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Community-acquired soft-tissue pyogenic abscesses in Mulago hospital, Kampala: Bacteria isolated and antibiotic sensitivity.

P.A. Ongom[1], E.A. Obuku[2], B. Achan[3]
[1]Department of Surgery, School of Medicine Makerere University College of Health Sciences,
[2] Joint Clinical Research Centre, Kampala, Uganda
[3]Department of Medical Microbiology, School of Biomedical Sciences, Makerere University College of Health Sciences, Kampala, Uganda
Correspondence to: Dr. Peter A. Ongom, **E-mail:** petongom@yahoo.co.uk

Background: Clinical practice, for a long time, has dwelt on study and management of pyogenic abscesses without distinction between nosocomial and community-acquired types. This study aimed at identifying the bacteria isolated from community-acquired acute subcutaneous and soft tissue pyogenic abscesses. It also determined their sensitivity to a wide range of antibiotics.
Methods: The cross-sectional study was conducted in Mulago hospital, between August and December, 2011. Consecutive, convenient sampling was used to attain a sample size of 130 subjects, with all age groups eligible. They were treated for the abscesses by incision and drainage. The pus was subjected to bacterial culturing and drug sensitivity testing. Data was analysed using STATA version 11.2.
Results: The median age was 21.6 years; with females constituting 43.9%, and 10.8% were HIV positive persons. The predominant organism isolated was Staphylococcus aureus (53.9%), followed by coliform organisms (14-1%). Mixed infections, mostly with Staphylococcus aureus, constituted 8.6%. Staphylococcus aureus was most susceptible to ciprofloxacin and showed greatest resistance to chloramphenicol. Coliform organisms were most susceptible amikacin and showed greatest resistance to augmentin.
Conclusions: The predominant bacterium isolated from these pyogenic abscesses is Staphylococcus aureus. It is most susceptible to ciprofloxacin and resistant to chloramphenicol. There is benefit in conducting a larger study with more antibiotic sensitivity tests and specific bacterial type identification. Recommendations can then be made for appropriate antibiotic policies.

Introduction

In Uganda, a common public health and clinical challenge, is the widespread occurrence of pyogenic abscesses[1,2,3]. A big portion of these follow acute bacterial infections in the communities in which we live. This entity constitutes community-acquired acute pyogenic abscesses. They are responsible for high morbidity rates[4]. Furthermore, there is a rise in antibiotic resistance that has not been fully explored[5,6]. This study aimed at identifying bacteria present in these abscesses, and determining their antibiotic sensitivity. Mulago Hospital being the biggest and busiest in the country, offered a good catchment site for study.

Pyomyositis, a common presentation, is responsible for up to 4% of hospital admissions in the tropics[4,7]. In the advent of HIV/AIDS, the hospital prevalence has stepped up due to defective neutrophil action and impaired cell mediated immunity[8,9]. The typical organisms found in pyomyositis are staphylococcus aureus, group A streptococci, group B,C,G streptococci, enterobacteriaceae, and anaerobes. Normal body flora is responsible for the majority of pyogenic abscesses of the skin, subcutaneous tissues and soft tissues[1,2,10,11], which this study focuses on. Early recognition and proper medical and surgical management is the cornerstone of therapy[2]. Antibiotic therapy offers adjuvant treatment.

Abscesses may be caused by a single bacterial species or may be polymicrobial. Group A streptococci, staphylococcus aureus, and the indigenous aerobic and anaerobic cutaneous and mucous membranes'

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local microflora usually are responsible for polymicrobial infections[12]. Anaerobic infections are common with involvement of normal flora of mucosa, particularly oral, colonic and vaginal[11,13,14,15].

The bacterial property of antibiotic sensitivity is vital to explore due to their adjuvant role in abscess management. Most studies generally show that there are a wide range of bacterial isolates and antibiotic susceptibility patterns, in different settings. Some hospital-based studies illustrate this. Finegold SM, and co-workers emphasised the role of surgical drainage in the management of soft-tissue infections[16], but also showed that better results were attained from concurrent use of new antimicrobial agents that included: new penicillins, new cephalosporins, and nitroimidazoles. A study in India by Ghadage DP investigated pyoderma[17] in which Staphylococcus (67.34%) was the predominant species isolated, as is the case with numerous studies. Strains of S. aureus were susceptible to amikacin (75%), co-trimoxazole (72%), cefotaxime (65%), chloramphenicol (62%), ciprofloxacin (61%) and clindamycin (61%). There was low susceptibility to cephaloridin (11%), gentamicin (12%) and penicillin (21%). Many of the strains were found to be resistant to one or more antibiotics. Another author noted resistance of S.aureus to Methicilin, cefalotin, erythromycin and clindamycin; suceptiblity to trimethoprim-sulfamethoxazole, ciprofloxacin and rifampicin[18].

