


Healthcare Associated Infections (HAI)

Between 5% and 10% of patients admitted to hospitals acquire one or more infections, based on reporting data largely from developed countries. In the USA, it is reported that 1 out of every 136 hospital patients becomes seriously ill as a result of acquiring an infection in the hospital. It is estimated that in developing countries (including India) the risk of Healthcare Associated Infections (HAI) is 2 to 20 times higher than in developed countries. In India, indiscriminate use of antibiotics both in community settings and in hospital settings contributes to development of antibiotic resistance. Further there is need for robust reporting of HAI in India. This 'double-edged-sword' of indiscriminate antibiotic use and lack of reporting of healthcare associated infections needs to be addressed. The Director-cum-Vice Chancellor of SVIMS **Dr.B.Vengamma** announced that SVIMS is taking a step forward to contribute in containing HAI in India. Adapting international guidelines (eg WHO, CDC) SVIMS is invoking a ten pronged strategy. One key component is 'Antimicrobial Stewardship', which aims to optimize antibiotic use among patients in order to reduce antibiotic resistance, improve patient outcomes and safety and ensure cost effective therapy. Ex Hon'ble Health Minister of Andhra Pradesh, Dr. Kamineni Srinivas garu released the first edition of "SVIMS Antimicrobial Stewardship pocket guide" on 12.07.2016. This is revised 6 monthly and new editions are released every January and July to inform all health care personnel (doctors, nurses, and allied health staff) of pathogen surveillance, antimicrobial use, infection control measures and outcomes. This programme is jointly monitored by Hospital Infection Control Committee, Antimicrobial stewardship Committee and SVIMS Quality Council.

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1) Healthcare Associated Infections (HAI): SVIMS Ten Pronged Strategy

	Strategy	Implementation
1	• Reducing Inappropriate Device usage	Education by SQC
2	• Hand hygiene and Barrier precaution	HICC, SQC group
2	• Antimicrobial stewardship	Release pocket guide on 12.07.2016
4	• Leadership support at highest level	Director involvement Engineering AP Heath Ministry
5	• Implementing culture of safety	SQC launch
6	• Financial incentives & regulatory oversight	Consideration by AP Health Ministry
7	• System based appropriate protocol and checklist	Ongoing development
8	• Better care of technology	BME monitoring
9	• Public reporting of credible data	Launch 12.07.2016
10	• Partnership	Explore with CDC, WHO

SQC = SVIMS Quality Council

HICC = Hospital Infection Control Committee

BME = Biomedical Engineering

CDC = Center for Disease Control

WHO = World Health Organization

2) Hospital Infection Control (HIC) Committees

HIC Committee Members:

- HICC Chairman – Dr B. Vengamma, Director cum Vice Chancellor
  HICC Co-Chairman
- Dr. Ram, Medical Superintendent
- Member Secretary- Dr K.K.Sharma,HOD of Microbiology
- Hospital Infection Control Officers-Dr.R.Jayaprada, Dr.N.Ramakrishna
- Senior Consultant- Dr A. Mohan, Senior professor& HOD of Medicine-
  Member All the heads of the departments- Members
- Nursing AD- Mrs Prabhavathi
- Nursing Superintendent Grade I- Mrs.C.Sunitha-Member
- Infection Control Nurses- V.Karpugam, D.Redemma, A.Shobharani, N.Bayamma & all 47 Head nurses-Members
- Infection Control technicians: Mr P.Yashodhar, Mr. P.Rammurthy
- Operating theatre Incharge- Mrs Shakira- Member
- In-charge of Central Sterile Supplies Department- Mrs.Prabhavathi-Member
- Health inspector – Mrs. A.Umamaheswari-Member
- In-charge of pharmacy- Dr. P.Subramanyam-Member In-charge of hospital
  linen- Mrs. C.Sunitha-Member
- In-charge of hospital laundry- D.Indiramma-Member
- In-charge of hospital kitchen- Mrs M.Sunitha-Member
- Epidemiologist- Dr Ravishankar, Assistant professor, Social & Preventive
  medicine-Member

3) HIC Terms of Reference

1. Health care associated infections

    i) VAP
    ii) CLABSI
    iii) CAUTI
    iv) SSI
    v) Standardized infection ratio (SIR)
    vi) Needle stick injury incidence
    vii) Hand hygiene compliance

