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RESEARCH ARTICLE

CHANGING TRENDS IN MICROBIAL FLORA AND THEIR ANTIBIOTIC SENSITIVITY

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ABSTRACT:

Microbial resistance is a burning issue in the medical world from last few decades. Irrationale use of antibiotics in the treatment of infectious diseases has led to emergence of resistant strains of microorganisms; incapacitating the most potent weapon against infections. Thus, the present study was conducted to evaluate the trends in microbial flora and their antibiotic sensitivity. A retrospective study of five hundred twelve patients admitted in various hospitals attached to Dr. S. N Medical College, Jodhpur with various infections was conducted. The blood culture reports were screened to study microbial organisms and their antibiotic sensitivity pattern. The most common organisms isolated were staph aureus accounting for 29.5% of the isolates and followed by Klebsiella (13.87%), Enterococci (7.81%) and Citrobacter (7.42%). At the end of the study, it was observed that there were constant changes in the pattern of organisms and antibiotics in patients. Based on this study, it is suggested that before prescribing antibiotics, clinicians should be aware of recent trends of prevalent organisms and their sensitivity patterns. This would reduce emergence of resistant organisms and favour patient's wellbeing.

Key-words: Microbial resistance, antibiotics, Sensitivity

INTRODUCTION

Antibiotics have long been considered the "magic bullet" that would end infectious disease. Although they have improved the health of countless numbers of humans and animals, many antibiotics have also been losing their effectiveness since the beginning of the antibiotic era. Bacteria have adapted defenses against these antibiotics and continue to develop new resistances, even as we develop new antibiotics. In recent years, much attention has been given to the increase in antibiotic resistance. As more microbial species and strains become resistant, many diseases have become difficult to treat, a phenomenon frequently ascribed to both indiscriminate and inappropriate use of antibiotics in humans[1]. There is no doubt that the use of antibiotics provides selective pressure that results in antibiotic resistant bacteria and resistance genes.

In the past 60 years, antibiotics have been critical in the fight against infectious disease caused by bacteria and other microbes. Antimicrobial chemotherapy has been a leading cause for the dramatic rise of average life expectancy in the Twentieth Century. However, disease-causing microbes that have become resistant to antibiotic drug therapy are an increasing public health problem. Wound infections, gonorrhea, tuberculosis, pneumonia, septicemia and childhood ear infections are just a few of the diseases that have become hard to treat with antibiotics. The increasing prevalence of antimicrobial-resistant organisms is a major public health problem.

Nowadays, about 70 percent of the bacteria that cause infections in hospitals are resistant to at least one of the drugs most commonly used for treatment[2].

Bloodstream infections cause substantial morbidity and mortality. Increasing rates of antimicrobial resistance, changing patterns of antimicrobial usage, and the wide application of new medical technologies (e.g., indwelling catheters and other devices) may change the epidemiology and outcome of bloodstream infection. It is therefore important to continually review and update the epidemiology[3].

METHODOLOGY

The study was conducted from data collected from patients admitted in various hospitals attached to Dr. S.N Medical College Jodhpur. A total of 512 cases with blood culture positive by Bact Alert method were included in this study. The name, age, sex, complete clinical history, organism isolated and their antibiotic sensitivity of all the patients were recorded in a pre-designed performa. BacT/ALERT*FA culture bottles manufactured by BIOMERIEUX was used with the BacT/ALERT microbial detection system for enhanced recovery and detection of aerobic and facultative anaerobic microorganisms. The BacT/ALERT microbial detection system utilizes a colorimetric sensor and reflected light to monitor the presence and production of carbon dioxide that is dissolved in the culture medium[4].

Sub-Culture was done on blood agar, chocolate agar and thioglycollate broth and kept in 10% carbon dioxide atmosphere at 37° C for 48 hours and checked for growth after overnight incubation. If any colony was found on blood agar and chocolate agar then Gram's staining was performed and subsequent bacterial identification was done by using biochemical tests. Antimicrobial sensitivity testing was performed by the Kirby Bauer Disc Diffusion Method.

RESULTS

List of organisms isolated from samples are illustrated in table 1.

The sensitivity pattern of these isolated organisms is illustrated in table 2.

Isolation of organisms based on underlying illness is illustrated in table 3.

Table 1: Organisms Isolated In the Study

Organism	Total Number of Patients	(%)
Staph. Aureus	151	29.49
Klebsiella	71	13.87
Enterococci	40	7.81
Citrobacter	38	7.42
Enterobacter	34	6.64
Staph. Albus	31	6.05
Pseudomonas	27	5.27
Candida albicans	18	3.52
E. coli	18	3.52
Salmonella	13	2.54
Rest all others	71	13.87

As shown in table 1, the most common organisms isolated are Staph aureus accounting for 29.5% of the isolates and is followed by Klebsiella (13.87%), Enterococci (7.81%) and Citrobacter (7.42%) respectively.