Methicillin-resistant Staphylococcus aureus were first reported in the United States in the early 1960s. Currently, healthy individuals from the community with no risk factors for resistant bacteria present with methicillin-resistant Staphylococcus aureus infections, acquiring the name "community-associated methicillin-resistant Staphylococcus aureus" (CA-MRSA). CA-MRSA retains susceptibility to a range of older antibiotics available in oral formulations such as doxycycline, sulfamethoxazole-trimethoprim, levofloxacin, and clindamycin. Local susceptibility patterns provide a guide for selection of antibiotics[19]. Another study (a Brazilian pilot study) described bacteriological characteristics of community-acquired Staphylococcus aureus[3]. Notable antimicrobial agents with corresponding sensitivities were - were vancomycin (100%), erythromycin (90%), gentamicin (90%) and ceftriaxone (85%); and, low activity - ampicillin (50%), penicillin (30%), trimethoprim-sulfamethoxazole (30%) and tetracycline (25%).

Regarding Escherichia coli and other coliforms, a study revealed that they manifest high resistance rates among isolates for almost all antibiotics, except for ampicillin, cefazolin, aztreonam, co-trimoxazole and imipenem[20]. Howard AJ, in a Welsh study in 2001, observed that antibiotic usage and prescription practice in a population determines infection rate caused by resistant coliform organisms in that population[21]. For children, clinically important bacterial isolates from paediatric patients were found to be more susceptible to ceftazidime than ceftriaxone and cefotaxime were; even for pseudomonas strains[22]. Earlier studies had described the efficacy of cefotaxime[23], and cefpodoxime (oral)[24]. Independent studies have investigated antimicrobial susceptibilities of numerous enterobacteriaecae strains. Beta-lactamase production was detected in over 90% of isolates. Clinical isolates showed resistance rates of 93%, for ampicillin; and, 2% for amoxicillin/clavulanate, imipenem and chloramphenical[25]. Antibiotics that cover both gram-positives and anaerobic bacteria are recommended for clinical usage[26].

Patients and Methods

The study was a cross-sectional, descriptive study conducted on the Emergency surgical ward of Mulago National Referral hospital, Kampala, Uganda. The inclusion criteria were subjects of all ages, attending the emergency surgery ward, with features of community-acquired acute pyogenic infection within 2 weeks of the onset of symptoms, during the period between August and November, 2011. The features were: pain, warm swelling, fever, tenderness, with or without impaired function of the affected anatomical site. All participants gave written, informed consent. Minors (<18 years) had their

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parents/guardians give consent. Permission to conduct the study was sought from the hospital's Department of Surgery and the Hospital Research/Ethics committee.

Exclusion citeria included - Nosocomial abscesses; bone and joint pyogenic conditions; chronic abscesses and cold abscesses; and central nervous system, ENT, orbital, pulmonary, pleural, pericardial and peritoneal abscesses.

Data collection

The Leslie and Kish method (1965) for descriptive study sample size calculation was used, based on prevalence estimates. Subjects were enrolled by consecutive, convenient sampling till the sample size of 130 was reached. They were interviewed by the principal investigator and a team of co-investigators and assigned index numbers. A structured questionnaire was the tool for data collection. Independent variables were: patient particulars – age and sex; general examination findings – haemoglobin level; CBC and HIV serology screening; previous antibiotic use; and clinical diagnosis. Dependent variables were bacterial type isolated; bacteria susceptible to specific antibiotics; and antibiotics sensitive to specific bacteria.

Sample collection

For each patient, incision and drainage of the pyogenic abscess under standard aseptic conditions, and anaesthesia, was done. A pus swab or aspirate of the abscess was taken. Its colour and consistency were noted. The sample was placed in a sterile transportation/storage container. Following this, a broad spectrum antimicrobial and an analgesic/antipyretic of the attending doctor's choice was instituted.