2. Bed sore analysis
3. O.T. surveillance (Monthly)
4. Blood bank surveillance
5. Environmental surveillance (water& air) (Monthly)
6. Hand hygiene
7. Dialysate fluid testing
8. Needle-stick injuries incidence
9. Multi drug-resistant organisms (MDRO's) Surveillance
10. Outbreak investigation
11. Biomedical waste management
12. High end antibiotic monitoring
13. AMR surveillance
14. HBs Ag antibody titre testing
15. Endotoxin (LAL) assay for Dialysate fluid & water
16. Disinfectant testing-new and in-house
17. Stool for *Clostridium difficile* toxin A&B testing

4) Hand Hygiene

- The organization adheres to standard precautions at all times regarding the use of PPE, prevention of sharp injury etc.
- Hand Hygiene guidelines are followed in all areas of the hospital-Posters regarding Hand Hygiene are available.
- Specific precautions are being followed when required. Safe Injection and Infusion practices are followed.
- Cleaning, disinfection and sterilization practices being followed

Steps of Procedure Hand Washing

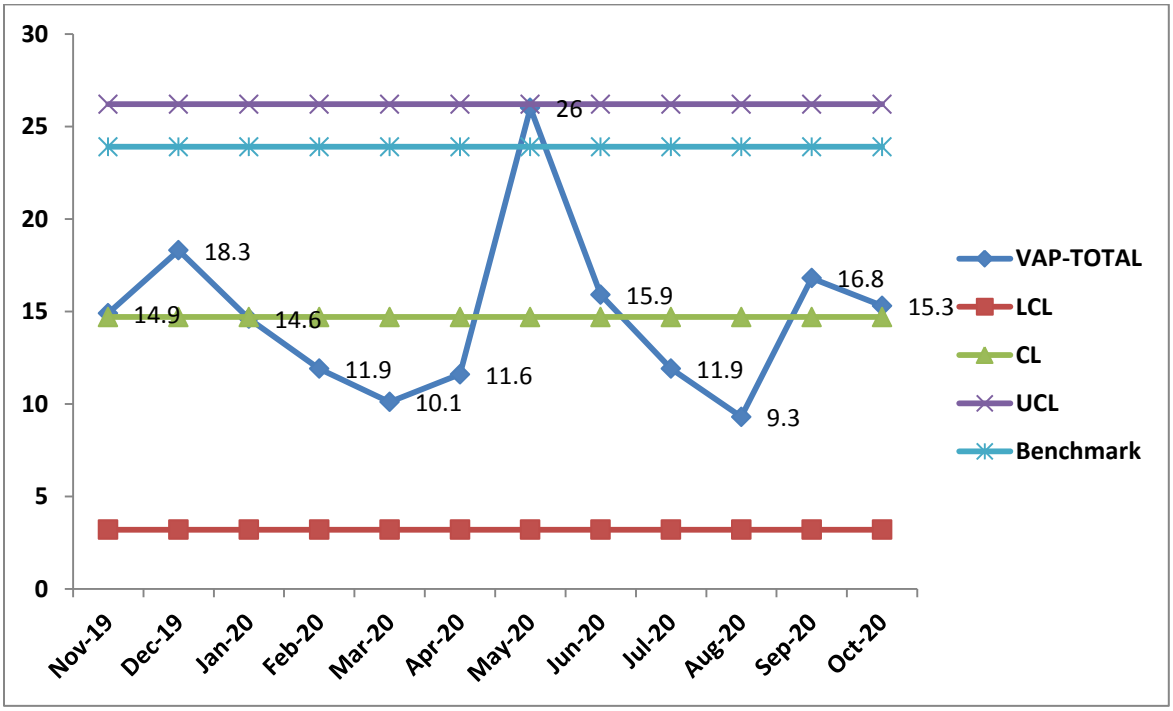
Surgical Hand Wash (3-5mts)

