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Bacteriological Profiles of Pus with Antimicrobial Sensitivity Pattern at a Teaching Hospital in Dhaka City

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Abstract

Background: The human skin and soft tissue infections (SSTIs) caused by microbial pathogens during or after trauma, burn injuries, and surgical procedures result in the production of pus, a white to yellow fluid comprised of dead WBCs, cellular debris, and necrotic tissues. **Objective:** The purpose of the present study was to see the frequency and distribution of bacteria isolated from pus and sensitivity pattern. **Methodology:** This retrospective study was conducted in the Department of Microbiology at Shaheed Suhrawardy Medical College, Dhaka from January 2016 to December 2016 for a period of one (01) year. The pus samples were collected from the patients who were visited in outpatient department and were admitted at IPD in Shaheed Suhrawardy Medical College Hospital (ShSMCH), Dhaka with skin and soft tissue infection. Bacteria were detected by culture and biochemical test and antibiotic susceptibility test done by disc diffusion method. **Result:** A total number of 212 patients presented with wound infection or pus were recruited for this study. Among 212 patients majority were in the age group of 20 to 40 years which was 89(42.0%) cases. Interestingly male was predominant than female which was 119(56.1%) cases and 93(43.9%) cases respectively. aerobic culture was positive in majority cases which were 131(61.8%) cases. **Conclusion:** In conclusion the most common isolated bacteria after aerobic culture of pus is the *Staphylococcus aureus*. However the gram positive cocci is less in number than gram negative bacilli. [*Bangladesh Journal of Infectious Diseases 2018;5(1):10-14*]

Keywords: Bacteriological profiles; pus; sensitivity pattern; antibiogram

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Introduction

Pyogenic infection is characterized by several local inflammations. It usually presents with pus formation. These are generally caused by one of the pyogenic bacteria[1]. Pyogenic infections may be endogenous or exogenous. The human skin and soft tissue infections (SSTIs) are caused by microbial pathogens during or after trauma, burn injuries, and surgical procedures[2]. These result in the production of pus[3]. Both aerobic and anaerobic bacteria have been implicated in wound infections which commonly occur under hospital environment resulting in significant morbidity, prolonged hospitalization and huge economic burden[4]. Coagulase positive *Staphylococcus aureus* has been found to be more dominant organism in pus[5-6].

Antibiotic resistance among bacteria is becoming more and more serious problem throughout the world. It is said that evolution of bacteria towards resistance to antimicrobial drugs, including multidrug resistance, is unavoidable because it represents a particular aspect of the general evolution of bacteria that is un-stoppable[7]. Antibiotic resistance emerges commonly when patients are treated with empiric antimicrobial drugs. Monitoring of resistance patterns in the hospital is needed to overcome these difficulties and to improve the outcome of serious infections in hospital settings[8].

The emergence of antibiotic resistance pathogenic bacteria are considered as grave threats to the public health worldwide[9]. During the last few decades, multidrug-resistant Gram-negative bacterial strains such as *Acinetobacter baumannii*, *E. coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* and Gram-positive methicillin-resistant *Staphylococcus aureus* (MRSA) were increasingly associated with pus infections under hospital settings due to extensive overuse and inadequate dose regimen of antibiotics[9-11]. Rapid emergence of multidrug-resistant bacteria poses a serious threat to public health globally due to the limited treatment options and discovery of new classes of antibiotics[11-12]. Therefore, this present study was undertaken to see bacteriological profiles of pus with their resistant pattern.

