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ORIGINAL ARTICLE

A RETROSPECTIVE ANALYSIS ON ANTIMICROBIAL SENSITIVITY PATTERN IN A MEDICAL COLLEGE HOSPITAL IN KANNUR DISTRICT

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ABSTRACT: BACKGROUND: Resistance by disease causing organisms to antimicrobial drugs is a worldwide issue. Infections caused by resistant microorganisms fail to respond to conventional treatment, resulting in prolonged illness and hospitalization, and greater risk of death. Novel resistance mechanisms have emerged, making the most recent generation of antibiotics almost ineffective. **OBJECTIVE:** To study the antimicrobial sensitivity pattern in Kannur medical college hospital. **MATERIALS AND METHODS**: The present study is a retrospective hospital-record based study, conducted in Kannur medical college hospital from 1.08.2013 to 30.09.2013. During the period of study all the blood, urine, pus, and sputum culture reports were studied, from the register of central microbiology laboratory. Among the positive culture reports, antibiotic sensitivity of the common bacteria isolated were also noted to determine the antibiotic sensitivity pattern. **RESULTS:** The most common bacteria isolated in urine sample was enterobactericae sensitive to nitrofurantoin, amikacin and gentamycin; that in pus sample was Staph. aureus sensitive to linezolid and vancomycin; that in sputum sample was klebsiella sensitive to cefaperazone and sulbactum and that in blood sample was Staph. aureus sensitive to linezolid, vancomycin and gentamycin. **CONCLUSION:** The study gives one time information about the antibiotic sensitivity pattern, the intermittent review of the sensitivity pattern is very essential.

KEYWORDS: AMR, antimicrobial, resistance.

INTRODUCTION: Antimicrobial resistance is not a new problem, but it has worsened dramatically in the last decade. During that time, the pace of development of new antimicrobials has slowed down while the prevalence of resistance has grown at an alarming rate.[1] First time in the 1940s when antibiotics were introduced, they were known as "Magic bullets"- the miracles of modern medicine. After their introduction the prevalence of severe infections like syphilis, gonorrhoea, leprosy, and tuberculosis decreased which resulted finally to increased life expectancy of humans. The powerful impact of these medicines sparked a revolution in the discovery of new drugs.[2] But it was short lived as the sensitive organisms became resistant and also with the introduction of newer microorganisms, challenging the role of antibiotics in infection control. Antimicrobial resistance (AMR) is resistance of a microorganism to an antimicrobial medicine to which it was originally sensitive. It can be either natural or acquired resistance. Natural resistance occurs when the bacteria is inherently resistant to the antibiotic and acquired resistance is developed in a previously sensitive microbe over a period of time through mutation or gene transfer.[3]

Resistant organisms (They include bacteria, fungi, viruses and some parasites) are able to withstand attack by antimicrobial medicines, such as antibiotics, antifungals, antivirals, and antimalarials, so that standard treatments become ineffective and infections persist increasing risk of spread to others. The evolution of resistant strains is a natural phenomenon that happens when microorganisms are exposed to antimicrobial drugs, and resistant traits can be exchanged between certain types of bacteria. The misuse of antimicrobial medicines accelerates this natural phenomenon. Poor infection control practices encourages the spread of AMR.[4]

In 2010, at least 440000 new cases of multidrug resistant-tuberculosis were detected and 10% of these are extensively drug-resistant tuberculosis, which has been reported in 69 countries to date. The malaria parasite is acquiring resistance to even the latest generation of medicines, and resistant strains causing gonorrhea and shigella have limited treatment options. Serious infections acquired in hospitals can become fatal because they are so difficult to treat and drug-resistant strains of microorganism are spread from one geographical location to another in today's interconnected and globalized world. Resistance is also emerging to the antiretroviral medicines used to treat people living with HIV.

The world is on the verge of losing these miracle cures. The emergence and spread of drug-resistant pathogens has accelerated, essential medicines are failing and therapeutic treatment options are shrinking. The speed with which these drugs are being lost far outpaces the development of replacement drugs. In the absence of urgent corrective and protective actions, the world is heading towards a post-antibiotic era, in which many common infections will no longer have a cure and, once again, kill unabated.[2]

Drug resistance is becoming more severe and many infections are no longer easily cured, leading to prolonged and expensive treatment and greater risk of death, warns WHO on World Health Day 2011. Under the theme "Combat Drug Resistance: no action today no cure tomorrow.", WHO calls for urgent and concerted action by governments, health professionals, industry and civil society and patients to slow down the spread of drug resistance, limit its impact today and preserve medical advances for future generations.[5]