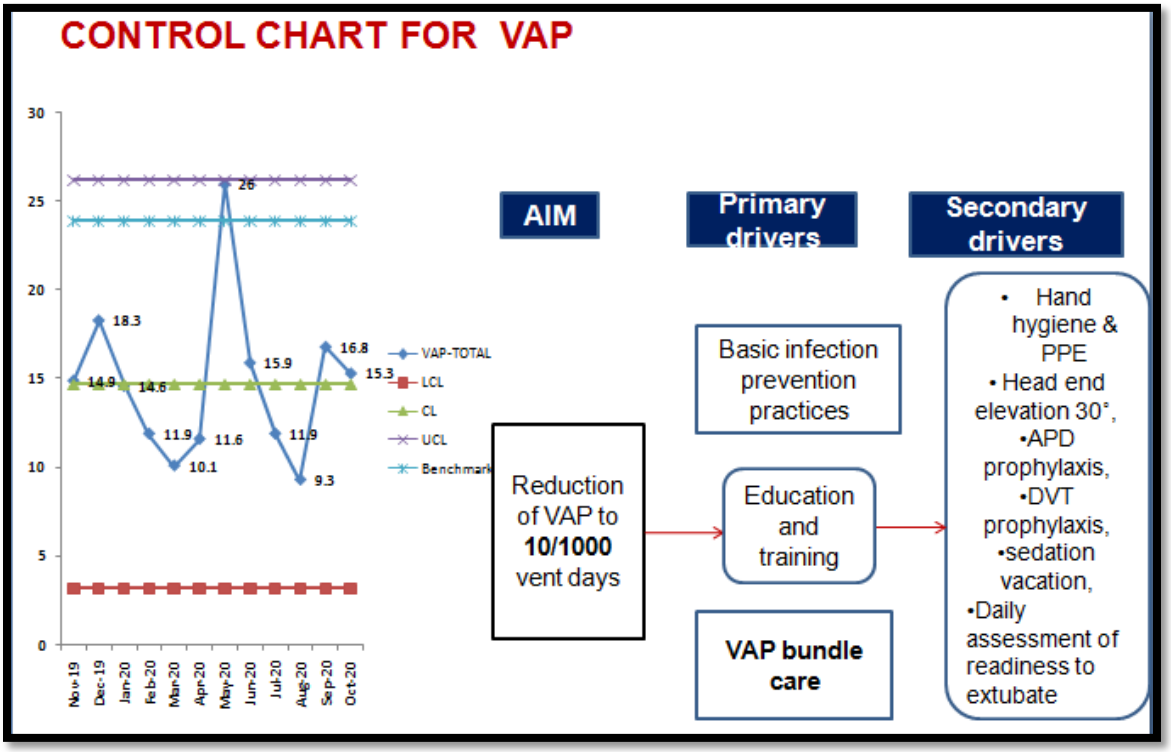
5) Outcomes & KPIs for Infections

1. VENTILATOR ASSOCIATED PNEUMONIA (VAP) rate:

Month	ALL VENTILATED PATIENTS (VAP/ 1000 ventialtor days)	RICU (VAP/ 1000 ventialtor days)
Nov-19	14.9	20
Dec-19	18.3	8.2
Jan-20	14.6	21.2
Feb-20	11.9	10.3
Mar-20	10.1	25.3
Apr-20	11.6	10.5
May-20	26	30.6
June-20	15.9	24.9
July-20	11.9	26.8
Aug-20	9.3	0
Sept-20	16.8	0
Oct-20	15.3	6.6