Table 2: Sensitivity Pattern of Organisms

ANTIBIOTIC	Staph aureus		Klebsiella		Enterococci		Citrobacter		Enterobacter	
	Total 151	%	Total 71	%	Total 40	%	Total 38	%	Total 34	%
Ciprofloxacin (CP)	61	40.39	23	32.39	14	35	13	34.21	9	26.47
Amoxycillin+sulbactum(Ams)	45	29.80	21	29.58	21	52.5	15	39.47	11	32.3
Amikacin (AK)	25	16.56	22	30.99	12	30	23	60.53	15	44.12
Ofloxacin (OF)	44	29.14	17	23.94	-	-	15	39.47	8	23.53
Tazobactum+Pipercillin(TzP)	34	22.5	34	47.89	16	40	13	34.21	5	14.71
Tigecycline(Tgc)	36	23.84	22	44.89	7	33.33	20	52.63	13	38.02
Gatifloxacin(GF)	52	34.44	-	-	-	-	7	18.42	5	14.71
Meropenem(MEM)	51	33.77	29	40.84	10	25	21	55.26	12	35.29
Cefepime/Tazobac(CPT)	31	20.53	26	36.62	5	12.50	21	55.26	7	20.59
Moxifloxacin (MXF)	32	21.19	18	25.35	7	17.05	6	15.78	5	14.71
Pefloxacin (PF)	30	19.87	20	28.16	-	-	13	34.21	1	2.94
Vancomycin (VA)	44	35.76	-	-	12	30	9	23.68	4	11.76

The observations tabulated in table 2 shows that Staph aureus was most sensitive to Ciprofloxacin, Klebsiella to Tazobactum+Pipercillin (TzP), Enterococci to Amoxycillin+sulbactum (Ams), Citrobacter and Enterobacter were both most sensitive to Amikacin.

The observations recorded in table 3 exhibits that Staph. aureus and Klebsiella are the most common isolates in patients with Diabetes Mellitus while Klebsiella, E.coli and Citrobacter are the major isolates in patients with UTI.

In patients with Pneumonia; Staph. aureus, Klebsiella and Streptococci are major pathogens. While for Puerperal sepsis; Staph. aureus, Pseudomonas and Enterococci are major isolated pathogens.

TABLE 3: Isolation of Organism based on underlying illness

Organism	Diabetes Mellitus	UTI	Pneumonia	Puerperal sepsis
Staph. aureus	29	1	30	5
Klebsiella	17	20	10	0
Pseudomonas	8	8	1	3
Candida albicans	7	3	0	0
Enterococci	7	9	1	2
Enterobacter	6	0	0	1
Citrobacter	4	12	1	1
Providencia	3	2	1	0
Streptococci	3	0	6	1
E. coli	1	13	0	1
Rest all others	6	4	0	2

DISCUSSION

The inappropriate use of antibiotics has resulted in selection of large number of resistant strains[5]. To overcome this problem, the understanding of microbial flora and their sensitivity profile is essential.

The four most common organisms isolated in this study were Staphylococcus aureus (29.49%), Klebsiella (13.8%), Enterococci (7.8%) & Citrobacter (7.4%).

The observations made in this study shows that Staph aureus was most sensitive to Ciprofloxacin, Klebsiella to Tazobactum+Pipercillin (TzP), Enterococci to Amoxycillin+sulbactum (Ams), Citrobacter and Enterobeter were both most sensitive to Amikacin.

The antibiotic sensitivity patterns of individual organisms isolated from the study sample were analysed. In the present study, it was observed that the Staph. aureus was most susceptible to fluroquinolones followed by Amoxycillin + Sulbactum (29.8%) & Vancomycin (35.76%). Klebsiella was most susceptible to Tazobactum + Pipercillin (47%) followed by Cefepime + Tazobactum (36.6%), Meropenem & Ciprofloxacin both 32.3%. Enterococci was most susceptible to Amoxycillin+sulbactum (52.5%) followed by Tazobactum+Pipercillin (40%), Amikacin (30%), Vancomycin (30%), Meropenem (25%) and Tigecycline (25%). Citrobacter was most susceptible to Amikacin (60.53%) followed by Meropenem and Cefepime + Tazobactum both in 55.26%, Tigecycline (52.63%) and tetracycline in 42.11% cases. E.coli was susceptible to Meropenem (38.8%) followed by Ciprofloxacin (33.33%), Amikacin (22.22%).

The source of infection and underlying illness in these patients was analysed, it revealed that the diabetes was the major underlying illness in 15.1% cases followed by urinary tract infection (12.1%) & Pneumonia (9.54%).

The result of EPIC study performed in Europe in 1992, also showed that the Pneumonia was the most common infection (46.9%) followed by UTI (17.6%)[6]. NNIS study from USA identified UTI (31%) as the most common infection in patients with sepsis followed by Pneumonia (27%)[2].

Staphylococcus aureus & Klebsiella accounting for 46%, were the most common organism causing infection in patients with Diabetes Mellitus. Staph. aureus, Pseudomonas & Enterococci were the most common organisms causing Puerperal sepsis.

CONCLUSION

The present study shows that there are constantly changing patterns of microorganisms causing infections along with their antibiotic sensitivity. It has been noted that the pathogens causing infections are also dependent on the underlying illness such as Diabetes Mellitus, UTI, and Pneumonia. This is also an important aspect to be considered by the clinician while prescribing antibiotics to such population.

Thus, this study clearly emphasizes the importance of early identification of the organism and their sensitivity pattern using latest techniques, which will surely decreases the mortality and morbidity in patients. Further, judicious use of antibiotics will not only reduce the development of antibiotic resistance but also would lessen the economic burden on the patients.

The present study also proposes the importance of such studies to be conducted at regular intervals to determine latest trends in microbial infections and their sensitivity patterns.

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