 patients presenting acute superficial abscesses at the Accident and Emergency Department at Khartoum Teaching Hospital were enrolled in a case-control study. Follow-up visits by patients already enrolled in the trial previously were not included for analysis. A similar number of control subjects, matched for sex and age, were included as well. The control group included healthy volunteers and patients undergoing other surgical procedures. None of them had an abscess or soft tissue infection. All abscess patients and control persons filled in detailed questionnaires. There was no apparent selection bias, because control individuals were randomly selected from outpatients and volunteers. Data, collected by direct interviewing to circumvent problems of illiteracy, covered individual clinical information and the presence of possible factors that were known to predispose to infectious complications (see Table 1 for a detailed survey of the questionnaire). The history of antibiotic intake before presentation to the hospital for abscess drainage was recorded in conjunction with detailed information on work and home environment, hygienic status and special habits and hobbies. The hygienic status was assessed during physical examination. Overall body hygiene was scored, as was the degree of contamination of the axillary and groin regions.

2.2. Bacteriology

From the infected patients, pus and nasal swabs were taken. Sterile dry cotton swabs (Trans swab; Medical Wire and Equipment Co. Ltd., Corsham, UK) were used. The swabs were circled through both nostrils four times consecutively while applying an even pressure. Wound swabs were taken from the inside wall of the abscess cavities after evacuation of pus. From the control group, only nasal swabs were taken. The nasal swabs were inoculated directly onto 5% Blood Agar and Phenol Red Mannitol Salt Agar (Difco Laboratories, USA), while wound swabs were inoculated onto 5% Blood Agar and MacConkey Agar plates. All plates were incubated aerobically at 37°C for 24–48 h. No direct Gram staining of pus was performed. From nasal and pus cultures, *S. aureus* colonies were identified by their morphology and a positive Staphaurex Plus test (Murex Diagnostic, Dartford, UK).

2.3. Genetic characterisation of *S. aureus* isolates

To study the genetic relatedness of microorganisms encountered in superficial abscesses, *S. aureus* isolates, both from abscesses and the vestibulum nasi, were typed by PCR-mediated DNA fingerprinting as described in detail previously [16]. Assays aiming at the random amplification of polymorphic DNA were performed for the strains derived from abscesses in three different assays, employing primers ERIC1, ERIC2 and BG2, respectively. The sequences for these three primers are 5'-ATGTAAAGCTCCTGGGGATTAC-3', 5'-AAAGTAAGTGACTTGGGGTGAAGCG-3' and 5'-TACATTGGAGGACCCTAAAGTG-3'. For comparative genetic analysis of paired nasal isolates and abscess strains from individual patients, DNA was analysed by RAPD with primers API and AP7 (5'-GGTTGGGTGAGAATTGCA-3' and 5'-GTGGATGGCGA-3') according to Van Leeuwen et al. [17]. Interpretation of the DNA banding patterns was performed visually per assay. Different types were identified by different capital letters on the basis of one or more DNA fragment differences between fingerprints. All strains studied were characterised by a three-letter code.

2.4. Data analysis

Statistical analysis was done using the Statistical Package for the Social Sciences (SPSS) computer software. Proportions were compared using the Yates corrected $X^2$. A logistic regression model was used to identify the independent contribution of variables that were correlated with superficial abscesses. *P*-values of less than 0.05 were considered significant.
3. Results

3.1. Patient characteristics

This prospective hospital-based study included 86 patients with superficial abscesses. Their mean age was 27.5 years (ranging between 1 and 72 years). More than 83% of patients were below 40 years of age and most of them were in the third decade of their life, followed in numbers by those in the fourth decade. Patients older than 60 years accounted for only 5% of the group studied. The male to female sex ratio was 2.6:1, whereas the most frequently affected group consisted of labourers (28%) followed by students (23%), housewives (16%) and pre-school children (13%). Anaemia (haemoglobin level less than 10 g/dl) was observed in 14% of patients. Six patients (7%) were diabetics, six patients (7%) were obese and four patients had skin lesions. Other predisposing factors such as uraemia, immune-suppression, malnutrition and jaundice were noticed in only 5% of the patients. Most of the patients (63%) had received antibiotics before they presented to the hospital for surgical drainage. The nature and amount of the antibiotics used could not be assessed reliably since antibiotics can be purchased freely (‘over the counter’ or OTC) in Sudan and patients did not keep adequate track of usage. Almost all patients (97%) presented with pain, which was localised to the abscess area in 80% of the patients. Diffuse pain was noted in 16% of the patients and in 88% of them the pain was throbbing. Localised tenderness was documented for 81 patients (92%) and in 18% of them it was marked and causing restriction of movement. In 35 patients (41%), the abscesses were surrounded by an area of cellulitis, and 27 patients (31%) had enlarged, tender regional lymph nodes. Fever (temperature > 38°C) was observed in 20% of the patients and a heart rate over 100 min⁻¹ was noted in 28% of the patients. Only 2% of patients were dehydrated at presentation. The mean systolic and diastolic blood pressures were 116 mm Hg (range 95–160) and 72 mm Hg (range 60–110), respectively. In this study, all patients were treated with incision and drainage. Three of the diabetic patients