Laboratory procedure

Pus samples were transported to the laboratory and delivered within 30 minutes of collection, under standard conditions for transportation of bioharzardous specimens. They were cultured on appropriate agar plates for 24 hrs (for significant growth), then subcultured for specific bacterial growth and identification. Gram staining was done. Light microscopy was used to identify gram stain characteristics and cellular morphology. Specific microbiological tests were used to identify bacteria when feasible. Disc sensitivity testing was done. The antibiotics tested for were Amikacin, Augmentin, Chloramphenicol, Cefuroxime, Ceftazidime, Erythromycin, Gentamicin, Rifampicin, Tetracycline and Vancomycin.

Blood sample was collected through a convenient vein, venepuncture was done with aspiration of 3-5mL of blood. The sample was used for HIV serology (HIV determine rapid test) screening and complete blood counts (CBC).

Surgical procedure and treatment

The surgical procedure and treatment were conducted by the attending doctor.

Results

A total of 130 patients aged one week to 75 years attending 3BE/S ward of Mulago hospital with community-acquired pyogenic abscesses were enrolled. Of these 12 (9.3%) were neonates (< one month old) and 33(25.4%) were aged 1 month to 5 years. The median age was 21.6 years. The sociodemographic characteristics are shown in Table 1.

The majority of the patients (60%) came to hospital between 72 hours and 7 days from the onset of symptoms with only 35 (26.9%) reporting under 72 hours. A vast majority, 122 (93.8%), sought antibiotic

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treatment from local drug shops, clinics and pharmacies prior to presentation at hospital. Most pus samples had gram positive cocci isolates only (59.2%), while mixed isolates of gram positive cocci and negative bacilli (15.4%), came next in frequency. There were no organisms, on gram staining, in 13.9% of the samples. There was a 19.2% prevalence of anaemia overall[27]. Males were more often anaemic (24.7%) than females (12.3%). Different anatomical sites were affected by the abscesses. Apart from 2 cases (1.5%) who had involvement of multiple sites, the rest (98.5%) had abscesses confined to a single anatomical site (Table 1).

The specific sites described, with their respective frequencies of involvement, were: the lower limb (30%), thorax (29.2%), head/neck (16.9%), upper limb (9.2%), abdomen (7.7%) and inguino-perineal region (5.4%). Pus was more often of a frank, purulent nature (81.5%). In 12.3% of samples, the pus had a significant amount of blood (pyo-sanguinous), while 6.2% of samples were predominantly bloody (sanguinous). Pus samples were mostly odourless (87.3%). Foul-smelling pus was encountered in 12.3% of cases. Staphylococcus aureus was the most frequently occurring organism isolated (53.9%).

Table 1. Baseline Characteristics for Participants in the Pyogenic Abscess Study

Characteristic	**Category**	**N = 130 (%)**
Age (years)	**(median, IQR)**	**21.6 (1.5 - 34)**
	< 1 month	12 (9.3)
	1 month – 5	33 (25.4)
	6 – 17	12 (9.2)
	18 – 39	48 (36.9)
	40 – 75	25 (9.2)
Gender	Male	73 (56.1)
	Female	53 (43.9)
Duration of abscess (days)	< 3	35 (26.9)
	3 – 7	78 (60)
	7 – 14	17 (13.1)
Antibiotic exposure	Yes	122 (93.8)
	No	8 (6.2)
Anatomical site	Lower limb	39 (30)
	Thorax	3 (29.2)
	Head & Neck	22 (16.9)
	Upper limb	12 (9.2)
	Abdomen	10 (7.7)
	Inguino-Perineal	7 (5.4)
	Multiple sites	2 (1.5)
Pus appearance	Purulent	106 (81.5)
	Pyo-sanguineous	16 (12.3)
	Sanguineous	8 (6.2)
Pus smell	Foul	16 (12.3)
	Neutral	114 (87.3)
HIV status	Positive	14 (10.8)
	Negative	116 (89.2)
Hemoglobin g/dL	(mean, SD, range)	12.67 (1.76, 7.6 – 18.8)
	All Anemia	25 (19.2)

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	Female < 11	7 (12.3)
	Male < 12	18 (24.7)
Pus cells	1+	54 (41.5)
	2+	35 (26.9)
	3+	39 (22.3)
	None/*Lost	12 (9.2)
Gram stain	PC	77 (59.2)
	PC, NB	20 (15.4)
	NB	14 (10.8)
	PB	1 (0.8)
	No organ./*Lost	18 (13.9)