Control chart for VAP

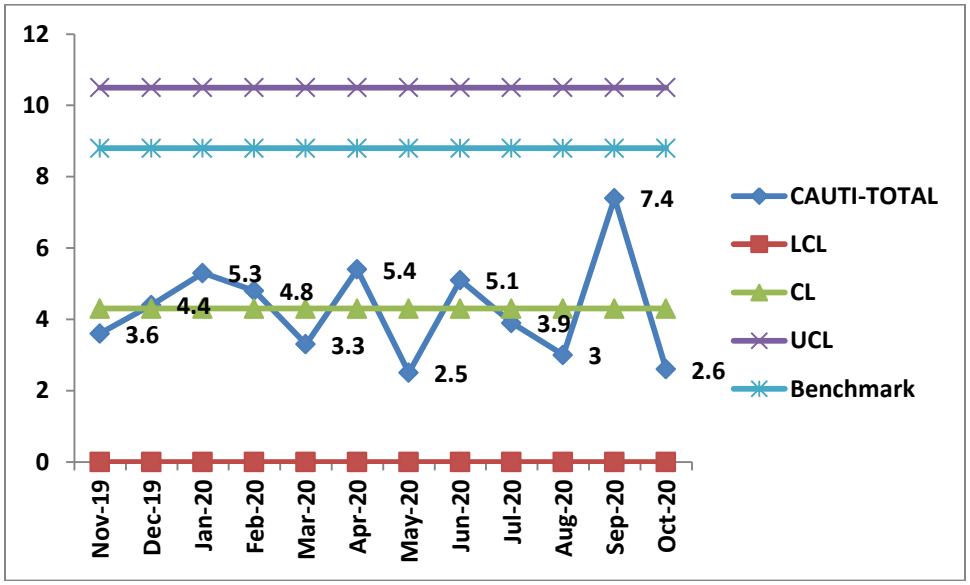


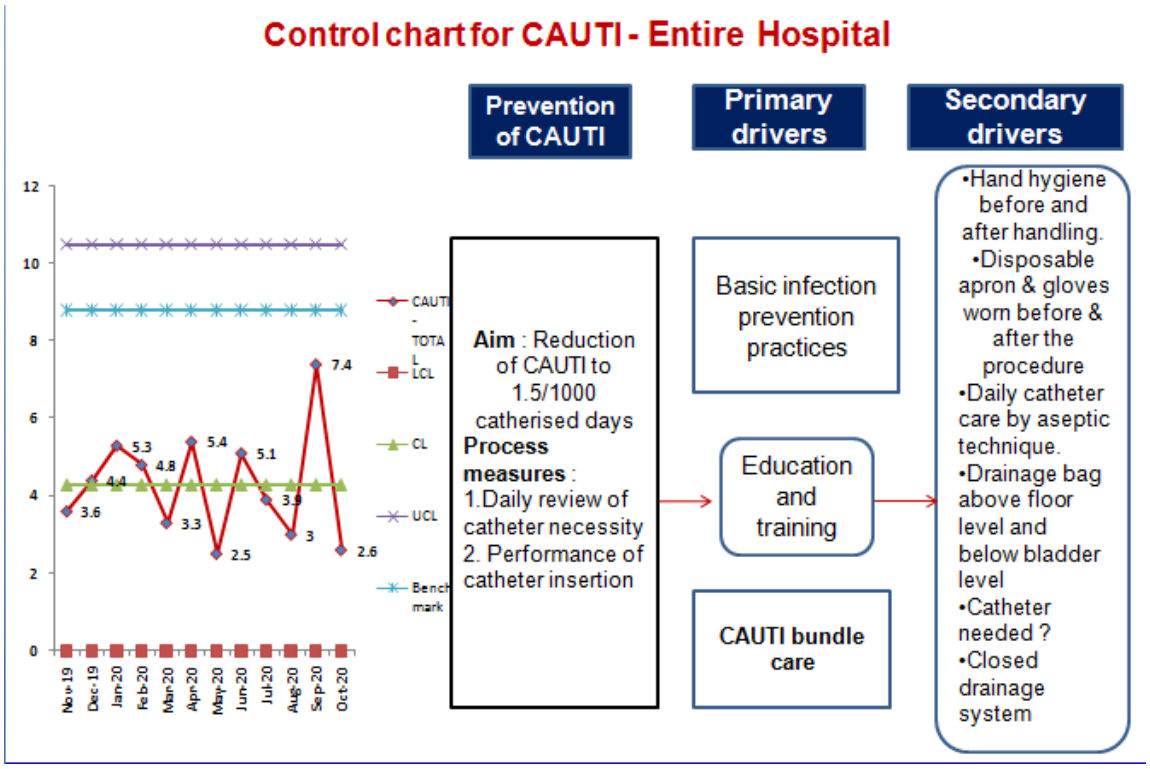


2. CAUTI rate total and from ICU's & Recovery rooms:

Month	TOTAL CAUTI / 1000 catherized days	RICU AND MICU, CTRR, GS ICU, ANCU PATIENTS
Nov-19	3.6	**5.9**
Dec-19	4.4	**3.3**
Jan-20	5.3	**7.2**
Feb-20	4.8	**6.5**
March-20	3.3	**6.3**
April-20	5.4	**5.2**
May-20	2.5	**9.6**
June-20	5.1	**6.1**
July-20	3.9	**7.7**
Aug-20	3	**0**
Sept-20	7.4	**14.7**
Oct-20	**2.6**	**7.2**

