Original Article

Bacteriological Profile of Wound Swab and Their Antimicrobial Susceptibility Pattern in Shaheed Suhrawardy Medical College, Dhaka

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Abstract

Background: *Wound infections are global problem in the field of surgery associated with long hospital stay, higher treatment expenditure, morbidity and mortality.*

Objective: *To isolate and identify the bacteria causing wound infection and to determine the antimicrobial susceptibility pattern.*

Methods: *This retrospective study was conducted in the Department of Microbiology at Shaheed Suhrawady Medical College, Dhaka from January 2017 to December 2017 for a period of one (01) year. A total of 190 wound swabs were collected from the patients who were visited in outpatient department and were admitted at inpatient department with skin and soft tissue infection. Swabs from the wound were inoculated on appropriate media and cultured and the isolates were identified by standard procedures as needed. Antimicrobial susceptibility testing was done by disc diffusion method according to 'The Clinical Laboratory Standard Institute' guidelines.*

Results: *In this study, out of 190 cases 115 (60.52%) were male and 75 (39.47%) were female and majority 85(44.73%) were in the age group of 16 to 30 years. A total number of 190 isolates were obtained, among which 124 (65.25%) were culture positive cases. Among the isolated organisms predominant bacteria was* Staphylococcus aureus *68 (35.79%) followed by* Escherichia coli *30 (15.79%),* Pseudomonas *14 (7.37%),* Klebsiella *6 (3.16%),* Proteus *4 (2.10%) and* Acinetobacter *2 (1.05%).* Staphylococcus aureus *was sensitive to linezolid (94.11%), vancomycin (88.23%) and amikacin (70.58%). Among the Gram negative isolates* Escherichia coli *was predominant and showed sensitivity to imipenem (80%), amikacin (70%), ceftazidime (60%), piperacillin+ tazobactum (56.66%), colistin (53.33%).* Pseudomonas *showed sensitivity to colistin (78.57%), imipenem (71.42%).* Klebsiella *showed sensitivity to imipenem (83.33%), amikacin (66.66%), piperacillin+ tazobactum (66.66%), and colistin(66.66%).*

Conclusion: Staphylococcus aureus *was the most frequently isolated pathogen from wound swab and the antibiotic sensitivity pattern of various isolates will guide for appropriate selection of antibiotics against wound infection, so as to reduce the spread of resistant bacteria.*

Key Words:
Bacterial isolates, wound infections, antimicrobial susceptibility, drug resistance.

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Introduction

Wound is defined as an injury to any of the body tissue especially when it is caused by physical means that interrupts continuity.[1] The exposed subcutaneous tissue provides a favorable substratum for a wide variety of microorganisms to contaminate and colonize, and if the involved tissue is devitalized and the host immune response is compromised, the conditions become optional for microbial growth.[2] The progression of a wound to an infected state is likely to involve a multitude of microbial and host factors.[3] Wound infection can be caused by variety of organisms like bacteria, virus, fungi and protozoa

and may co-exist as poly microbial communities especially in wound margins and in chronic wounds.[4] Infection of the wound is the invasion and proliferation by one or more species of microorganisms sometimes resulting in pus formation.[5] The most common bacterial genera infecting wounds are *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Klebsiella spp.* and *Acinetobacter spp*.[6] The spread of antimicrobial resistance is now a global problem, which is due to significant changes in microbial genetic ecology, as a result of indiscriminate use of antimicrobials.[7] The increasing frequency of antimicrobial resistance among pathogens causing nosocomial and community acquired infections is making numerous classes of antimicrobial agents less effective resulting in emergence of antimicrobial resistance.[8] Continued use of systemic and topical antimicrobial agents has provided the selective pressure that has led to the emergence of antibiotic resistant strains which in turn, has driven the continued search for new agents. Unfortunately, the increased costs of searching for effective antimicrobial agents and the decreased rate of new drug discovery has made the situation increasingly worrisome.[9] Hence the present study was carried out to identify the causative agent of wound infection and antibiotic susceptibility pattern of the isolates, which will be beneficial as guidance for medical practitioners to select empirical antimicrobial therapy and on the implementation of infection control measures that plays an important role in minimizing the emergence rate of antimicrobial resistance.