**Lost – results were not available for these study participants (n=2)*

Table 2. Frequency of isolates from study participants in the pyogenic abscess study

Isolated infections	**Frequency, n=128 (%)**		
	[Ψ]All	**Mixed**	**Single**
Staphylococcus aureus	69 (53.9)	8 (6.3)	61 (47.7)
Coliform bacteria	18 (14.1)	7 (5.5)	11 (8.6)
Klebsiella spp.	5 (3.9)	3 (2.3)	2 (1.6)
Proteus spp.	4 (3.1)	3 (2.3)	1 (0.8)
Stretococcus pyogenes	2 (1.6)	-	2 (1.6)
Eschericia coli	2 (1.6)	-	2 (1.6)
Pseudomonas auriginosa	1 (0.8)	-	1 (0.8)
Enterobacter spp.	1 (0.8)	1 (0.8)	-
No bacterial growth	30 (23.4)	-	-
No significant growth	7 (5.5)	-	-
Total number of patients	*128 (100)	[¶]22 (17.2)	80 (62.5)

[Ψ]Denominator remains 128 patients in the study
**Results for two participants were not available and thus excluded from analysis*
[¶]Multiple frequencies for mixed infections across the different species of bacteria

Table 3. Antibiotic Susceptibility Patterns of isolates from the pyogenic abscess study participants (n=88, 67.7%) expressed as coun

Isolated organism	**Frequency of susceptibility to antibiotics as counts**												
	AMI	**AUG**	**CHL**	**CEF**	**CIP**	**CTZ**	**ERY**	**GEN**	**IMIP**	**RIF**	**TET**	**VAN**	**Total**
S. aureus	11	28	28	35	48	2	31	30	-	27	2	15	**257**
Coliforms	10	3	5	4	5	3	-	5	-	1	-	1	**37**
Klebsiella spp.	2	-	-	-	-	-	-	-	-	-	-	-	**2**
Proteus spp.	-	-	-	-	-	-	-	-	-	-	-	-	**0**
S. pyogenes	-	1	-	1	-	-	1	-	-	-	-	-	**3**
E. coli	1	-	1	1	1	1	-	1	1	-	-	-	**7**
Pseudomonas spp.	1	-	-	-	-	1	-	1	-	-	-	-	**3**

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Enterobacter spp.	-	1	-	1	1	-	1	1	-	-	-	-	**5**
Total No. Patients	**25**	**33**	**34**	**42**	**55**	**7**	**33**	**38**	**1**	**28**	**2**	**16**	**314**

NB: Results from thirty seven participants (37/128, 28.9%) did not have any bacterial growth and thus excluded from analysis; in addition to five participants who did not have drug susceptibility results at all. Participants had mixed infections and susceptibility to more than one antibiotic.

Next in frequency were coliforms (14.1%). Other notable organisms were Klebsiella(3.9%) , proteus (3.1%), S. pyogenes (1.6%), E. coli (1.6%), P. aeruginosa (0.8%) and enterobacter (0.8%). In addition, S. aureus and coliform bacteria were found in mixed infections more often than other bacteria with frequencies of 6.3% and 5.5%, respectively.
There were no bacteria isolated, on culturing, in 23.4% of the samples isolated (Table 2).

Only a limited assortment of antibiotic susceptibility tests (10) was done. These tests were restricted to the laboratory routine (Tables 3 and 4). Antibiotics (with their respective abbreviations) involved were: Amikacin (AMI), Augmentin (AUG), Chloramphenicol (CHL), Cefuroxime (CEF), Ceftazidime (CTZ), Erythromycin (ERY), Gentamicin(GEN), Rifampicin (RIF), Tetracycline (TET) and Vancomycin(VAN). Imipenem (IMIP) was tested on only one occasion. Intermediate susceptibility, in 26 of the samples, was manifested largely by erythromycin, ceftazidime and cefuroxime (not shown in tables). Staph aureus was susceptible to ciprofloxacin in 54.5%, followed by cefuroxime (39.8%), erythromycin (35.2%) and gentamicin (34.1%).

