e- ISSN 0976-0342
Print ISSN 2229-7456

International Journal of Pharmacy & Therapeutics

Journal homepage: www.ijptjournal.com

Research article

A STUDY ON EMERGING MULTI-ANTIBIOTIC RESISTANCE IN SURGICAL PATIENTS & THE PATHOGENS ASSOCIATED IN A TERTIARY CARE HOSPITAL

Sruthi Doddapaneni[1]*, Khandker Fatima Farah Hassan[1]*, Subramanyam Jalasuthram[1], Dr. B Raju[2], Shaik Sharmila[1], Satheesh S Gottipati[1]

Vignan Pharmacy College, Vadlamudi, Guntur District, Andhra Pradesh, India, 522213.
Department of General Surgery, Ramesh Hospitals, Guntur, Andhra Pradesh, India, 522213.

ABSTRACT

The advent of multidrug resistance among pathogenic bacteria is decreasing the effectiveness of antibiotics. The goal of this study is to identify antibiotic resistance patterns of various microorganisms isolated from surgical patient samples. A total of 250 surgical patient's antibiotic resistance patterns were analysed of which 187 were male and 63 were female. We observed a wide emergence of infections instigated by multi-resistant gram-negative bacteria 193 (77.2%) especially, E. coli (24%), K. pneumonia (22.8%), P. aeruginosa (13.2%), Acenetobacter sp. (4.8%). Among gram-positive bacteria 55 (22%), multi- drug resistance was noticed in staphylococcus species (18.8%) especially s. Aureus (8.8%). The least being 2 (0.8%) resistant to atypical bacteria. Reported differences in resistance patterns among bacteria isolated from surgery patients may attribute to differences in the patient demographics. Antimicrobial resistance continues to rise at an alarming rate, particularly among gram-negative bacteria. This study will continue to be beneficial in guiding antimicrobial medication decisions in surgical patients.

Key Words:- Antibiotic, Surgical Patients, Antibiotic Resistance, Microorganism.

Access this article online

Home page: http://ijptjournal.com/

Quick Response code

Received:05.03.2022 **Revised:**12.04.2022 **Accepted:**30.05.2022

Corresponding Author

Sruthi Doddapaneni
Vignan Pharmacy College, Vadlamudi, Guntur District, Andhra Pradesh, India, 522213

E-mail: sruthid777@gmail.com

INTRODUCTION

Antibiotics have dramatically reduced bacterial infection-related fatalities and consequences, paving the way for contemporary medicine. Antibiotic-resistant bacteria (arb) are "threatening the achievements of contemporary medicine," according to the world health organization (Yang x, et. al., 2018 and Marsha f. Crader). The "golden era" of antibiotics ranged from the 1930s to 1960s which gave rise to many antibiotics (Alemkere g, 2018, Ebimieoweietebu, 2016). Unfortunately, this era ended because researchers were unable to maintain the pace of antibiotic discovery in the face of emerging resistant pathogens (Garimakapoor, 2015, Siddharthsagaret, 2017). Persistent failure to develop or discover new antibiotics and non- judicious use of antibiotics are the predisposing factors associated with the emergence of antibiotic resistance (Edgar pérez barragán et.al., 2018). Antibiotic resistance threatens a post-antibiotic age, and the medical profession is fighting to preserve our present arsenal with limited amounts of new medications. Some experts believe that in the near future, antibiotic resistance will kill more people than cancer (Nuribayram, 2013, Jiyoun lim, 2010).

Surgical site infections (SSI) are the most common cause of healthcare-acquired infections among surgical patients, accounting for up to 20% of all healthcare-acquired infections outside of the intensive care unit. Surgical antibiotic prophylaxis may reduce overall infection rates, but also has the potential to harm patients (Ferreira rl, Amirmortezaebrahimzadehnamvar, 2014). For researcher and clinicians, as well as drug companies looking for effective treatments, the battle between germs and their susceptibility to drugs continues to be difficult (M. S. Ratnamani 2013). Surgical site infections caused by drug-resistant bacteria are also becoming a severe concern in developing nations like India, owing to overcrowding in hospitals, illogical antibiotic prescriptions, and inadequate infection prevention and control strategies (Aoife howard, 2012). Identifying a bacteria and analyzing its susceptibility pattern aids patients while also assisting clinicians in selecting chemo-therapies that prevent the spread of multi-drug resistance organisms in hospitals.