Fig. 1. Schematic representation of the S. aureus genotypes as encountered in three different groups of patients. Group I comprises six strains from patients that recently visited a healer and lived in a high risk environment. Group II contains 20 strains from individuals living in the same neighbourhood but did not visit a traditional healer. The seven strains represented in group III are from individuals living in a region of low incidence. Note that limited overlap in genotypes was encountered. Only type AAA was found on a limited number of occasions in all three groups, whereas the types BGL and AAI are shared among groups I and II versus II and III, respectively.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Schematic survey of the clinical questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Patient identification number</td>
<td>Age, sex, residence, occupation</td>
</tr>
<tr>
<td>2. Wounds</td>
<td>Repeated occupational cuts and bruises</td>
</tr>
<tr>
<td></td>
<td>Recent contacts with patients with skin disease</td>
</tr>
<tr>
<td>3. Nutritional and clinical status</td>
<td>Obesity, dehydration or malnutrition</td>
</tr>
<tr>
<td></td>
<td>Breast feeding</td>
</tr>
<tr>
<td></td>
<td>Skin lesion (scars, scabies and eczema)</td>
</tr>
<tr>
<td>4. Family history</td>
<td>Uraemia</td>
</tr>
<tr>
<td></td>
<td>Sepsis</td>
</tr>
<tr>
<td>5. Employment</td>
<td>Regular job or school attendance</td>
</tr>
<tr>
<td></td>
<td>Carrying goods more than 10 kg each day</td>
</tr>
<tr>
<td></td>
<td>Wearing shoes at work</td>
</tr>
<tr>
<td></td>
<td>Using exposure to sunlight during work</td>
</tr>
<tr>
<td>6. Living environments</td>
<td>Living near farms</td>
</tr>
<tr>
<td></td>
<td>Having animals at home</td>
</tr>
<tr>
<td></td>
<td>Frequent exposure to insect bites</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>7. General observations</td>
<td>Hobbies</td>
</tr>
<tr>
<td></td>
<td>Length of finger and toe nails</td>
</tr>
<tr>
<td>8. Personal hygiene</td>
<td>Axilla</td>
</tr>
<tr>
<td></td>
<td>Breast</td>
</tr>
</tbody>
</table>
needed local debridement and two of them had extensive thigh abscesses. Postoperative antibiotics were prescribed to 88% of the patients and cloxacillin was the predominant antibiotic used.

3.2. Abscess characteristics

The head and neck region was involved in 22% of cases, hands being the next frequent site (19%). Extremity abscesses (upper and lower limbs) were seen in 19% of the patients, followed by abscesses in the perineal region in 14% of the patients. Gluteal abscesses were observed in 13% of the patients. Abscesses in the trunk, axilla and breast were less frequent accounting for 5%, 4% and 4% of all cases, respectively. In six patients (7%), the abscesses were due to intra-muscular chloroquine injections, and all were in the gluteal region. Obvious local trauma was the cause in 12 of the patients (14%) and in 15 patients (17%) another infectious focus was found. In 53 patients (62%), no clear cause or predisposing factor could be recognised.

Table 2
Risk factors and predisposing factors for patients with an abscess versus controls

