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Original Article

Antibiotic Sensitivity Pattern Of Different Isolated Bacteria In Pus Sample

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Abstract:

Background: Knowledge of local common pathogens and their resistance status can guide clinician to choose appropriate antibiotic for empirical treatment of patients.

Objective: This study was undertaken to determine the frequently isolated organism from pus culture and to determine the antibiotic sensitivity patterns. The human skin and soft tissue infections (SSTIS) caused by microbial pathogens during or after trauma, burn injuries and surgical procedures. These result in the production of pus, a white yellow fluid comprised of dead WBC, cellular debris and necrotic tissues.

Methods: Total 110 samples were collected from July 2018 to December 2018, to study antibiograms of various organism. All isolated bacteria were identified based on colony characteristics, Gram stain and standard biochemical tests and antibiotic susceptibility testing with disk diffusion method.

Results: Most commonly encountered organism was Staphylococcus aureus (56.2%) followed by E. Coli (21.4%), Klebsiella (8.1%), Pseudomonas (6.4%), Streptococcus pyogens (5.6%) and Proteus (2.3%).

Conclusion: The present study exemplify, there is an increasing need for gaining knowledge about the pattern of microbes and their antibiotic sensitivity and resistance, hence regular monitoring of bacterial sensitivity to antibiotics is essential.

Keywords: Wound infection, Bacterial pathogen, Antibiotic susceptibility pattern, Pus sample.

Introduction:

Pyogenic infections are characterized by local and systemic inflammation with pus formation. Infection of soft tissue are generally associated with the production of pus and bacteria involved are said to be pyogenic. Both aerobic and anaerobic bacteria have been implicated in wound infections which commonly occur under hospital environment and result in significant morbidity, prolonged hospitalization.[1] Coagulase positive Staphylococcus aureus has been found to be more dominant organism in pus.[2]

Since the emergency of methicillin resistant Staphylococcus aureus (MRSA) in 1960, there have been reports of increasing rate of infection by MRSA and this superbug has established itself as the common cause of nosocomial as well as community acquired infections.[3]

Further, many reports have shown the increasing rates of infection in children by MRSA.[4]

Moreover, wound infections were found to be higher (49%) among post-operative patients as compared to pre-operative patients (15.9%) in that study.[5] Post-operative wound infections have emerged as one of the important causes of morbidity among the hospitalized patients.[6] Wound infection is becoming a major concern among patients and health care practitioners for its increased toll on morbidity and financial loss. It also generates demand for attaining expensive management with in public health system.[7]

The study aimed to collect data on the bacteriological profiles of wound infection and their antibiotic susceptibility patterns in a teaching hospital in Bangladesh.

Materials and Methods:

This retrospective study was conducted in the department of Microbiology at Holy Family Red Crescent Medical College Hospital Dhaka, from July 2018 to December 2018. The microbiology department collected the samples from the outpatient and inpatient department of Surgery.

110 swab samples were collected from patients with various wound infections including post-operative surgical wounds, burn wounds, and superficial and soft tissue infections.

Bacteria were detected after aerobic culture at 37° C for 24 hours. Identification of bacteria was performed by biochemical test and antibiotic susceptibility test was done by disk diffusion method. Pus samples were processed for Gram staining and culturing. The sample were aseptically inoculated on blood agar (5% sheep blood) and MacConkey's agar plates, incubated aerobically at 35° C-37° C for 24 hr-48 hr.

Identification of isolated bacteria was done by colony morphology, gram staining and standard bio chemical tests by microbiologist 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), Ciprofloxacin (5µg), Cloxacillin (30 µg), Gentamycin (10 µg), Imipenem (10 µg), Levofloxacin (5 µg), Meropenem (10 µg), Piperacillin (100/10 µg), Tetracycline (30 µg) and Vancomycin (30 µg).

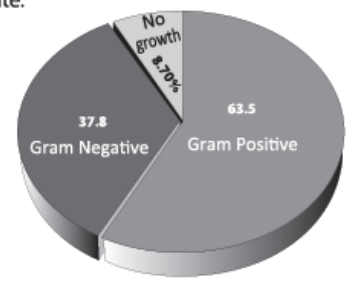
Antibiotic Susceptibilities of bacterial isolates were determined according to the method recommended by the clinical and laboratory standards Institute.[8]

The data were expressed in percentage as applicable. Comparison between groups was done by chi. Square test. Probably less than 0.05 was considered as significant.