Aim & objectives:

Aim:

To study the multi- antibiotic resistance in surgical patients & the pathogens associated in a tertiary care hospital.

Objectives:

1. To study the multi- antibiotic resistance patterns.
2. To study the pathogens associated with multi-antibiotic resistance.

Materials & methods:

Study design:

A combined retrospective- prospective observational study

Study resources:

Bed side clinical data, case sheets, drug charts of patients.

Study site:

The study was conducted in the department of general surgery in a multi-specialty tertiary care hospital

Duration of the study:

Six months

Sample size:

250 patients

Methodology of the study:

After ethical committee approval and obtaining patients consent for the study we performed the study.

a. **Inclusion criteria**
   - Patients of either sex (both male & female)
   - Patients of age ≥ 15 years

b. **Exclusion criteria**
   - Paediatrics patients
   - Immune compromised patients
   - Pregnancy and lactating woman

The demographic details like age, gender & other details like culture reports, past medical history, past medication history, comorbidity conditions, diagnosis and procedure done were collected from the patients case sheets. Surgical patient's culture reports were screened for multi-antibiotic resistance patterns.

The screened culture reports were filled in the pre- specified proforma sheets. They were then analyzed statistically.

Statistical analysis:

Frequencies are measured in absolute numbers and percentages to represent age, gender, co-morbid conditions, samples collected, organisms isolated, antibiotics resistance in surgical patients. Chi- square test was used to determine their association, p value of 0.05 or less was considered statistically significant.

Results:

Age distribution of the study:

Out of 250 patients, mean age of the patients is 55.41±16.6, youngest being 15-35 years (young-adults), oldest being >55years (old age adults) [figure 1].

Gender distribution of the study:

In this combined retrospective- prospective observational study, out of 250 patients 187 (74.8%) are male, 63(25.2%) are female [figure 2].

Table 1: co morbidities in study population

Out of 250 patients, 111 (44.4%) patients were found with Diabetes mellitus. 22 (8.8%) patients were found with hypothyroidism. 15 (6%) patients were found with CKD . 43 (17.2%) patients were found with CAD. 125 (50%) patients were found with CAD [table 1].

Comorbidities:

Gramstain:

Among the 250 surgical patients included in the study, 193 (77.2%) were found to be multi- antibiotic resistant to gram negative bacteria, 55 (22%) were found to be resistant to gram positive bacteria while the least being 2 (0.8%) resistant to atypical bacteria [figure 3].

Organism isolated

In the 250 samples collected from surgical patients, the commonly isolated organisms were Eschericia coli 60 (24%), Klebsiella pneumonia 57 (22.8%), Pseudomonas aeruginosa 33 (13.2%), Staphylococcus aureus 22 (8.8%) [Figure 4].

Among male (187), the most commonly observed organisms were E. coli (45), Klebsiella pneumonia (45), Pseudomonas aeruginosa (27). Whereas, in female (63) commonly isolated organisms were E. coli (15), klebsiella pneumonia (12), Staphylococcus aureus (9) [Figure 5].

Here, p value=0.025.

Age vs organism isolated

The resistance was observed most commonly in the age group >55years. These age group people were most resistant to E. coli (33), Klebsiella pneumonia (28), Pseudomonas aeruginosa (25). In the age group 35-55 years, resistance was observed to be the most in Klebsiella pneumoniae (22), E. coli (14). Whereas, in the age group 15-35 years resistance was found to be most in E. coli (13) [figure 6].