Antimicrobial resistance is a major public health problem worldwide because resistance costs money, livelihoods and lives, and affects the effectiveness of health care programmes,[6] and basic factors that hasten the emergence and spread of AMR include lack of a comprehensive and coordinated response; weak or absent antimicrobial resistance surveillance and monitoring systems; inadequate systems to ensure quality and uninterrupted supply of medicines; inappropriate use of antimicrobial medicines, poor infection prevention and control practices; insufficient diagnostic, prevention and therapeutic tools.[4]

There is a need of periodic review on the pattern and sensitivity of organisms isolated from different cases and the results must be communicated to doctors. The present study is one such effort with the objective to determine the antimicrobial sensitivity pattern of frequently isolated bacteria from various cultures in a medical college hospital in Kannur district.

MATERIALS AND METHODS: The present study is a retrospective record based study. It was conducted in Kannur medical college from 1.08.2013 to 30.09.2013. During the period of study all the culture reports of blood, urine, pus, and sputum were studied, from the register of Central Microbiology laboratory in Kannur Medical College and Hospital. The culture reports of the samples which were already registered were noted. Among the positive culture reports, antibiotic sensitivity of the common bacteria isolated was also noted to determine the antibiotic sensitivity pattern.

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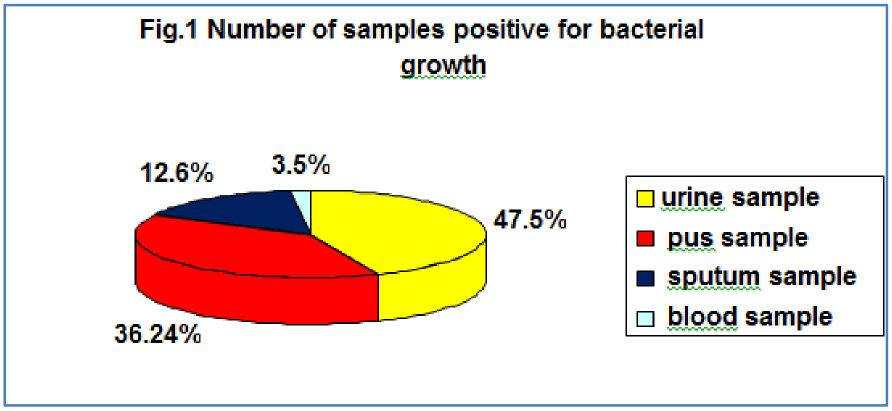
RESULTS: A total of 735 sample reports were analyzed. Out of these, 276 were urine samples, 250 were pus samples, 157 were sputum samples and 62 were blood samples. Cultures of 229(31.2%) of all the samples were positive for bacterial growth. It was found that cultures of 109(47.5%) urine samples, 83(36.24%) pus samples, 29(12.6%) sputum samples, and 8(3.5%) blood samples were positive as shown in Fig. 1.



Urine Culture: The most common organism isolated from urine sample was E. coli (101; 92.6%) followed by pseudomonas (8; 7.3%). E. coli isolates showed 79.5% sensitivity to nitrofurantoin, 65.3% to amikacin, 56.2% to gentamycin, 23.2% to ciprofloxacin, 22% to cefaperasone, 50% to cefaperazone+sulbactum, 36% to cotrimoxazole, 27% to norfloxacin, 25.7% to ceftriaxone, 16.3% to piperacillin and 3.2% to oflocxacin. The pseudomonas isolates showed 78.4% sensitivity to cefaperazone, 71.2% to amikacin, 76.4% to gentamycin, 25% to ofloxacin, 28.6% to cefaperazone+sulbactum, and 25.2% to piperacillin; it was not sensitive to commonly used ceftriaxone, cotrioxazole, nitrofurantoin, ciprofloxacin, norfloxacin, as shown in Table 1.