Table 4. Antibiotic susceptibility patterns of isolates from the pyogenic abscess study participants **(n=88, 67.7%)**

§Isolated organism	**Frequency of susceptibility to antibiotics as a proportion of the totals (%)**												
	AMI	**AUG**	**CHL**	**CEF**	**CIP**	**CTZ**	**ERY**	**GEN**	**IMIP**	**RIF**	**TET**	**VAN**	**Totals**
S. aureus	12.5	31.8	31.8	39.8	54.5	2.3	35.2	34.1	0	30.7	2.3	17.0	**81.8**
Coliforms	11.4	3.4	5.7	4.5	5.7	3.4	0	5.7	0	1.1	0	1.1	**11.8**
Klebsiella spp.	2.3	0	0	0	0	0	0	0	0	0	0	0	**0.6**
Proteus spp.	0	0	0	0	0	0	0	0	0	0	0	0	**0**
S. pyogenes	0	1.1	0	1.1	0	0	1.1	0	0	0	0	0	**1.0**
E. coli	1.1	0	1.1	1.1	1.1	1.14	0	1.1	1.1	0	0	0	**2.2**
Pseudomonas spp.	1.14	0	0	0	0	1.14	0	1.14	0	0	0	0	**1.0**
Enterobacter spp.	0	1.14	0	1.14	1.14	0	1.14	1.14	0	0	0	0	**1.6**
ΨTotals	**8.0**	**10.5**	**10.8**	**13.4**	**17.5**	**2.2**	**10.5**	**12.1**	**0.3**	**8.9**	**0.6**	**5.1**	**100**

§The denominator for individual species and drugs is the total number of patients with results, n=88.
ΨThe denominator for the marginal totals is the total number of counts, n=314

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Table 5. Antibiotic resistance patterns of isolates from the pyogenic abscess study participants (n=73, 59.2%)

Isolated infections	Frequency of resistance to antibiotics as a proportion of the totals (%)													
	AMI	AUG	CHL	CEF	CIP	COT	CTZ	ERY	GEN	IMIP	RIF	TET	VAN	Totals
S. aureus	0	1.3	28.6	18.2	11.7	0	1.3	15.6	2.6	0	1.3	3.9	6.5	**44.0**
Coliforms	0	20.8	14.3	16.9	15.6	1.3	3.9	1.3	6.5	0	0	2.6	1.3	**40.9**
Klebsiella spp.	0	6.5	1.3	5.2	3.9	0	2.6	0	0	0	0	1.3	0	**10.1**
Proteus spp.	0	0	1.3	0	0	0	0	0	0	0	0	0	0	**0.6**
S. pyogenes	0	0	1.3	0	0	0	0	0	1.3	0	0	0	0	**1.3**
E. coli	1.3	2.6	1.3	0	0	0	0	0	0	0	0	1.3	0	**3.1**
Pseudomonas spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Enterobacter spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Totals	**0.6**	**15.1**	**23.3**	**19.5**	**15.1**	**0.6**	**3.8**	**8.2**	**5.0**	**0**	**0.6**	**4.4**	**3.8**	**100**

NB: Results from thirty seven participants (37/128, 28.9%) did not have any bacterial growth and thus excluded from analysis; in addition to twenty participants who did not have drug resistance recorded at all.

Coliform bacteria showed the greatest sensitivity to amikacin in only 11.4%, followed by ciprofloxacin (5.7%), chloramphenicol (5.7%) and gentamicin (5.7%) (Table 4). Overall, ciprofloxacin (17.5%) had the highest frequency of susceptibility for all bacterial forms isolated.

Resistance to S. aureus was highest for chloramphenicol (28.6%). This was followed by cefuroxime (18.2%) and erythromycin (15.6%) (Table 5). Coliforms were most resistant to augmentin (20.8%), followed by cefuroxime (16.9%), ciprofloxacin (15.6%) and chloramphenicol (14.3%). Overall, the highest proportion of resistance to an antibiotic shown by all bacterial types was to chloramphenicol (23.3%).

Discussion

Most patients (60%) presented to hospital between 3 and 7 days after the onset of symptoms. This follows initial treatment at home with little or no relief of symptoms. Some individuals even presented later, between 7 and 14 days. This could be due to: failure of medicinal treatment, inaccessibility of health facilities or personal choice. The majority, though, take some form of antibiotic prior to hospital attendance, albeit irrationally.

The abscesses were generally confined to a single anatomical site. Only in 1.5% of subjects were multiple anatomical sites involved. Multiple sites are often expected for immunocompromised patients[8,9]. HIV positive patients (10.8% of all patients) did not present characteristically with this. This could be due to the role of previous antibiotic administration and early presentation to hospital for the majority of cases. The HIV prevalence of the sample population is higher than Uganda's national prevalence of 6.7%. The

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study however did not include antiretroviral use and blood CD4 counts, which have a bearing in infection predisposition.