Table 1: Co Morbidities In Study Population

COMORBIDITY	FRE-QUENCY	PERCENT-AGE
Hypertension	125	50
Diabetes Mellitus	111	44.4
Coronary Artery Disease	43	17.2
Thyroid disease	22	8.8
Renal disease	15	6

Figure 01: age wise distribution of the study

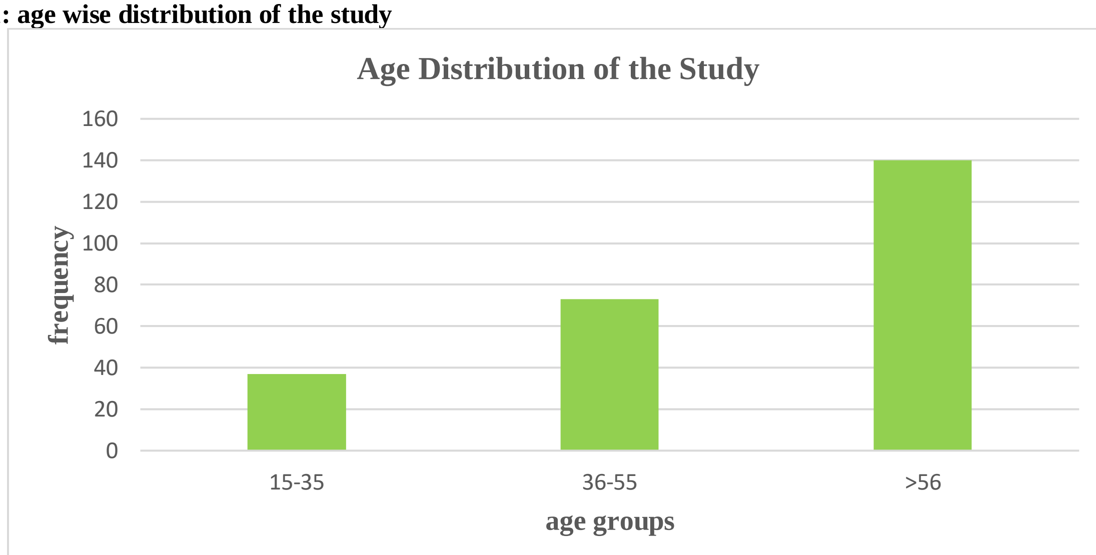


Figure 02: gender wise distribution of study