Antibiotic	E.coli Sensitivity (%) n=101	Pseudomonas Sensitivity (%) n=8
Ceftriaxone	25.7	0
Cotrimoxazole	36	0
Cefaperazone	22	78.4
Nitrofurantoin	79.5	0
Ofloxacin	3.2	25
Ciprofloxacin	23.2	0
Norfloxacin	27	0
Amikacin	65.3	71.2
Gentamycin	56.2	76.4
Cefaperazone+sulbactum	50	28.6
Piperacillin	16.3	25.2

Table 1: Showing antibiotic sensitivity of organisms isolated from urine culture

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Pus Culture: Among the 83 positive pus culture reports the most common organism isolated was staphylococcus aureus (54, 64.4%) followed by pseudomonas (18, 22.03%) and klebsiella (11, 13.6%). Staph. aureus showed sensitivity - 79% to vancomycin, 70.8% to linezolid, 42.7% to cefalothin, 43.7% to erythromycin, 2% to ciprofloxacin and 2.6% to ofloxacin; and was totally resistant to ampicillin and penicillin as shown in Table. 2. The gram negative bacilli isolates showed 66% sensitivity to piperacillin+ tazobactum, 42.8% to cefaperazone + sulbactum and amikacin, 38% to imipenem, 28.5% to gentamycin and ciprofloxacin, and 4. 8% to ceftazidime and ceftriaxone.

Antibiotic	Staph. aureus Sensitivity (%) n=54
Linezolid	70.8
Ofloxacin	2.6
Vancomycin	79
Cefalothin	42.7
Cefoxitine	39.4
Erythromycin	43.7
Ciprofloxacin	2
Ampicillin	0
Penicillin	0

Table 2: Showing antibiotic sensitivity of Staph Aureus isolated from pus culture

Sputum Culture: Among the 29 positive sputum samples, 86.7% were gram negative bacilli and 13.3% were gram positive cocci. The most common isolates were pseudomonas (45.3%), klebsiella (28.1%), streptococcus pneumonia (16.3%), streptococcus viridans (5.7%), others (4.6%). Pseudomonas isolates showed sensitivity to amikacin and piperacillin+tazobactum 75.2%, to cefaperazone+sulbactum 53.6%, to ciprofloxacin 33.5%, to ceftazidime 22.7%, to cefipime and ceftriaxone 12.7%, to cotrimoxazole 10. 53% and no reaction to doxycycline and ampicillin as shown in Table. 3. Streptococcus pneumonia showed 100% sensitivity to penicillin and erythromycin, 78.3% to cotrimoxazole, 77.2% to ceftriaxone, 23.8% to clindamycin and 24.3% to gentamycin as shown in Table 4.

Antibiotic	Pseudomonas Sensitivity (%) n=14
Amikacin	75.2
Piperacillin+Tazobactum	75.2
Cefaperazone+sulbactum	53.6
Gentamycin	51.4
Ceftazidime	22.7
Ciprofloxacin	33.5
Cefipime	12.7

Ceftriaxone	12.7
Cotrimoxazole	10.53
Doxycycline	0
Ampicillin	0

Table 3: Showing antibiotic sensitivity to pseudomonas isolated from sputum culture

Antibiotic	Strep pneumonia Sensitivity (%) n=5
Penicillin	100
Erythromycin	100
Cotrimoxazole	78.3
Ceftriaxone	77.2
Clindamycin	23.8
Gentamycin	24.3
Amikacin	0

Table 4: Showing antibiotic sensitivity to Strep pneumonia isolated from sputum culture

Blood Culture: Among the eight positive samples five enterococci and three staphylococcus aureus were isolated. Enterococci showed sensitivity to vancomycin, gentamycin, ciprofloxacin, chloramphenicol, linezolid and amikacin. Staph. aureus showed sensitivity to linezolid, vancomycin, cephalothin, amikacin, gentamycin, ciprofloxacin and clindamycin.

DISCUSSION: Antimicrobial resistance is a major public health problem. It is making a growing number of infections virtually untreatable, both in hospitals and in general community. The major cause of current crisis in antimicrobial resistance is due to uncontrolled and inappropriate use of antibiotic drugs.[1]

In our study a total of 735 sample reports were analyzed. Out of these, 276 were urine samples, 250 were pus samples, 157 were sputum samples and 62 were blood samples. Cultures of 229 (31.2%) of all the samples were positive for bacterial growth. It was found that culture of 109 (47.5%) urine samples, 83 (36.24%) pus samples, 29 (12.6%) sputum samples, and 8 (3.5%) blood samples were positive.