Results: -

Characteristics of study participants: The mean age of the study participants were 29 years to 41 years and 58.1 % of participants were male.

Figure -I: Out of 110 cases shows the frequency of bacterial growth. Around 63.5% of culture positive plates out to be from positive organisms and 37. 8 % Gram negative. Only 8.7 % did not yield any growth in culture plate.



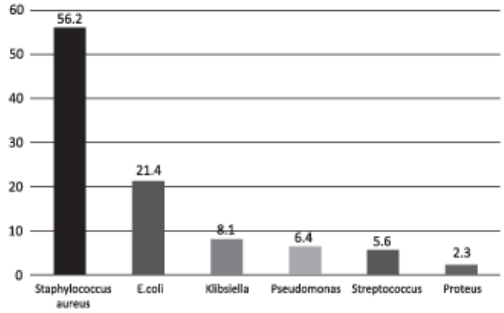
Pattern of bacterial growth among samples (N-110)

In this figure blue portion indicate Gram positive Yellow Indicate Gram Negative and gray portion indicate no growth.

Isolation of different types of bacteria:

Staphylococcus aureus 56.2% was predominantly found to be isolated among all the presenting bacteria. The frequency of E. coli and klebsiella were 21.4% and 8.1 % respectively and also Pseudomonas species, Streptococcus pyogens and Proteus were 6.4 %, 5.6%, 2.3 % respectively

Figure -II:



Rate of isolation of different bacteria are mentioned here based on number and their corresponding percentage.

Table-I: Sensitivity pattern of isolated Gram -positive bacteria (N=62)

Antibiotic Susceptibility test was done by Disk Diffusion Method.

Antimicrobial Agents	Staphylococcus aureus (56)	Streptococcus pyogens (6)
Amoxicillin (10 µg)	33 (58.9%)	3 (50.0%)
Penicillin (10 µg)	30 (53.5%)	4 (66.6%)
Cloxacillin (30 µg)	42 (75.0%)	4 (66.6%)
Azithromycin (30 µg)	40 (71.4%)	4 (66.6%)
Cephradine (30 µg)	31 (55.3%)	4 (66.6%)
Tetracycline (30 µg)	32 (57.1%)	3 (50.0%)
Gentamicin (10 µg)	43 (76.7%)	5 (83.4%)
Cefuroxime (30 µg)	32 (57.1%)	4 (66.6%)
Imipenem (10 µg)	52 (92.8%)	5 (83.3%)
Ceftriaxone (30 µg)	46 (82.1%)	5 (83.3%)
Vancomycin (30 µg)	31 (55.3%)	3 (50.0%)

The susceptibility pattern of Gram-positive bacteria was mostly isolated to Imipenem (92.8%) followed by Ceftriaxone (82.1%), Gentamycin (76.7%), Cloxacillin (75%), Azithromycin (71.4%) and others antibiotics (> 70%).

Table-II: Sensitivity pattern of isolated Gram -negative bacteria (N=37).

Antibiotic Susceptibility test was done by Disk Diffusion Method.

Antimicrobial agents	E. Coli (21)	Klebsiella (8)	Pseudomonas (6)	Proteus (2)
Cephradine (30 µg)	10 (47.6%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Cefixime (5 µg)	18 (85.7%)	1 (12.5%)	1(16.6%)	1 (50.0%)
Penicillin (10 µg)	8 (38.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Cefuroxime (30 µg)	19 (90.4%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Ceftriaxone (30 µg)	19 (90.4%)	1 (12.5%)	5 (83.3%)	2 (100%)
Ciprofloxacin (5 µg)	5 (23.8%)	0 (0.0%)	3 (50.5%)	1 (50%)
Azithromycin (30 µg)	8 (38.0%)	2 (25.0%)	3 (50.0 %)	2 (100%)
Amoxicillin (10 µg)	1 (4.7%)	1 (12.5%)	0 (0.0 %)	0 (0.0%)
Gentamycin (10 µg)	19 (90.4%)	3 (37.5%)	4 (66.6%)	1 (50%)
Imipenem (10 µg)	19 (90.4%)	1 (12.5%)	4 (66.6%)	2 (100%)
Ceftazidime (30 µg)	20 (95.2%)	3 (37.5%)	3 (50.5%)	2 (100%)

Most of the Gram negative isolates were sensitive to Ceftazidime (95.2%), Ceftriaxone (90.4%), Gentamycin (90.4%) and other antibiotics (>70%).