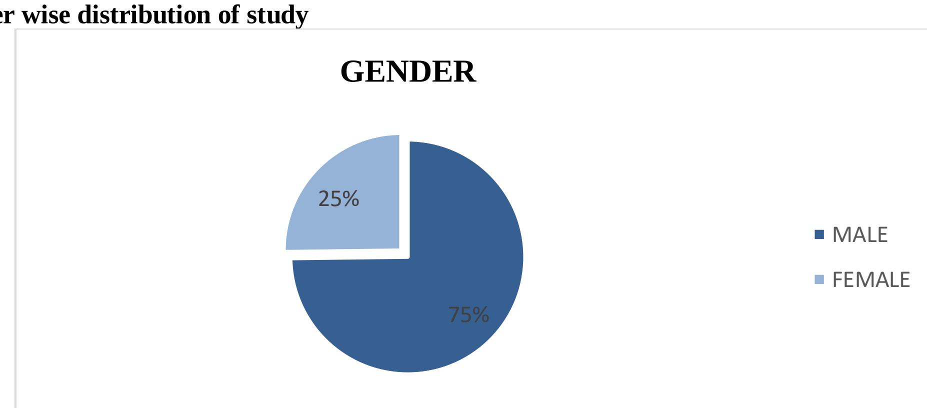


Figure 03: gram stain distribution

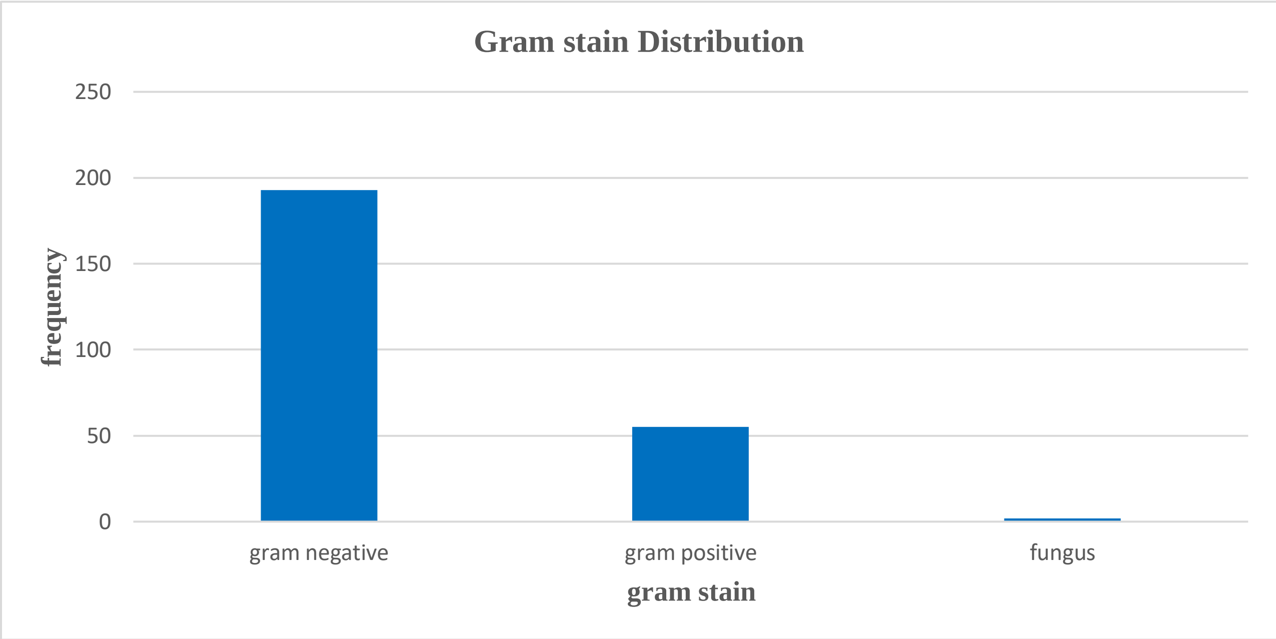


Figure 03: gram stain distribution