The level of anaemia is unlikely to be explained by the acute disease features. It is more likely to occur during chronic infections. The 19.2% prevalence probably reflects the fact that general population anemia levels are sizeable.

The predominance of S. aureus as an isolate is illustrated[2,3,6]. This is explained by its being a major component of the body's normal flora and its ubiquitous occurrence in the community. Coliforms fall next in order of prevalence. They also constitute a major portion of body normal flora. They have been encountered in the various hospital and community based studies cited[2,4,5,10]. There was an obvious inadequate laboratory capacity in specific bacterial (species) type identification, particularly coliforms. In only few samples were some specific bacterial types identified. These were: Klebsiella, Proteus, E. coli, P. aeruginosa and enterobacter. All are documented bacteria involved in acute pyogenic abscesses. In 23.4% of the pus samples there was no bacterial growth on culturing. This was possibly due to: the good inflammatory response, concomitant antibiotic use or the presence of anaerobic organisms[13,14,15]. Anaerobes require special conditions for pus sample collection, transportation and culture. These were not provided for in this study and thus leaves a gap in our knowledge of the burden of anaerobic abscesses.

Antibiotic sensitivity testing was done for a rather narrow range of antibiotics. The assortment purely depended on the availability of the antibiotic discs. As it turned out S. aureus was sensitive to at least all antibiotics tested for. It exhibited susceptibility most to ciprofloxacin. Ciprofloxacin, a quinolone, is described in many previous studies as being an antibiotic active against most forms of S. aureus [3,6,17], even with the emergence of MRSA and other resistant forms[18,19]. Coliforms too were sensitive to at least each of the antibiotics[5], except for erythromycin and tetracycline. There was most susceptibility to amikacin. This may be attributed to the prescription practice and/or limitations due to drug costs of amikacin. It has generally not been widely used both in the community and hospitals. Apparently, resistant forms may not yet be widely prevalent.

Staph. aureus showed resistance to the assortment of antibiotics[6,18,19,23,24], except for amikacin[17]. This can probably be explained by the absence of resistant forms. However, due to the small numbers of tests for amikacin susceptibility by S. aureus, we cannot definitely state that all its strains have this property. The highest prevalence of resistance was to chloramphenicol. It is a broad spectrum antibiotic that has been used in a wide range of settings for several decades. Resistant bacteria forms seem to have developed over the years. Coliforms characteristically showed highest levels of resistance to augmentin (amoxicillin/clavulanic acid) (20.8%). This is in spite of the clavulanic acid presence in this drug[20]. The likely explanation is the coliforms being organisms classified as extended-spectrum beta lactamase producers. These are on the rise in prevalence and are notable for resistance to penicillins[5].

Some setbacks were encountered during the study. The cross-sectional design and duration of study yielded a rather limited sample size. It was therefore difficult to analyse for causation and to explore associations by regression. We also had fewer than desirable disc sensitivity tests and were unable to collect and culture anaerobic bacteria. Methicillin resistance by S. aureus was particularly not done.

Conclusion

- Most subjects with community acquired acute pyogenic abscesses, who seek medical treatment, take some form of antibiotic medication prior to presentation to hospital. The type, dose and

duration of this pre-hospital medication, as well as the quality of the prescriber/drug dispenser, are areas which need to be looked into.

- The predominant organism isolated from these abscesses was S. aureus followed by coliform organisms. Thus, they are the main aetiologic bacteria involved. These bacterial forms all exhibited a mixed picture of susceptibility and resistance to a range of antibiotics.
- S. aureus was most susceptible to ciprofloxacin and showed greatest resistance to chloramphenicol. Coliform organisms were most susceptible to amikacin and showed greatest resistance to augmentin. There is a likelihood of extended-spectrum beta-lactamase producing bacteria causing this resistance and posing a challenge to antibiotic therapy.
- Future research should focus on longitudinal studies with a wider spectrum of antibiotic sensitivity tests and thorough bacterial type identification. Study should be done on community-acquired extended-spectrum beta-lactamase producing bacteria and MRSA, particularly CA-MRSA. The prevalence, types and sensitivity tests for anaerobic organisms needs exploration too. Subsequently, recommendations can be made for appropriate antibiotic usage policies for community acquired pyogenic infections.

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