Material and Methods

This retrospective study was conducted in the Department of Microbiology at the Shaheed Suhrawady Medical College, Dhaka from January 2017 to December 2017 for a period of one year. A total of 190 wound swabs were collected from patients attending at outpatient and inpatient department of Shaheed Suhrawady Medical College and Hospital. All the samples were cultured on blood agar and Mac Conkey agar media incubated overnight at 37ºC. Organisms were identified by standard microbiological procedures including colony characters, Gram staining and biochemical reactions.[10] All the isolates were tested for antimicrobial susceptibility by the disc diffusion technique according to the Clinical Laboratory Standards Institute (CLSI) guidelines.[11,12]

Results

Out of 190 cases 115 (60.52%) were male and 75 (39.47%) were female and majority 85(44.73%) were in the age group of 16 to 30 years followed by 31 to 45 years and 46 to 60 years which was 38 (20.0%) cases and 27 (14.22%) cases respectively (Table-1). A total number of 190 isolates were obtained, among which 124 (65.25%) were culture positive cases (Table -II).

Table-I

Age and gender distribution of the study populations (n=190)

Age group(years)	Male	Female	Total
≤ 15	11(9.5)	8(10.6)	19 (10)
16-30	53(46.08)	32(42.66)	85(44.73)
31-45	20(17.39)	18(24.0)	38(20.0)
45-60	16(13.92)	11(14.66)	27(14.21)
>60	15(13.04)	6(8.0)	21(11.05)
Total	115(100.0)	75(100.0)	190(100.0)

Table-II

Culture Positivity of the study populations (n=190)

Culture	Frequency	Percentage
No growth	66	34.75
Growth	124	65.25
Total	190	100.0

Among the isolated organisms predominant bacteria was *Staphylococcus aureus* 68 (35.79%) followed by *Escherichia coli* 30 (15.79%), *Pseudomonas* 14 (7.37%), *Klebsiella* 6 (3.16%), *Proteus* 4 (2.10%) and *Acinetobacter* 2 (1.05%) (Table-III).

Table-III

Organisms isolated from wound swab (n=190)

Organisms	Number	Proportion (%)
Staphylococcus aureus	68	35.79
Escherichia coli	30	15.79
Pseudomonas	14	7.37
Klebsiella	6	3.16
Proteus	4	2.10
Acinetobacter	2	1.05
Total	124	65.26

All the bacterial isolates were tested for antimicrobial susceptibility. *Staphylococcus aureus* found highly sensitive to linezolid (94.11%), vancomycin (88.23%) and amikacin (70.58%) and low sensitivity found in Ceftazidime (27.94%), Ceftriaxone (29.41%) and Ampicillin (29.41%). *Escherichia coli* found sensitive to imipenem (80%), amikacin (70%), ceftazidime (60%), piperacillin+ tazobactum (56.66%), colistin (53.33%). *Pseudomonas* showed lowest sensitivity to almost all of the drugs except colistin which was 78.57% sensitive and imipenem was 71.42% sensitive. *Klebsiella* showed 83.33% sensitivity to imipenem and 66.66% sensitivity to amikacin, piperacillin+ tazobactum and colistin (Table-IV).

Table-IV

Antibiotic sensitivity pattern of the isolates in wound infections.

Antibiotics	*Staphylo coccus* (n=68)	*Escherichia coli* (n=30)	*Pseudomonas* (n=14)	*Klebsiella* (n=6)	*Proteus* (n=4)	*Acinetoba cter* (n=2)
Amikacin	48(70.58)	21(70.0)	6(42.85)	4(66.66)	2(50.0)	1(50.0)
Ampicillin	20(29.41)	18(60.0)	5(35.71)	3(50.0)	1(25.0)	0(0.0)
Ciprofloxacin	25(36.76)	15(50.0)	7(50.0)	3(50.0)	1(25.0)	1(50.0)
Ceftriaxone	20(29.41)	16(53.33)	5(35.71)	3(50.0)	1(25.0)	1(50.0)
Ceftazidime	19(27.94)	18(60.0)	4(28.57)	3(50.0)	1(25.0)	1(50.0)
Gentamycin	30(44.11)	17(56.66)	8(57.14)	2(33.33)	2(50.0)	1(50.0)
Co-trimoxazole	25(36.76)	15(50.0)	5(35.71)	3(50.0)	0(0.0)	0(0.0)
Imipenem	0(0.0)	24(80.0)	10(71.42)	5(83.33)	0(0.0)	0(0.0)
Piperacillin+Tazobactum	0(0.0)	17(56.66)	8(57.14)	4(66.66)	3(75.0)	1(50.0)
colistin	0(0.0)	16(53.33)	11(78.57)	4(66.66)	0(0.0)	0(0.0)
Azithromycin	39(57.35)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Linezolid	64(94.11)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Vancomycin	60(88.23)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)

Discussion

Purulent wound infections are exemplified by severe local inflammation, habitually with pus formation caused by severe pyogenic bacteria. These infections can lengthen the hospital stay, hinder in wound healing and raises the overall cost and morbidity.