Methodology

This retrospective study was conducted in the Department of Microbiology at Shaheed Suhrawardy Medical College, Dhaka from January 2016 to December 2016 for a period of one (01) year. All the patients presented with skin and soft tissue infection were selected as study population. The pus samples were collected from the patients who were visited in outpatient department and were admitted at IPD in Shaheed Suhrawardy Medical College Hospital (ShSMCH), Dhaka. Bacteria were detected after aerobic culture at 370 C for 24 hours. Identification of bacteria was performed by biochemical test and antibiotic susceptibility test was done by disc diffusion method. Pus samples were collected from skin (furuncles, pustules, and abrasions), nasal wounds, ears, legs, Pus samples were processed for Gram staining and culturing. The samples were aseptically inoculated on blood agar (with 5% sheep blood) and MacConkey's agar plates, incubated aerobically at 35°C–37°C for 24–48 h. Identification and characterization of isolates were performed on the basis of Gram staining, microscopic characteristics, colony characteristic, and biochemical tests using standard microbiological methods. Antibiotics discs containing amikacin (30 µg), amoxicillin-clavulanic acid (30 µg), azithromycin (30 µg),, ceftriaxone (30 µg), cefotaxime (30 µg), cefuroxime (30 µg), cephalexin (30 µg), ciprofloxacin (1 µg), clindamycin (2 µg), cloxacillin (30 µg), erythromycin (15 µg), gentamicin (10 µg), imipenem (10 µg), levofloxacin (5 µg), linezolid (30 µg), meropenem (10 µg), ofloxacin (5 µg), piperacillin-(100/10 µg),, tetracycline (30 µg), and vancomycin (30 µg) were obtained from Himedia Laboratories (Mumbai, India) and used as per manufacturer's instructions. Antibiotic susceptibilities of bacterial isolates were determined according to the method recommended by the Clinical and Laboratory Standards Institute[13]. Briefly, inocula were prepared for each bacterial isolate by adjusting the turbidity to 0.5 McFarland standard and spread on Muller-Hinton agar plates. The numerical data obtained from the study were analyzed and significance of difference was estimated by using the statistical methods. Data were expressed in percentage as applicable. Comparison between groups was done by Chi - square test. Probability less than 0.05 was considered as significant.

Results

A total number of 212 patients presented with wound infection or pus were recruited for this study. Among 212 patients majority were in the age group of 20 to 40 years which was 89(42.0%) cases followed by 40 to 60 years and less than 20 years which was 68(32.1%) cases and 50(23.6%) cases respectively.

Table 1: Age and Gender Distribution of Study Population (n=212)

Age Group	Male	Female	Total
< 20 Yrs	26(21.8)	24(25.8)	50(23.6)
20 to 40 Yrs	45(37.8)	44(47.3)	89(42.0)
40 to 60 Yrs	43(36.1)	25(26.9)	68(32.1)
> 60 Yrs	5(4.2)	0(0.0)	5(2.4)
Total	**119(100.0)**	**93(100.0)**	**212(100.0)**

Figure within the parenthesis indicates percentage.

Interestingly male was predominant than female which was 119(56.1%) cases and 93(43.9%) cases respectively.

Table 2: Culture Positivity of Study Population (n=212)

Culture	Frequency	Percent
No growth	81	38.2
Growth	131	61.8
Total	**212**	**100.0**

Among the male and female group 20 to 40 Years was the most common age group which was 45(37.8%) cases and 44(47.3%) cases respectively (Table 1). Out of 212 cases aerobic culture was positive in majority cases which were 131(61.8%) cases and the rest of 81(38.2%) cases were growth negative. Therefore culture positive was more than no growth which was shown in this result and reflected the laboratory authenticity (Table 2).

Table 3: Rate of Isolated Bacteria after Aerobic Culture (n=212)

Bacteria	Frequency	Percent
E. coli	35	16.5
Pseudomonas	31	14.6
Staph. aureus	53	25.0
Klebsiella Spp	2	0.9
Acinatobactor spp	10	4.7
Total	**131**	**61.8**

Staphylococcus aureus was the most common isolated bacteria from pus which was 53(25.0%) sioaltes followed by *Escherichia coli*, *Pseudomonas, Acinatobactor* species and *Klebsiella* species which were 35(16.5%), 31(14.6%), 10(4.7%) and 2(0.9%) isolates respectively (Table 3).

Table 4: Sensitivity Pattern of Isolated Bacteria

Antibiotics	*E. coli*	*P. aeruginosa*	*S. aureus*	*K. pneumoniae*	*A. baumanii*
Amikacin	00	00	00	-	100
Gentamycin	34.4	32	18.6	50	10
Cefotaxim	60	45.5	26.3	-	00
Ciprofloxacin	57.1	25	19	00	100
Imipenem	42.1	26.1	23.3	00	12.5
Cotrimoxazole	52.2	46.2	35.1	00	50
Azithromycin	70	42.9	33.3	-	100
Amoxicillin	90.9	64.7	46.2	100	-
Cephalexin	45.8	29.6	42.5	00	75
Vancomycin	80	50	18.5	100	66.7
Cephradine	47.4	62.5	56.2	100	100
Ceftriaxone	78.9	57.1	47.8	-	85.7
Nitelmycin	50	39.1	37	100	14.3
Ampicillin	70	61.5	75	-	80
Erythromycin	61.1	60	61.3	00	100
Pefloxacin	77.8	50	36.4	50	100
Cefuroxime	88.9	87.5	54.5	-	87.5
Linezolid	75	80	31.2	50	100
Meropenem	50	50	29.2	-	100
Cloxacillin	50	33.3	48.2	100	-
Ceftazidime	68.2	80	56.2	00	83.3
Amoxiclave	71.4	45.5	33.3	00	00
Pipericillin	40	14.3	47.1	50	-