Discussion:

Any wound is at some risk of becoming infected. Management of post-operative wound infection remains a significant concern for physicians globally.[9] 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 sample (110) we found that Gram positive organisms accounted for 63.5% of isolates, compared to Gram negative isolates that accounted for 37.8%. The reason is that suppurative infection of the skin, ear and eye are common occurrences in hospitalized patients as well as in the outpatient's department.

Furthermore, wound infection is regarded as the most common nosocomial infection among surgical patients.[10]

It has been associated with increased trauma care, prolonged hospitals stay and treatment.[11]

Staphylococcus aureus (56.2%) was the major microbial pathogen responsible for the wound infection. According to Centre for disease control and prevention (CDC). Staphylococcus aureus is the most common organism associated with surgical wound infections. This study supports the results reported by Nwachukwu et.al.[12] Among the Gram-negative organisms Escherichia coli were frequently isolated (21.4%) in our study. A previous survey conducted in Lahore supported our findings demonstrating that Staphylococcus aureus was the main causative organism of surgical infection.[13]

In our study, we found Imipenem as the most active antibiotic, with a susceptibility of 92.8 % against Staphylococcus aureus. This study showed high sensitivity Staphylococcus aureus against imipenem, Cloxacillin and gentamycin. This finding corresponds to a previous study that also found that Staphylococcus aureus was susceptible to higher generation of antibiotics.[14] We found that Staphylococcus aureus is usually resistant to various antibiotics and the infection might be acquired in the hospital.

Among the Gram-negative bacteria Escherichia coli was found to be susceptible to ceftriaxone, cefotaxime, gentamycin, cefixime, ceftazidime and cefuroxime.

Isolated Klebsiella spp., all organism were resistant to cephradine, penicillin, cloxacillin, cefuroxime, tetracycline and ciprofloxacin. Similarly, Okonko et al.[15] had observed a high level of resistance by Klebsiella spp. to most antibiotics. However, they noticed that all Klebsiella spp. isolate were susceptible to gentamycin and ceftazidime. This high susceptibility pattern might support gentamycin as a suitable antibiotic to treat Klebsiella infection.[16]

Among isolated pseudomonas spp. all were resistant to cephradine, penicillin, cloxacillin, cefuroxime, amoxicillin and cefotaxime. Pseudomonas isolates were susceptible to ceftriaxone, imipenem, gentamycin, tetracycline, ciprofloxacin, azithromycin, ceftazidime. The susceptibility pattern that we found that most of the isolated strains were multi drug resistant, similarly, a study conducted in European setting reported a high resistance of Pseudomonas spp., mostly isolated from surgical wounds.[17]

The control of wound infections is becoming difficult due to widespread bacterial resistance to antibiotics. Previous studies also notified and increased incidence of bacterial infections by methicillin resistant Staphylococcus aureus, poly microbial flora and different fungi.[18]

As wound infections are found to be common in this study, prior knowledge of the causative agents of can be a helpful tool in selecting the empiric antimicrobial therapy to control infection.

Conclusion:

The result of the above study exemplify, there is an increasing need for gaining knowledge about the

pattern of microbes and their antibiotic sensitivity and resistance, which varies in a geographical manner. The isolates from this study showed that Staphylococcus aureus was the most isolated organisms from the pus culture report followed by E. Coli, Klebsiella,

Pseudomonas, Streptococcus pyogens and Proteus. Knowledge of causative agents of pyogenic infection and their antibiotic sensitivity pattern is very essential for the judicial administration of empirical therapy before culture are available. Antibiotic sensitivity of micro-organism varies from place to place and time to time, hence regular monitoring of bacterial sensitivity to antibiotics is essential.

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