<table>
<thead>
<tr>
<th>Factor</th>
<th>Abscess group n = 86</th>
<th>Control group n = 86</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recent skin disease</td>
<td>10(11.6)</td>
<td>3(3.5)</td>
<td>0.083</td>
</tr>
<tr>
<td>Recent traditional treatment</td>
<td>12(14.0)</td>
<td>1(1.2)</td>
<td>0.004</td>
</tr>
<tr>
<td>Malnutrition</td>
<td>3(3.5)</td>
<td>0(0.0)</td>
<td>0.244</td>
</tr>
<tr>
<td>Anaemia Hb &lt; 10 g/dl</td>
<td>12(14.0)</td>
<td>4(7.4)</td>
<td>0.066</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>6(7.0)</td>
<td>1(1.2)</td>
<td>0.123</td>
</tr>
<tr>
<td>Previous superficial abscess</td>
<td>28(32.6)</td>
<td>2(3.2)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Sepsis</td>
<td>15(17.4)</td>
<td>7(8.1)</td>
<td>0.110</td>
</tr>
<tr>
<td>Malignancy</td>
<td>3(3.5)</td>
<td>0(0.0)</td>
<td>0.244</td>
</tr>
<tr>
<td>Obesity</td>
<td>6(7.0)</td>
<td>5(5.8)</td>
<td>1.000</td>
</tr>
<tr>
<td>Immuno-suppression</td>
<td>1(1.2)</td>
<td>0(0.0)</td>
<td>1.000</td>
</tr>
<tr>
<td>Recent infection</td>
<td>22(25.6)</td>
<td>11(12.8)</td>
<td>0.053</td>
</tr>
<tr>
<td>Malaria</td>
<td>12(14.0)</td>
<td>0(0.0)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>URTI</td>
<td>6(7.0)</td>
<td>6(7.0)</td>
<td>0.038</td>
</tr>
<tr>
<td>Other</td>
<td>10(11.6)</td>
<td>5(5.8)</td>
<td>0.280</td>
</tr>
<tr>
<td>Recent injection</td>
<td>14(16.3)</td>
<td>15(17.4)</td>
<td>1.000</td>
</tr>
</tbody>
</table>

The various proportions were compared using the Yates corrected $X^2$. A logistic regression model was used to identify the independent contribution of variables correlated with the development of superficial abscesses. P-values less that 0.05 are considered significant. Values in parentheses are percentages (Hb = haemoglobin; URTI = upper respiratory tract infection).
Twenty-eight patients (33%) had a history of previous superficial abscesses.

3.3. Microbiological analysis and typing of S. aureus strains

*S. aureus* was isolated from 64% of cultures and represented 69% of all organisms isolated. For 70 patients, the staphylococcal carriage status was determined. In 47% of the patients, nasal carriage of *S. aureus* was documented. For 79% of them, the organism was also isolated from their abscesses. Nasal carriage rates determined for *S. aureus* (47% versus 36% when patients are compared to controls) did not significantly differ between the two groups (*P* = 0.16). In order to establish whether or not clonal spread of certain pathogenic types of *S. aureus* occurred, three different sub-collections of strains were formed. Group I comprised of six strains derived from patients living in a high risk neighbourhood (combinatory score of factors such as: small number of rooms in the house, many persons living per room, sleeping out at night etc.; see Table 1) who recently visited a traditional healer. The second group represented 20 control strains from people in the same environment who did not visit a healer, whereas group III strains (*n* = 7) originated from people living in a low risk environment. Fig. 1 summarises the outcome of the genotyping studies. Represented by their genotypes, all strains are captured in a Venn diagram showing no significant overlap among the various strains. Only type AAA was found once in all three groups, whereas types BGL and AAI were shared among two groups. All other types appeared to be unique. No widely disseminated strain could be pinpointed on the basis of these observations. A study involving 39 pairs of strains derived from nose and abscess of individual patients revealed that in 20 cases (51%) nose and wound isolate could not be discriminated on the basis of two RAPD tests (see Fig. 2 for a representative experimental result). None of the strains isolated during the present study was resistant towards methicillin (results not shown).

3.4. Risk factor assessment

There was no significant difference between the patients and the control group in age, sex ratio or the nature of their occupations. However, members of the two groups differed significantly with respect to area of residence (*P* < 0.001). More patients in the abscess group were from Khartoum North area (51 versus 25), whereas 50% of the control group (*n* = 43) was from outside Khartoum State. Possible risk factors for abscess formation in cases and controls were compared (see Table 2). Risk factors such as recent skin disease, injections, local sepsis, diabetes mellitus, malignancy, immuno-suppression, malnutrition and obesity were observed in frequencies not significantly different between the two groups. The group of infected patients had an almost significantly higher frequency of recent systemic infection (*P* = 0.053) and anaemia (*P* = 0.066). It must be noted, however, that both malaria and lack of upper respiratory tract infections, when analysed separate, present significant independent risk factors for abscess development (*P* < 0.001 and *P* = 0.038, respectively). The relation between the development of a superficial abscess and traditional treatment (*P* = 0.004) or past history of superficial abscesses (*P* < 0.001) was significant. A significantly higher number of patients with superficial abscess were living in houses consisting of one single room (27% versus 7%, *P* = 0.001). Members of the two groups did not differ significantly with respect to contact with animals or the regular utilisation of public transport.