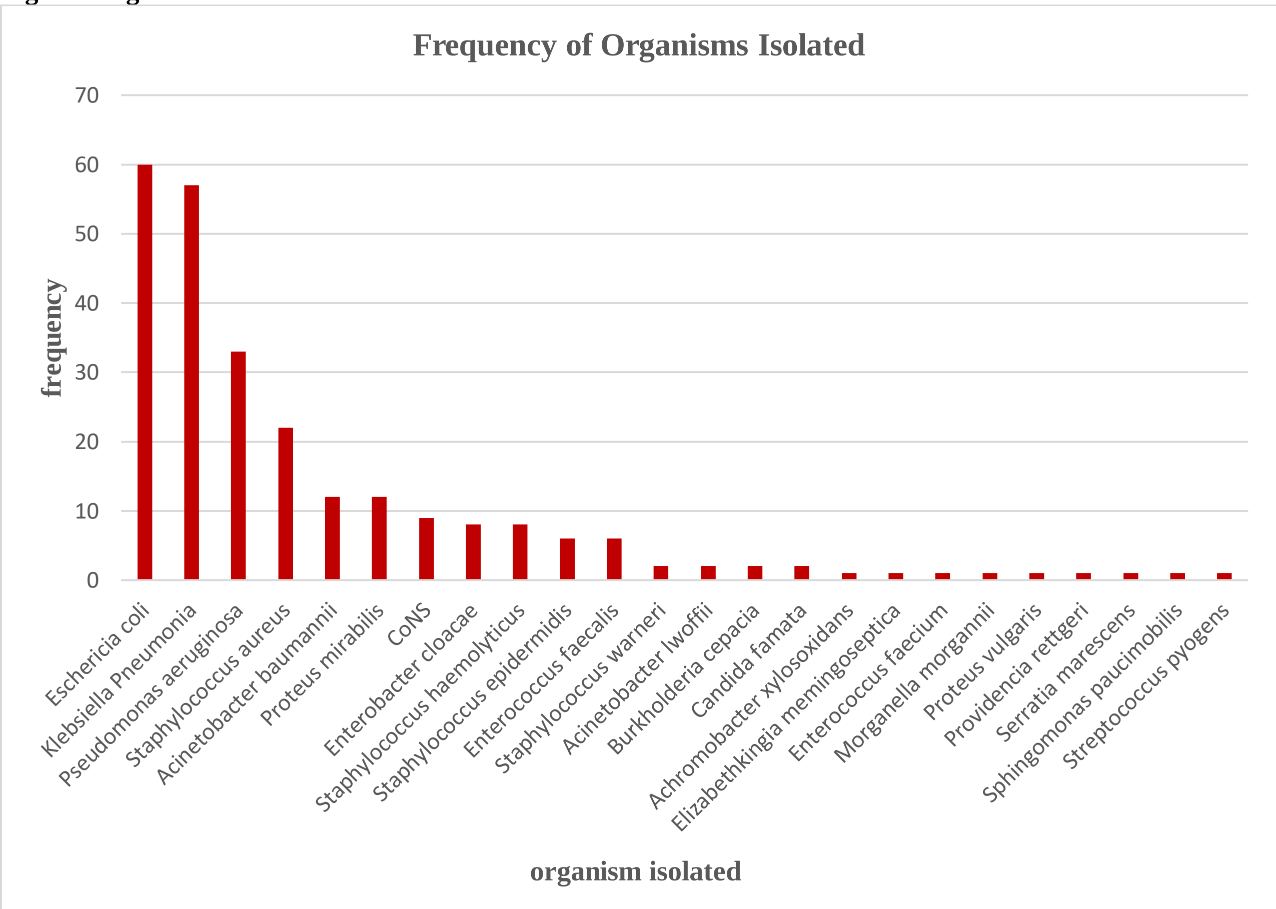


Figure no 04: frequency of organisms isolated

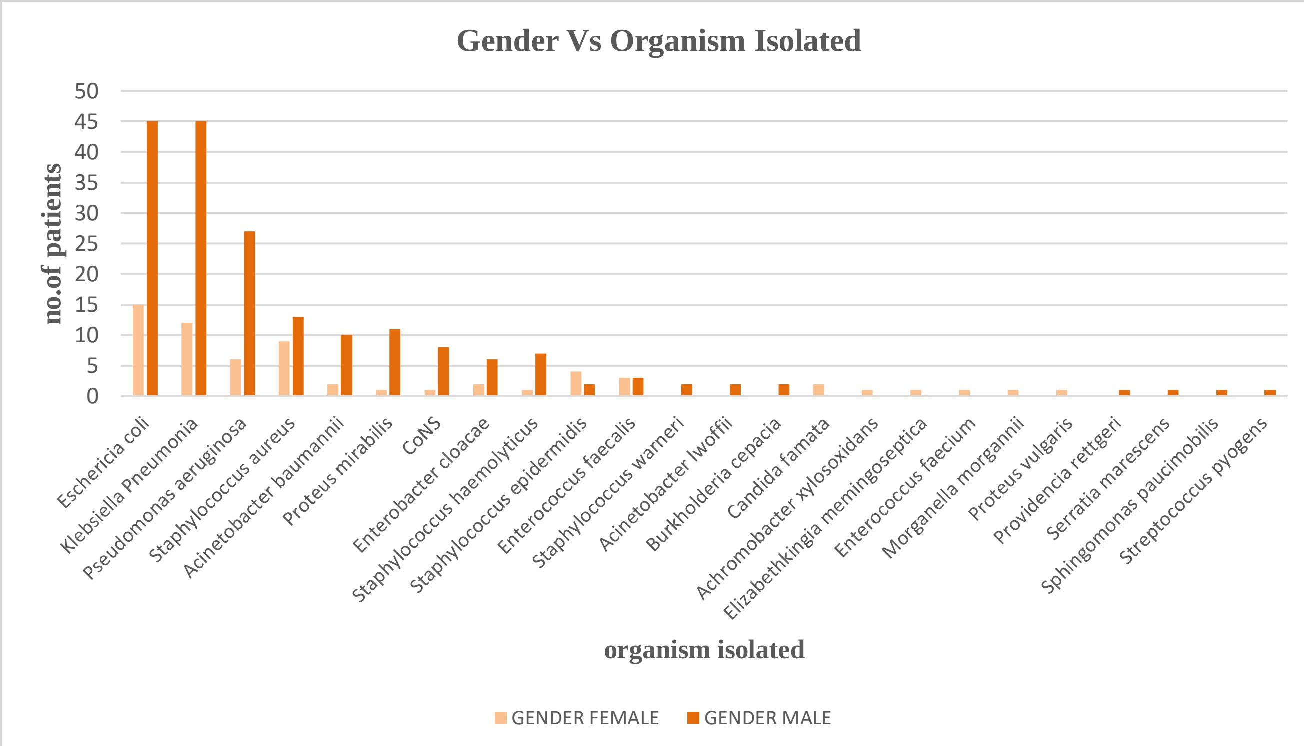
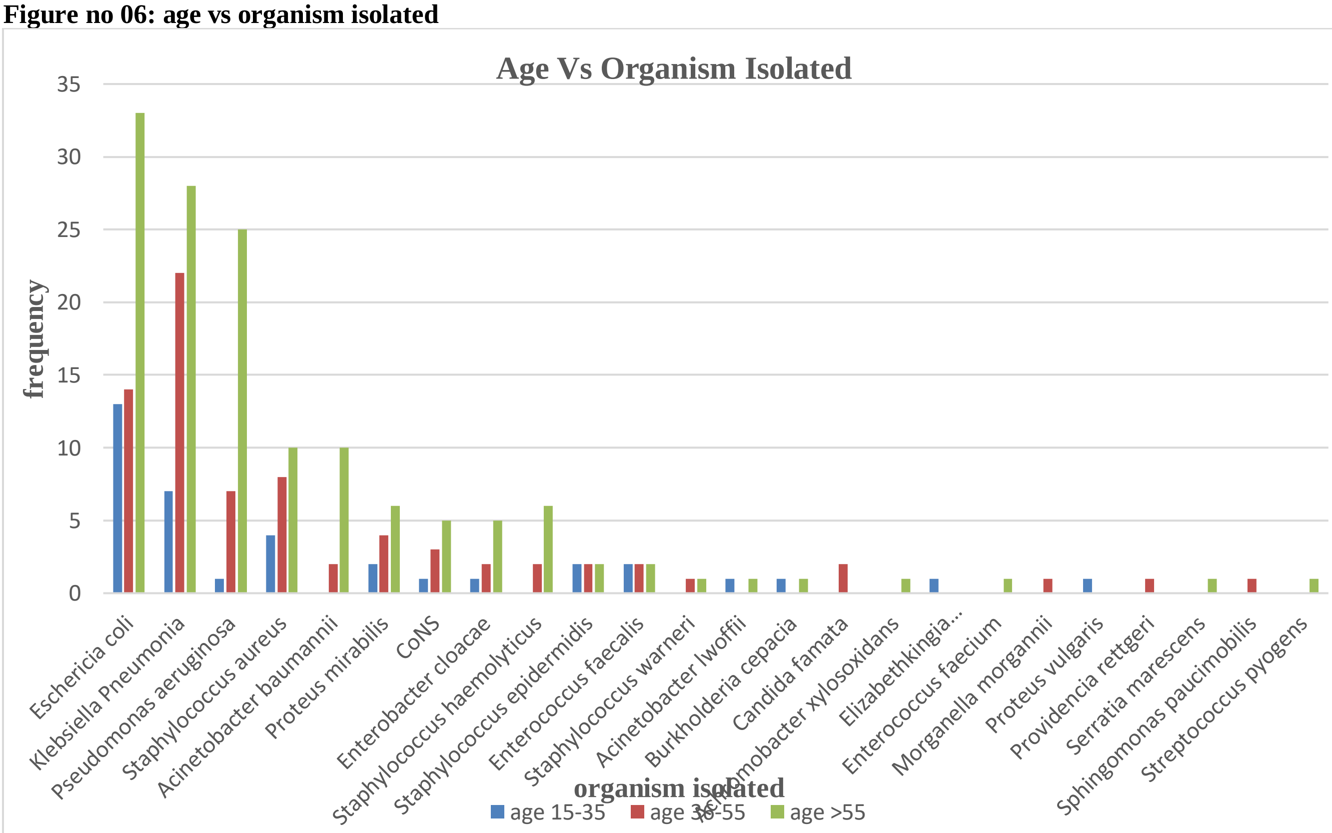