Control chart for CAUTI total

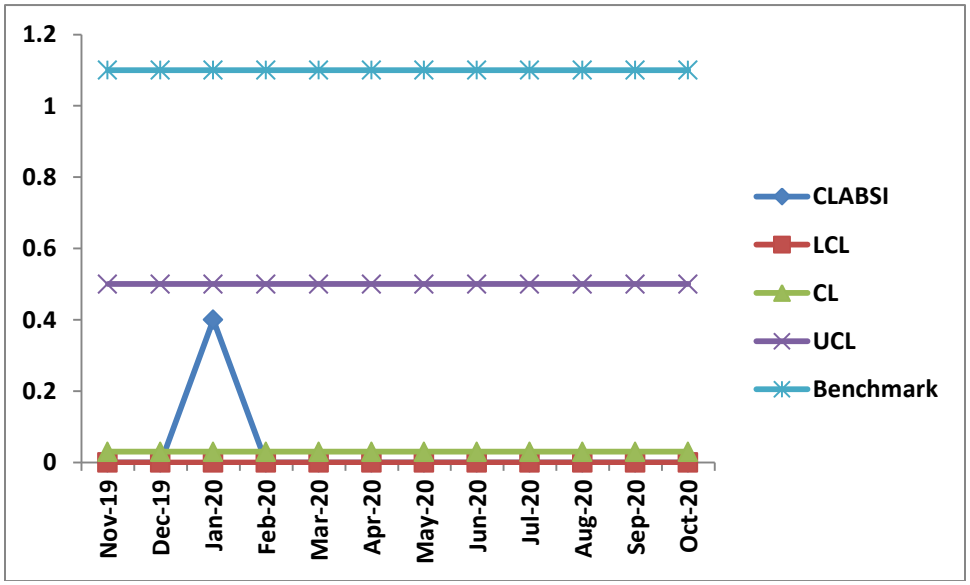


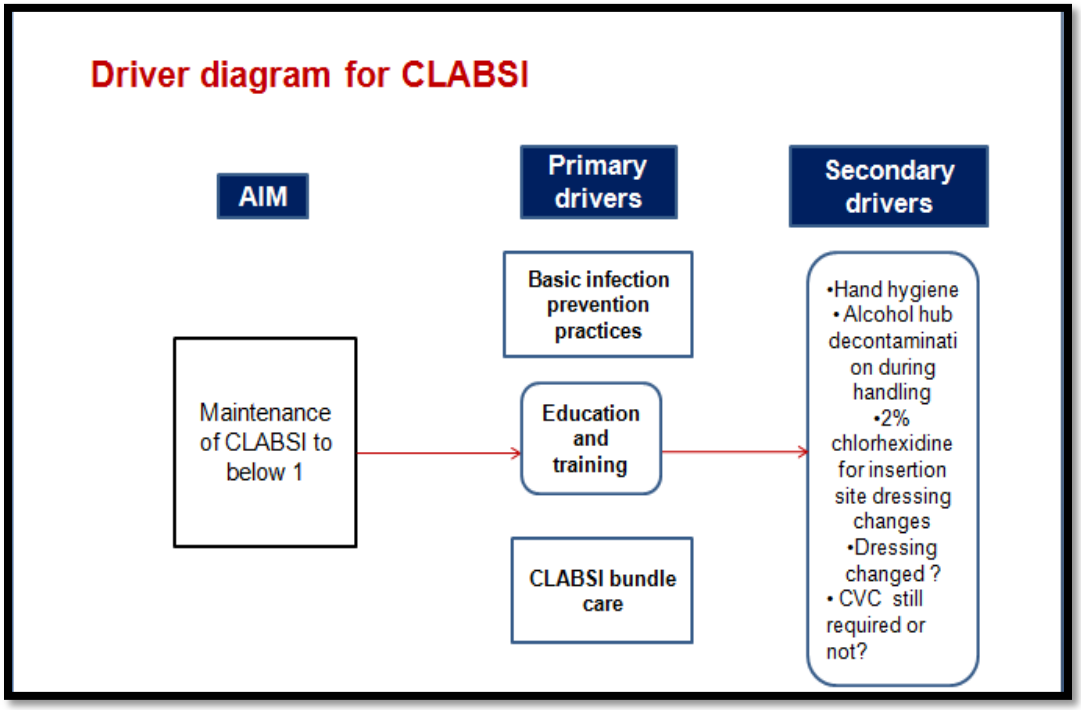


3. **CENTRAL LINE ASSOCIATED BLOOD STREAM INFECTION (CLABSI) rate:**

Month	TOTAL CLABSI
Nov-19	0
Dec-19	0
Jan-20	0.4
Feb-20	0
March-20	0
April-20	0
May-20	0
June-20	0
July-20	0
Aug-20	0
Sept-20	0
Oct-20	0