The state of hygiene in the two groups was compared. Patients presenting superficial abscesses had poorer general body hygiene (*P* < 0.001), less clean axillary and groin regions (*P* < 0.001) and they had moist skin due to excessive sweating (*P* = 0.067). No significant difference was observed with regard to the length of fingernails. Patients in the abscess group had less favourable clinical conditions (*P* < 0.001) and a significantly higher pulse rate.

3.5. Multivariate analysis

The residential area, recent traditional treatment, recent skin disease, abscess history, sweating, recent malaria infection, anaemia, rooms number and hygienic state were among the univariate factors that predict the development of superficial abscesses. These factors were used as co-variables in a multivariate analysis to study the independent contribution of variables. Multiple logistic regression analysis revealed that residence, recent traditional treatment, abscess history, poor hygienic state and adverse home situation were significant independent factors associated with the development of superficial abscesses.

4. Discussion

4.1. Clinical findings

Superficial abscesses predominantly affected the younger and middle aged male population as was also reported earlier [1,18–20]. Contradictory findings have been published as well, demonstrating more frequent occurrence of abscesses in females [13,14]. In our study, the anatomical distribution of abscesses was comparable to that reported in other series with a predominance for head and neck [13,18,19,21]. Pilonidal abscesses, which accounted for approximately 10% of the abscesses in many series, were not seen in the patients included in this study, indicating that this condition may occur less frequently in Sudan. Simple superficial abscesses are not known to be associated with systemic manifestation of infection [9] unless there are other factors such as immune-suppression, diabetes or abuse of injected drugs [22–24]. In our group
of patients, drug abuse was not reported, immune-suppression was rare, diabetes was not very common and most of the patients were young and healthy. Delay in surgical drainage is known to result in spread of infection and systemic manifestations [25,26]. In this study, the mean duration of symptoms before presentation was 6 days, a fairly long period for harbouring an abscess without being drained. Abscesses in the gluteal region were encountered more than in the other series. This is probably due to the intra-muscular chloroquine injections in the gluteal region for the treatment of malaria. We, however, got the impression that the incidence of gluteal abscesses is going down when compared to figures reported for the same hospital 10 years ago [15]. Throbbing pain was the presenting symptom in the majority of patients and localised tenderness was the dominant sign, these are the cardinal features of superficial abscesses [25,27,28]. Pain was severe enough to jeopardise mobility and, hence, normal activities in nearly 20% of the patients. Hand abscesses were associated with a considerable delay of return to normal activity and may cause permanent disability and work loss [1,2]. Locally spreading cellulitis and lymphadenitis were noticed in more than one third of patients as noticed before [13].

Most of the patients in this study were on antibiotics before presentation. This may have resulted in the delay of these patients seeking surgical treatment. All patients in this study were uniformly treated with incision, drainage and subsequent dressing [9,13,26,28]. Postoperative antibiotics were prescribed for 89% of the patients. The antibiotic therapy for superficial abscesses and the timing of the therapy is a subject of great controversy. Some authors advocate the routine use of antibiotics for these patients [26,28], whereas others advice to limit such therapy [19,25,29]. Some authors used a preoperative dose only [21], others denied antibiotic therapy all together [15,19]. The latter authors claimed that complications attributable to withholding of antibiotics were never seen. Most likely, antibiotic therapy can be restricted to patients showing signs of systemic infection.

4.2. Microbiological findings

The main organism isolated was *S. aureus*, which lesions were characterised by their localised nature [25]. Positive growth was obtained in 93% of all cultures, which is similar to the figures determined during other studies [11,14], but is less than some other reports [12,13]. The reason that cultures were sterile in 7% of cases may be due to the use of antibiotics or to the presence of anaerobes. However, anaerobes are most likely to be isolated in cultures mixed with other organisms rather than in mono-culture [12,13]. In the present study, we did not find evidence for the clonal spread of a particularly pathogenic strain of *S. aureus*. The genetic heterogeneity among the strains that were typed suggests that many *S. aureus* strains are capable of inducing an abscess.

*S. aureus* is reported to account for 24–93% of isolates from superficial abscesses [10–14]. This variation may be due to different patient characteristics or the different sites where abscesses were located. *S. aureus* was the most frequently isolated organism from abscesses in the perineal region, although it has been suggested that intestinal bacteria and anaerobes are most frequently isolated from these sites [3,12,30,31]. Cultures from 27% of perineal abscesses revealed no growth. Similarly, in 28% of these abscesses, the pus was of foul smell, indicative of the presence of anaerobes [3,32,33]. Offensively smelling pus was also found in over half of the breast abscesses in this study, similar in frequency to that documented by others [34,35]. *S. aureus* was predominant in extremity and hand abscesses, in contrast to other studies where streptococci were the main cause of extremity abscesses [28].