In the present study, among the 190 samples 124 (65.25%) was culture positive. This culture positivity rate in our study is in accordance with the study by Nithya et al.[13] However, lower rate was also reported by Shrestha et al (50%).[14]

The incidence of wound infection was higher in males (60.52%) than in females (39.47%) which could be explained by the fact that male were more prone to wound infections perhaps due to disparities in propensitity for skin colonization or other anatomical differences. Dessalegn et al recorded higher infection in males as compared to females.[15] Hermandez et al reported (65.6%) males and (34.4%) females among the surgical site infection patients.[16] which is similar with this study.

In the present study majority of the cases was reported in the age group of 15-30 years (44.73.%) which coincides of the results of previous studies.[17] Anush et al reported maximum of infection (28%) in 41-50 years of age group and the lowest (1.4%) in 81-90 years age group.[18]

The common bacterial isolates found in the study were *Staphylococcus aureus* (35.79%) followed by *Escherichia coli* (15.79%), *Pseudomonas* (7.37%), *Klebsiella* (3.16%), *Proteus* (2.10%) and *Acinetobacter* (1.05%). Several studies had reported that *Staphylococcus aureus* was the common isolate of purulent wound infections worldwide with the prevalence rate ranging from 4.6% to 54.4%.[19] *Staphylococcus aureus* infection is usually associated with patient's own endogenous flora and it is a skin and nasal microbial flora, acquired also from contaminated hospital environment, surgical devices or from hands of health care workers.[20] *Escherichia coli* was the next common organism followed by *Pseudomonas*, *Klebsiella* which was similar to the study done by Albumani et al.[21] This confirms that most wound infections arising from abdominal procedures are acquired from patients own fecal flora.[20]

In this study, *Staphylococcus aureus* showed 94.11% sensitive to linezolid, 88.23% to vancomycin, followed by 70.58% to amikacin and less sensitivity were found in Ceftazidime (27.94%), Ceftriaxone (29.41%) and Ampicillin (29.41%). Remarkable susceptibility of *Staphylococcus aureus* to vancomycin, linezolid, fusidic acid, amikacin and gentamicin may be due to lesser use of these antibiotics as a result of their less availability, cost and toxic effect.[22]

In this study, *Escherichia coli* were sensitive to imipenem (80%), amikacin (70%), ceftazidime (60%), piperacillin+ tazobactum (56.66%), colistin (53.33%) which was similar to the study done by Mahmood et al.[23] So, reduced antibiotic sensitivity pattern noted for *Escherichia coli* suggests its importance for hospital acquired infection.

Pseudomonas showed lowest sensitivity to almost all of the drugs and susceptible to colistin (78.57%), imipenem

(71.42%), piperacillin+ tazobactum (57.14%), and gentamycin (57.14%). But the study done by Albumani et al.[21] had shown variable susceptibility pattern with imipenem 100%, piperacillin+ tazobactum (87.71%), levofloxacin (85.71%), cefotaxime (71.42%) for *pseudomonas aeruginosa*.

Klebsiella showed highest sensitivity to imipenem (83.33%), amikacin, piperacillin+ tazobactum and colistin (66.66%) and reduced sensitivity to ampicillin, ciprofloxacin, ceftriaxone, ceftazidime, co-trimoxazole (50.00%) which was similar to the study done by Anderl et al.[24]

Conclusion

The findings of this study showed that *Staphylococcus aureus* was found to be the predominant among all of the isolates of wound infections and showed highest sensitivity to linezolid, vancomycin followed by amikacin. Among the Gram negative bacilli *Escherichia coli* was the most common bacteria causing wound infection. Most of the Gram negative isolates were highly sensitive to imipenem, piperacillin + tazobactum, colistin. So this knowledge of the most likely causative organisms and prevailing drug susceptibility pattern of this study may be helpful in deciding empirical therapy to reduce mortality and morbidity in wound infections. Therefore periodic review of the bacteriological profile and antibiotic susceptibility pattern should be done at regular intervals to evolve the control strategies and reduce the infection rate.

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