Control Chart for CLABSI

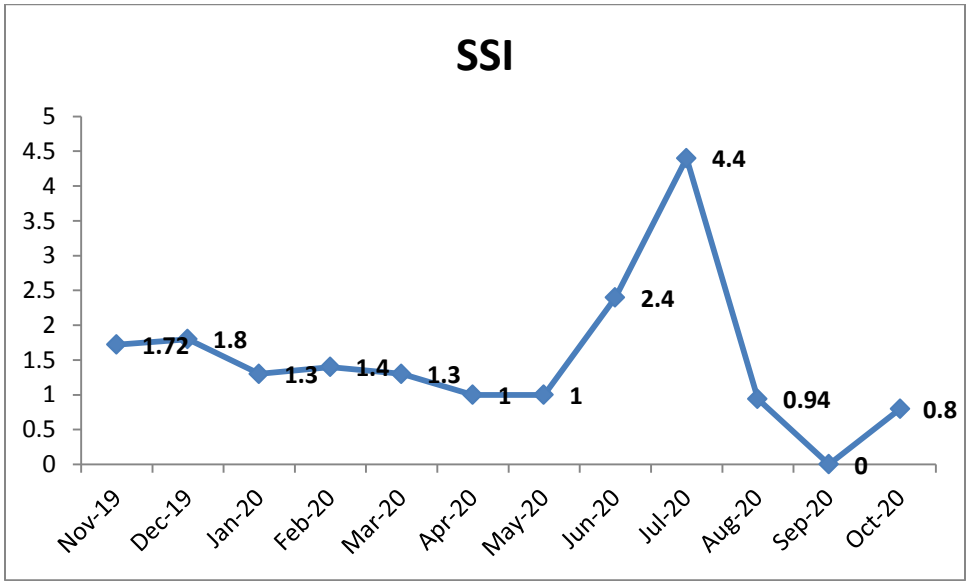


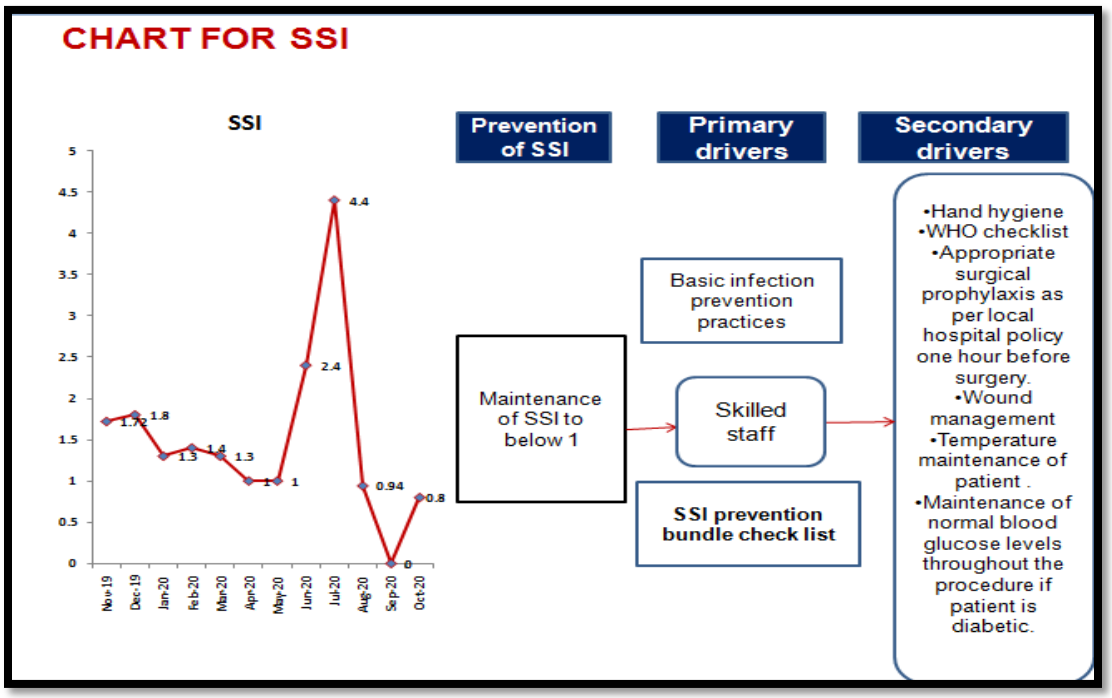


4. SURGICAL SITE INFECTION(SSI) rate:

Month	SSI
Nov-19	1.72
Dec-19	1.8
Jan-20	1.3
Feb-20	1.4
March-20	1.3
April-20	1
May-20	1
June-20	2.4
July-20	4.4
Aug-20	0.94
Sept-20	0
Oct-20	0.8

SURGICAL SITE INFECTION(SSI) rate:

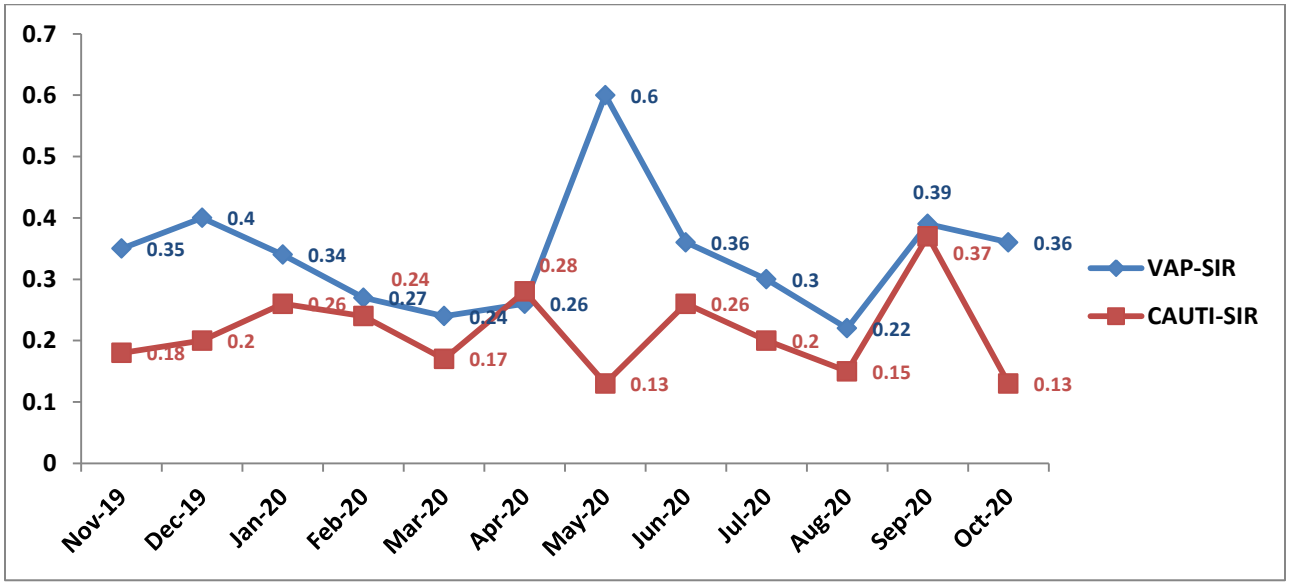




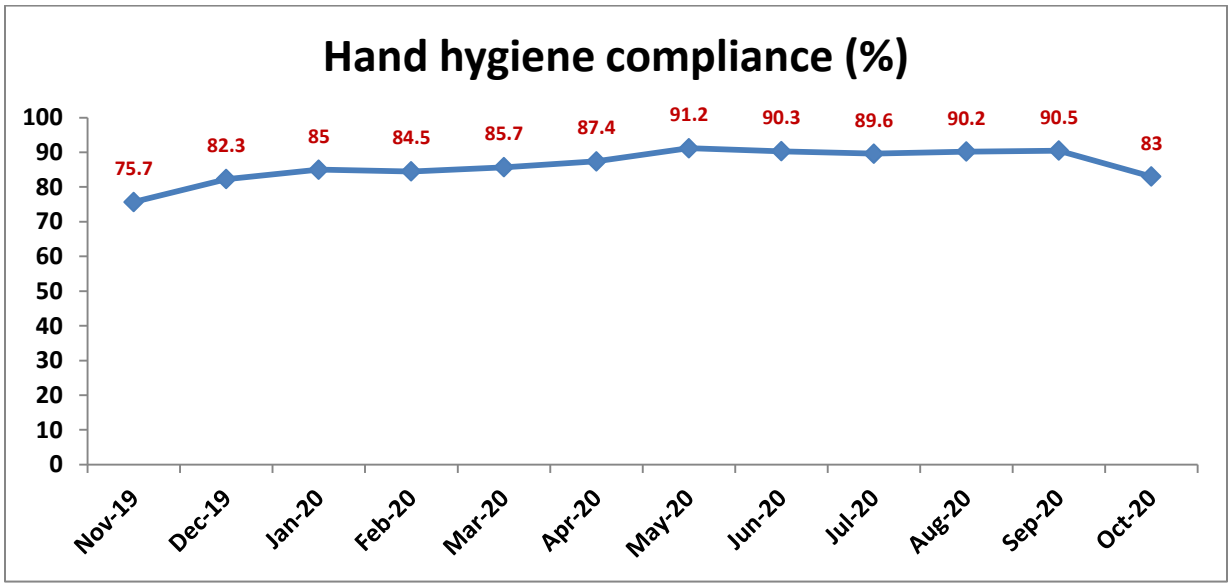
5. STANDARDIZED INFECTION RATIO (SIR):