4.3. Nasal carriage of *S. aureus*

The nasal carriage rate of *S. aureus* in the control group of 36% is higher than the average for healthy individuals in the community. However, most of the control group subjects were hospital patients, whose higher rate of nasal carriage of *S. aureus* is well-documented [36–38]. Among the patients with superficial abscesses, 47% turned out to be *S. aureus* nasal carriers providing a reservoir from which the organism could spread and cause infection [3,39–41]. Nasal carriage of *S. aureus* has been linked to the recurrence of a superficial abscess [42]. In our study, 88% of *S. aureus* nasal carriers had also *S. aureus* isolated from their abscesses and half of the patients with staphylococcal abscesses had *S. aureus* isolated from their anterior nares. However, isolation of *S. aureus* from the nose was done at the time of diagnosis of abscesses. Consequently, it may be that the nares of these patients were colonised from the abscesses and not vice versa.

Our results show that a large proportion of the abscesses is caused by extraneous staphylococcal isolates. As was recently reviewed by Kluytmans et al. [43], the majority of *S. aureus* infections in surgical patients is supposed to be auto-infectious, although this may depend on a large array of variable factors that may either be environmental or patient-related. Prospective studies on carriage versus infection are required to reveal the precise sequence of events for patients such as described in the current manuscript [44]. In addition, genetic analysis of *S. aureus* isolates did not identify epidemic spread of clones sharing certain virulence factors among patients at risk. Our data indicate that nasal carriage of *S. aureus* does not constitute a significant risk factor for the development of superficial abscesses.

4.4. Abscess aetiology and risk factors

In this study, no clear cause for abscess development could be recognised in 62% of patients. This is higher
than figures reported before, where trauma and injections accounted for an increased occurrence of abscesses [1,7]. The absence of a recognised cause can be attributed to trauma which is too minor to be recognised by the patients [1,2,14] or abscesses arising in for instance obstructed sebaceous or sweat glands [14], duct ectasia [12,35] and as a consequence of blood borne bacteria [27,45]. Chloroquine is known to induce local tissue necrosis that predisposes to abscess formation [45]. Intra-muscular injections were also reported as important causes of gluteal abscesses in India [6]. In other papers reviewed, injection abscesses were secondary to intravenous drug abuse, a problem that is not prevalent in the Sudanese population [4].

Most of the patients with superficial abscesses were from specific residential areas, which are of rather low socio-economic status. Difference in residence was significant. However, because the control subjects were mainly patients coming for elective procedures and these patients may come from all over the Sudan, residence cannot validly be regarded as a risk factor. It may be claimed that patients from certain areas have easier access to Khartoum Teaching Hospital. Significantly more patients in the abscess group were living in houses consisting of a single room. This again indicates that low socio-economic status may be a risk factor for the development of an abscess [4]. In this study, host medical characteristics known to predispose to infection in general (diabetes, malnutrition, obesity, malignancy and immune-suppression) were encountered in several patients with an abscess. This preponderance lacks statistical significance in comparison with the control group, however.

Recent traditional treatment was also a significant and novel finding for patients with abscesses. In this study, 12 patients had traditional treatment shortly before hospital admission. Local application of heat (Hijamma) or cautery was reported by five patients. Another two patients had Fisadda (local small incision). All these can be regarded as inducing physical trauma. Five patients reported local application of home made herbal preparations for the treatment of pre-existing skin lesions. Possibly some of these traditional treatments were applied in the initial phase of abscess development and their importance as risk factors may be questioned. A recent history of systemic infection was predominantly found in the abscess group; in more than half of them malaria was diagnosed. Six out of 12 patients with malaria had chloroquine injection-induced abscesses. However, prevalence of recent infection was not different in the two groups. The injections in the control group were in sites other than the gluteal region. Patients in the abscess group were found to have less favourable hygienic status and improving body hygiene is a recommended measure for preventing further skin abscesses [3,27]. Excessive sweating was correlated with superficial abscesses as well. Moist skin as a risk factor for abscess formation, especially in the extremities, was reported before [27].

In conclusion, although in 62% of the patients no clear cause or predisposing factor was identified, previous history of superficial abscess, recent malaria and chloroquine injection, recent traditional treatment, unfavourable hygienic state or housing condition and excessive sweating were the factors positively associated with the development of superficial abscesses. Measures to improve hygiene, especially during traditional treatments, could possibly reduce the incidence of superficial abscesses among people in the tropics. It is fascinating to note that the epidemiology of staphylococcal infections in the setting we studied is completely different from anything described to date. Additional research should provide deeper insight in the pathogenesis of these bacterial infections.

References


