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The Prevalence of Pathogenic Bacteria from Different Clinical Samples in a Tertiary Care Hospital

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Abstract

The present study was undertaken to assess the antibiotic susceptibility patterns of various pathogens at a tertiary care hospital in Patiala, India. Total of 425 culture positive samples including blood isolates, urine isolates and other isolates were taken and microbial sensitivity testing was done using disk diffusion test. The results confirmed the presence of high priority pathogens including S.aureus, Enterococcus species, Klebsiella species, Esch.coli, Pseudomonas species, Acinetobacter species and candida species in the isolates.By assuming the causative agent before starting empirical treatment can act as lifesaving in critical situations. It also helps to choose the most suitable antibiotic from the pool instead of haphazard use.

Keywords: Antimicrobial susceptibility, disk diffusion technique

Introduction

Multiple antibiotic resistances in bacterial populations are a pervasive and growing clinical problem, which is recognized as a threat to public health. As now a days individuals are very much exposed to many antibiotics, widespread use of antibiotic has increased the probability of resistance day by day leading to multiple antibiotic resistances. There is a need to conduct area-specific monitoring studies to profile different pathogens responsible for specific infections and their resistance patterns, so as to generate data that would help clinicians to choose the correct empirical treatment. Hence, the word antimicrobial susceptibility came into play which is referred as when microbe such bacteria are incapable to breed in the presence of antimicrobial drugs at their lowest MIC (minimum inhibitory concentration). It helps to understand the antibiotic resistance profiles of bacterial isolates and helps physicians to make better treatment decisions and predict therapeutic outcome.

A sharp rush in bacteria-encoding resistance is taking place worldwide, jeopardizing the efficacy of antibiotics which have saved hundreds of thousands of lives. The antibiotics that have threatened microorganisms for many years are below grave danger themselves. Owing to massive societal consequences of multidrug resistance and the drastically decreased improvement of drugs, it's far obligatory to decide the microbes which want greater interest than others for drug improvement. Subsequently, WHO has advanced a concern listing of the pathogens, and stratified the listing into critical, high, and medium priorities. The infections resulting from resistant bacteria, due to mutations results themselves with harsher signs than their predecessors.

Esch.coli is an epitome of opportunistic nosocomial pathogen, which causes a wide spectrum of infections and leads to substantial morbidity in immuno-compromised patients (ref). Unfortunately, other pathogens prevalent among nosocomial infections are Klebsiella species and Enterococcus species. These bacterias also (ref) Therefore, the present study was undertaken to find out the antibiotic susceptibility patterns of pathogenic

isolates from various specimens of hospital acquired infections (HAI).

Materials and Methods:

This work was done at the Department of Microbiology, Government Medical College, Patiala (Punjab), India. Our study group comprised of patients who were referred to our department for culture and antibiotic susceptibility testing, which were clinically suspected cases of bacterial infections Four hundred and twenty five isolates samples (blood, urine, tracheal aspirates/ bronchoalveolar lavage, soft tissue samples and sterile body fluids), received from patients admitted to the hospital were processed for isolation and identification of bacterial pathogens according to standard microbiological techniques.

The samples were inoculated for semi-quantitative culture using a calibrated loop. TheBlood agar, Nutrient Agar and MacConkey's culture plates were incubated at 37°C for 18-24 hrs under aerobic conditions. Identification of bacterial growth was determined by Gram's staining and standard microbiology techniques.

Bacteria were inoculated onto Mueller-Hinton agar plate containing different antibiotic disk with different concentrations. Kirby–Bauer Disk diffusion technique was imploded for antibiotic susceptibility. According to the Clinical Laboratory Standard Institute (CLSI) guidelines. [3] Paper disks (Hi-media, Mumbai) were impregnated with antibiotics:

Ampicillin (10mcg), Amoxycillin-clavulanic acid (20/10mcg),Piperacillin tazobactam, Gentamicin (10 mcg), amikacin (30 mcg), erythromycin (20mcg), Clindamycin (30mcg), Ciprofloxacin (20mcg), Levofloxacin (30mcg), Ceftriaxone, Vancomycin (20mcg), andmeropenem (10 mcg),doxycycline (20mcg), polymyxin B (30MCG), tetracyclines (20mcg), azithromycin (15mcg), chloramphenicol (30 mcg). During this incubation, the antibiotics diffuse into the media with antibiotic concentration decreasing with increasing distance from the disk. Zone of inhibition diamenter was measured and results were interpreted as resistant or senstitive as per CLSI guidelines.

Results

Out of 2850 clinical samples, cultures were positive in 425 samples. 425 samples subjected to culture sensitivity reported the presence of bacterial infection. The percentage occurrence of Esch. coli in these samples was 53.6% from urine (124), blood (2) and other isolates (102). Another dominating pathogen reported from the isolates was Klebsiella species contributing to 21.8% among all pathogens from urine (35), blood (10) and other isolates (48). Other species observed in the present investigation was S.aureus, Enterococcus species, Pseudomonas species, and Acinetobacter species contributing to 5.8%, 8%, 4%, and 6.11% respectively. Esch. Coli was the most prominent bacteria all through the studied period.

Table 1:
Distribution of microorganisms isolated from 425 samples of tertiary care hospital.