Figure no 06: age vs organism isolated



Discussion:

In the combined retrospective-prospective observational study conducted, we considered 250 patients admitted in surgical department based on the inclusion and exclusion criteria to study the emerging multi- antibiotic resistance patterns to establish safe and efficacious use of antibiotics.

In our study, we observed that the antibiotic resistance is more common in male subjects i.e., 75.8% when compared to female subjects i.e., 25.2%. The antibiotic resistance was found to be increased in older adults (>56years) i.e., 56% followed by middle aged adults (36-55 years) 29.2% and younger adults (15-35 years) 14.8%.

Among the 250 subjects, 111(44.4%) subjects were found to have diabetes mellitus, 22(8.8%) have hypothyroidism, 15(6%) have chronic kidney disease, 43(17.2%) have coronary artery disease, 125(50%) have hypertension. Though there was increasing trend it did not reach statistical significance (p=0.22).

The commonly collected sample was pus i.e., 88(35.2%) and lowest being the sputum 2 (0.8%). Here, 193 (77.2%) were found to be multi- antibiotic resistant to gram negative bacteria, 55 (22%) were found to be resistant to gram positive bacteria while the least being 2 (0.8%) resistant to atypical bacteria.

In the 250 samples collected from surgical patients, the most commonly isolated organisms were Escherichia coli 60 (24%), followed by Klebsiella pneumonia 57 (22.8%), Pseudomonas aeruginosa 33 (13.2%), Staphylococcus aureus 22 (8.8%).

the resistance was observed most commonly in the age group of >55years. These age group people were most resistant to E. coli (33), Klebsiella pneumonia (28), Pseudomonas aeruginosa (25). In the age group 35-55 years, resistance was observed to be the most in Klebsiella pneumoniae (22), followed by E. coli (14). Whereas, in the age group 15-35 years' resistance was found to be the most in E. coli (13).

Among male (187), the most commonly observed organisms were E. coli (45), Klebsiella pneumonia (45), Pseudomonas aeruginosa (27). Whereas, in female (63) commonly isolated organisms were E. coli (15), Klebsiella pneumonia (12), Staphylococcus aureus (9). Here a p value of 0.025 shows that it reaches statistical significance.

the age and drug resistance parameters were compared which shows the resistance patterns among various age groups (15-35, 35-55, >55 years). Cephalosporins were found to be completely resistant in all age groups. The combination of beta- lactams & beta-lactamse inhibitors were also found to be with increased resistance. Classes of drugs like carbapenems, aminoglycosides especially gentamicin, fluoroquinolones were prone to resistance. The last choice of antibiotics like colistin, tigecycline were observed to be resistant in >55yr age group. Tigecycline was at increased risk of resistance.