Discussion

Any wound is at some risk of becoming infected. When a wound fails to heal, the patient suffers from morbidity, treatment costs. Therefore the general wound management practices become more resource demanding. As wound infection is becoming the major hospital acquired infection, hospital environment plays a major role for causing wound infection.

In this study out of all samples majority (61.8%) are growth positive. The reason is that the suppurative infection of the skin, ear, and eye are common occurrences in hospitalized patients as well as in the outpatients department. Furthermore wound infection is regarded as the most common nosocomial infection among surgical patients[8]. It has been associated with increased trauma care, prolonged hospitals stay, and treatment[9].

The most common isolated bacteria is the *Staphylococcus aureus* (25.0%). Similar to the present study result Mantravadi et al[14] have revealed that *S. aureus* is the most commonly isolated pathogen (37.2%) in pus samples, which is in agreement with the studies by Rao et al[15], Tiwari and Kaur[16], Lee et al[17] and Mahmood[18]. However, Agnihotri et al[19] have found *S. aureus* to be the second most common pathogen after *Pseudomonas* species. *E. coli* followed by *Klebsiella* was the most common Gram negative bacteria isolated from the pus samples in from this present study. Though *S. aureus* was the predominant organism, gram-positive cocci accounted for only 25.0% of the total isolates, 75.0% being GNB. Such GNB dominance in the aerobic growth in pus culture has been highly supported by the studies reported by Ghosh et al[20] and Zubair et al[21] Another study by Basu et al[22] also reported *Pseudomonas* and *E. coli* spp. to be the most commonly occurring pathogens in wound infections which is inconsistent with the present study result. Raza et al[23] found *E. coli* to be the most common pathogen with similar observations by studies conducted in Nigeria.

High antibiotic resistance was seen by *S. aureus* to penicillin (84.5% to penicillin and 63.6% to ampicillin). Macrolides like erythromycin showed approximately 58.3% sensitivity and 41.7% resistance pattern while they were fairly sensitive to Vancomycins like clindamycin. Highest sensitivity was shown by high-end drugs such as linezolid and vancomycin. Unfortunately, this only shows that *Staphylococcus* has become highly resistant to the first and second lines of treatment. On the other hand, *Streptococcus*, the other gram positive bacteria isolated, still shows fair amount of sensitivity to most of the drugs. These findings are similar to those of Rao et al[15] who also found *S. aureus* to be resistant to penicillin (84.62%), erythromycin (84.62%), and sensitive to clindamycin (65.38%) and vancomycin (100%). Studies by Taiwo et al[24] revealed 99.6% resistance to ampicillin and 33.1% to oxacillin, 72.7% to erythromycin but 100% sensitivity to vancomycin and more than 98% to linezolid. Among the b-lactams, high resistance was seen by gram-negative bacteria to even fourth-generation cephalosporins whereas carbapenems are still sensitive though increasing resistance has been observed to meropenem.

Amikacin among the aminoglycosides showed good sensitivity whereas resistance to gentamicin and tobramycin is on the rise. Resistance was seen by most of the isolates to quinolones. Combination drugs such as piperacillin plus tazobactam and cefoperazone plus sulbactum showed good amount of sensitivity. Similar studies by Taiwo et al[24], Rao et al[15] and Basu et al[22] corroborated our findings. The knowledge of the bacteriology of an infection and the laboratory susceptibility testing of microorganism implicated could make drug selection in antimicrobial chemotherapy more rational.

Conclusion

In conclusion the most common isolated bacteria after aerobic culture of pus is the *Staphylococcus aureus*. However the gram positive cocci is less in number than gram negative bacilli. Among the Gram negative bacilli *E. coli* is the most common bacteria causing wound infection. Large scale study should be conducted to see the actual scenario regarding the wound infection.

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