High priority pathogens	Number isolated in blood samples	Number isolated in Urine samples	Other Isolates			
			Number isolated in Swabs (vaginal)	Number isolated in Swabs (Pus)	Number isolated in CSF	Number isolated in Respiratory samples
S.aureus	3	2	6	5	5	4
Enterococcus species	3	30	2	-	1	-
Klebsiella species	10	35	15	16	7	10
E.coli	2	124	26	38	20	18
Pseudomonas species	2	5	3	4	1	2
Acinetobacter species	4	4	5	8	3	2

In the present study results revealed the bacterial species isolated from diverse samples of hospital admitted patients, as well as their antibiotic susceptibility patterns in order to identify hospital acquired infections. The various antibiotics used in the study were Amoxycillin-clavulanic acid, Piperacillintazobactam, Erythromycin, Gentamicin, Ciprofloxacin, Ceftriaxone, Clindamycin, Vancomycin and Imipenam. Maximum sensitivity of all the

isolates was to Imipenam. Almost all the isolates including Esch. coli, Kleb pneumoniae, Ps.aeruginosa and Pr. mirabilis, S. aureus were resistant to Ceftriaxone. On the other hand Esch. coli was more sensitive to amoxyclav and imipenam which accounts to 88 % and 94% respectively. The incidence of infection was maximum in the age group of 30-49 years.

Discussion:

Knowledge of the antimicrobial-resistance patterns of the most common uropathogens is required for the best treatment of hospitalized patients. During empirical treatment, it is critical to monitor the regional and local spectrum of the most commonly occurring bacteria as well as antimicrobial-resistance rates. Pseudomonas species emerged as acritical pathogen which causes nosocomial infections and is one of the critical reasons of morbidity amongst hospital patients. This is because of the reason that it has acquired resistance to various antibiotics and antiseptics and its ability to spread and multiply widespread in hospitals despite minimal nutrients and inadequate moisture. As pseudomonas aeruginosa is responsible for severe infections, various studies were conducted to detect the antibiotic sensitivity patterns for the various drugs available and these studies helps the clinicians for the better examination and management of patients. Klebsiella pneumoniae strains are rapidly evolving into multidrug resistant (MDR) strains, posing a major concern to patients because to an increased fatality rate due to lower efficacy of treatment alternatives. Through the synthesis of enzymes such as Extended Spectrum-Lactamase (ESBLs) and Carbapenemase, K. pneumoniae has been shown to develop antibiotic resistance more easily than most bacteria. Bacteremia, septicemia, surgical site infection, urinary tract infection, hospital acquired pneumonia, and ventilator-associated pneumonia are all illnesses caused by K. pneumoniae colonising the oropharynx and gastrointestinal tract.

Health-care-associated infections have been linked to higher morbidity, death, and health-care expenses. An integrated infection control programme can reduce infection rates by up to 30% while also lowering health-care expenses (5). In the present study, the bacterial species isolated from diverse samples of hospital admitted patients, as well as their antibiotic susceptibility patterns in 14 different antibiotics, were studied in order to identify hospital acquired infections. One of the studied bacteria S.aureus showed resistance to ampicillin, cefepime, amikacin, ofloxacin and cefotaxime. In the previously reported study, all S. aureus strains from the infected wound were resistant to cefixime and ampicillin, moreover two strains of S. aureus strains were methicillin-resistant also (6). Another species of Enterococcus showed resistant to ampicillin, cefepime,ciprofloxacin, ofloxacin, cefotaxime, and sensitive to meropenem, gentamicin and tetracyclines. Previous study reported thatEnterococcus faecalis was fully susceptible to ampicillin, ciprofloxacin, gentamicin (high level), vancomycin and linezolid (7). Another bacteria found in the samples was Klebsiella species showed resistant to ampicillin, cefepime, ofloxacin and cefotaxime, whereas the species showed sensitivity to razupenem, amikacin, polymyxin,tetracyclines and chloramphenic. Another species of E.coli showed sensitivity to razupenem, meropenem, gentamicin, amikacin, polymycin and chloramphenic, whereas showed resistant to cefepime, ofloxacin, cefotaxime and tetracyclines.One of the most common causes of bacterial illnesses is Escherichia coli and its antimicrobial resistance patterns continue to be a major public health concern around the world, resulting in serious health issues such as prolonged hospitalisation and treatment failure. Various studies have showed that E. coli is one of the most common organisms causing UTI(8-10) the antibiotic sensitivity profile revealed that E. coli bacteria was highly sensitive to antibiotics such as Nitrofurantoin and Ofloxacin (11). Another studied species Pseudomonas showed resistant to only chloramphenic, whereas showed sensitivity to razupenem, meropenem, gentamicin, ciprofloxacin and polymyxin. Acinetobacter species in the present study showed resistant to cefepime, meropenem, gentamicin, ciprofloxacin, ofloxacin, cefotaxime, whereas showed sensitivity to polymyxin. Another study revealed that Acinetobacter baumannii was

highly sensitive to ceftazidime-tazobactam and colistin and was sensitive to gentamicin and showed low sensitivity for amikacin whereas was fully resistant to cefepime, cotrimoxazole and levofloxacin (7).

There fore, antibiotic prophylaxis can decrease the overall risk of infection. The surgeon can also minimize the risk to the patient by giving attention to technical details and awareness of the operating room environment, and the selective use of antibiotic prophylaxis for appropriate patients (12).This study will provide guidance to general practitioners in the tertiary care hospitals for the management of nosocomial infections by providing specific antibiotics and avoids the overuse of antibiotics.

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