The organism vs drug resistance shows the resistance patterns among various pathogens isolated from surgical patients. This shows E. coli, K. pneumoniae which occur most were almost resistant to all of the available antibiotics. Some organisms like Proteus spp became resistant to last choice of antbiotics like colistin, tigecycline.

Conclusion:

Antibiotics should be used more selectively for certain critical indications or illnesses. To generate locally applicable data and guide empirical therapy in areas where culture and drug susceptibility testing facilities are scarce, this study will continue to be beneficial in guiding antimicrobial medication decisions in surgical patients. The Indian government, as well as the international community, should take the following steps to address antibiotic resistance and improve antibiotic effectiveness,

- Effective multifaceted strategy to limit the impact of multi-drug resistance must include patient and physician education about appropriate antimicrobial use through continuing medical education (CME) & antimicrobial stewardship programme.
- Develop recommendations for the correct use of antibiotics in health-care facilities.
- Implement antimicrobial resistance management.
- Improve immunization coverage, which could minimize antibiotic use.
- Adopt a single public health policy (lower antimicrobial usage in agriculture, livestock).
- Raise public knowledge about the proper use of medications.
- Establish a strict guideline for drug vendors dispensing antibiotics.
- Prevent infections acquired in the hospital and in the community.
- Ensure political commitment to combat antimicrobial resistance.

REFERENCES

Alemkere g. antibiotic usage in surgical prophylaxis: a prospective observational study in the surgical ward of nekemte referral hospital. Plos one 13(9), 2018, 203-213.

Amirmortezaebrahimzadehnamvar, clinical characteristics of staphylococcus epidermidis: a systematic review, gms hyg infect control. 9(3), 2014.

Aoife howard, acinetobacterbaumannii, an emerging opportunistic pathogen, virulence. 3(3), 2012, 243–250.

Ebimieoweietebu, antibiotics: classification and mechanisms of action with emphasis on molecular perspectives *ijambr* 4, 2016, 90-101.

Edgar pérez barragán et.al. Achromobacterxylosoxidansbacteremia: clinical and microbiological features in a 10-year case series. *Rev espquimioter*. 31(3), 2018, 268–273.

Ferreira rl high prevalence of multi-drug-resistant Klebsiellapneumoniaeharboring several virulence and β-lactamase encoding genes in a brazilian intensive care unit. Front. *Microbiol*. 9, 3198.

Garimakapoor, action and resistance mechanisms of antibiotics: a guide for cliniciansjanaesthesiolclinpharmacol. 33(3), 2017, 300–305.

Jiyoun lim a brief overview of Escherichia coli o157:h7 and its plasmid o157. *J microbiolbiotechnol*. 20(1), 2010, 5–14.

M. S. Ratnamani, elizabethkingiameningoseptica: emerging nosocomial pathogen in bedside hemodialysis patients, *indian j crit care med*. 17(5), 2013, 304–307.

Marsha f. Crader; matthew varacallo, preoperative antibiotic prophylaxis; plos one 20(5): 618-622.

Nuribayram, sphingomonaspaucimobilis infections in children: 24 case reports. *Mediterr j hematol infect dis*. 5(1), 2013, e2013040.

Siddharthsagaret. Al. Providenciarettgeri:an emerging nosocomial uropathogen in an indwelling urinary catheterised patient. *J clindiagn res*. 11(6), 2017, dd01–dd02

Ushakamath, clinical significance of staphylococcus warneribacteremia. Journal of clinical microbiology, feb. 1992, p. 261-264.

Yang x., xiao x., wang l. Application of antimicrobial drugs in perioperative surgical incision. Ann clinmicrobiolantimicrob 17, 2 (2018)..

Cite this article:
Sruthi Doddapaneni, Khandher Fatima Farah Hassan, Subramanyam Jalasuthram, Dr. B Raju, Shaik Sharmila, Satheesh S Gottipati. A Study On Emerging Multi-Antibiotic Resistance In Surgical Patients & The Pathogens Associated In A Tertiary Care Hospital. *International Journal of Pharmacy & Therapeutics*, 13(2), 2022, 52-58.