Out of 109 urine samples positive for culture tested, 101 were positive for E. coli and 8 to pseudomonas. The E. coli isolates showed 79. 5% sensitive to nitrofurantoin, 65.3% to amikacin, 56.2% to gentamycin and 50% to cefaperazone+sulbactum, 36% to cotrimoxazole, 27% to norfloxacin, 25.7% to ceftriaxone, 23.2% to ciprofloxacin, 22% to cefaperazone, 16.3% to piperacillin and 3.2% to oflocxacin. This was consistent with the findings of James A Karlowsky et al. In that study the most common isolate was E. coli and it was sensitive to nitrofurantoin (98.3%), ciprofloxacin (97.4%), and sulfamethoxazole (83.8%).[7] And also in a study conducted by Kalpana Gupta et al, E. coli and Staphylococcus saprophyticus were the most common pathogens isolated but the sensitivity pattern was different, E. coli was resistant to ampicillin, cephalothin, and sulfamethoxazole (20% each).[8]

In pus culture the most common organism isolated was staphylococcus aureus (64.4%) followed by pseudomonas (22.03%) and klebsiella (13.6%). The staph. aureus showed sensitivity - 79% to vancomycin, 70.8% to linezolid, 42.7% to cephalothin, 43.7% to erythromycin, 2.6% to ofloxacin and 2% to ciprofloxacin; and was totally resistant to ampicillin and penicillin. In a study conducted by Poornima Tiwari, the most common organism isolated were Staph. aureus which were 100% sensitive to vancomycin, 87% to clindamycin, and 75% to oxacillin. The pseudomonas isolates showed 52% sensitivity to oxacillin, 50% to imipenem, 32% to piperacillin+tazobactum, and 45% to amikacin.[9] In another study conducted by Asha K Appu et al, the most common isolate was pseudomonas followed by staph. aureus. In their study staph. Aureus showed high sensitivity to cephalosporin, amikacin and 100% sensitivity to vancomycin and linezolid, and was resistant to penicillin, erythromycin and gentamycin. Pseudomonas showed high sensitivity to meropenam, amikacin, piperacillin, tazobactum, and was highly resistant to ampicillin, gentamycin, cephalosporin and ciprofloxacin.[10]

In our study the most common isolates in sputum culture were pseudomonas (45.3%), klebsiella (28.1%), streptococcus pneumonia (16.3%), streptococcus viridians (5.7%), others (4.6%). Pseudomonas isolates showed sensitivity to amikacin and piperacillin+tazobactum 75.2%, to cefaperazone+sulbactum 53.6%, to ciprofloxacin 33.5%, to ceftazidime 22.7%, to cefipime and ceftriaxone 12. 7% and no reaction to doxycycline and ampicillin. Streptococcus pneumonia showed 100% sensitivity to penicillin and erythromycin, 78.3% to cotrimoxazole, 77.2% ceftriaxone, 23.8%% to clindamycin and 24.3% to gentamycin. In a study conducted by Y. Wang et al, organisms most frequently isolated were: Pseudomonas aeruginosa (16.88%), Klebsiella pneumoniae (10. 80%), Escherichia coli (10.71%), fungi (10.62%), Staphylococcus aureus (9.68%) and Acinetobacter baumannii (9.03%) and the sensitivity pattern was different from our study. Pseudomonas showed resistance to imipenem (19.4%), ceftazidime (28.1%), cefaperazone (33.7%), ciprofloxacin (71.8%), of loxacin (63.8%) and ampicillin (90.7%).[11]

Among the eight positive blood samples five enterococci and three staphylococcus aureus were isolated. Enterococci showed sensitivity to vancomycin, gentamycin, ciprofloxacin, chloramphenicol, linezolid and amikacin. Staph. Aureus showed sensitivity to linezolid, vancomycin, cephalothin, amikacin, gentamycin, ciprofloxacin and clindamycin. In a study done by Poornima Tiwari, the most common isolates in blood was staph. Aureus and it showed 100% sensitivity to vancomycin, 69% to chloramphenicol, 68% to oxacillin, 67.4% to ciprofloxacin and 66% to gentamycin.[9]

CONCLUSION: In the present study the most common bacteria isolated in urine sample was enterobactericae sensitive to nitrofurantoin and amikacin; that in pus sample was Staph. aureus sensitive to linezolid and vancomycin; that in sputum sample was pseudomonas sensitive to amikacin and piperacillin-tazobactam and that in blood sample was enterococci sensitive to chloramphenicol, vancomycin and gentamycin.

A limitation of this study is the sample size is not so adequate as to reach a definitive conclusion, especially in case of sputum and blood samples. This study provides one time information about the antibiotic sensitivity which is not sufficient as the periodic revision of the sensitivity pattern is very essential.

Hospital antibiotic policy, an efficiently functioning hospital acquired infection control committee and periodic studies at regular intervals to watch over the emergence of drug resistant strains of microorganisms and their sensitivity pattern along with IEC programmes will be helpful in reducing the occurrence of antimicrobial resistance to a few extent.

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