Month	VAP-SIR	CAUTI-SIR
Nov-19	0.35	**0.18**
Dec-19	0.4	**0.2**
Jan-20	0.34	**0.26**
Feb-20	0.27	**0.24**
March-20	0.24	**0.17**
April-20	0.26	**0.28**
May-20	0.6	**0.13**
June-20	0.36	**0.26**
July-20	0.3	**0.2**
Aug-20	0.22	**0.15**
Sept-20	0.39	**0.37**
Oct-20	**0.36**	**0.13**

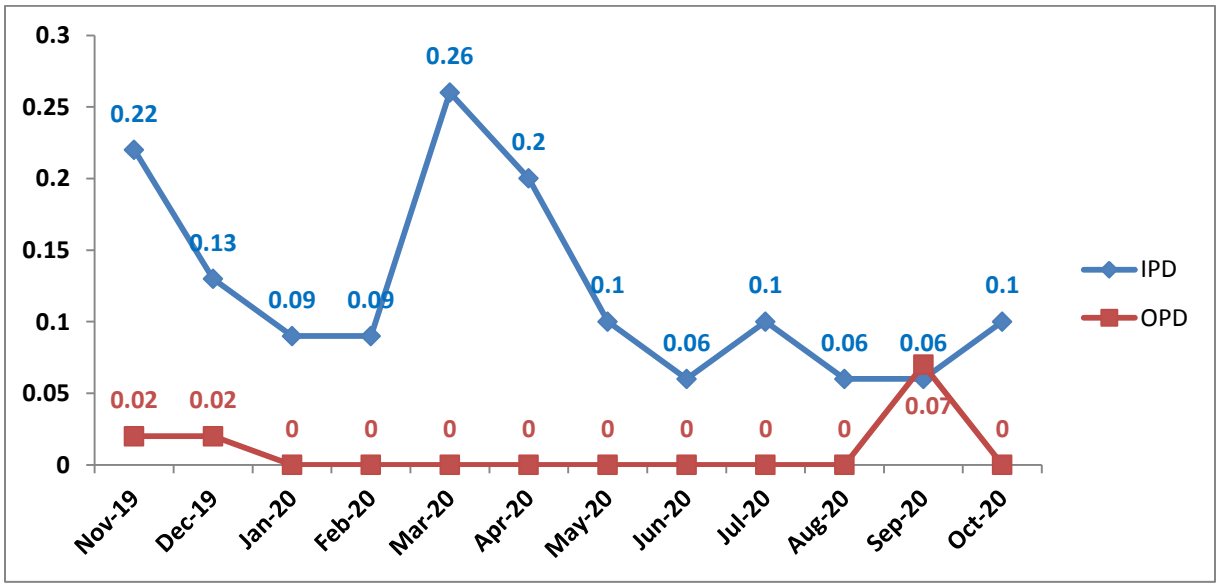
STANDARDIZED INFECTION RATIO (SIR):



5. **Hand hygiene overall compliance rate :**



6. **Needle stick injury incidences (NSI):**



SVIMS

Antimicrobial Stewardship Pocket Guide

JUNE 2020

9th Edition

Editors

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Message from Health Minister

It is very timely that Sri Venkateswara Institute of Medical sciences is making strides in controlling Health Care Associated Infections and innovating Antimicrobial Stewardship. Congratulations to the institute and I am proud that my Government will be at the forefront of tackling this emerging healthcare menace of misuse / overuse of antibiotics and drug resistance.

Dr. Kamineni Srinivas garu
Hon'ble Minister for Health Medical and Family Welfare
Govt., of Andhra Pradesh

Preface

Healthcare Associated Infections (HAI)

Among patients admitted to hospitals 5%-10% acquire one or more infections, based on reporting data largely from developed countries. It is estimated that in developing countries the risk of HAI is 2 to 20 times higher than in developed countries. In India, indiscriminate use of antibiotics both in community settings and in hospital settings contributes to development of antibiotic resistance. Further there is need for robust reporting of HAI in India. The Director-cum-Vice Chancellor of SVIMS Dr. **B. Vengamma** announced that SVIMS is taking a step forward to contribute in containing HAI in India. Adapting international guidelines (e.g. WHO, CDC), SVIMS is invoking a ten pronged strategy. One key component is 'Antimicrobial Stewardship', which aims to optimize antibiotic use among patients in order to reduce antibiotic resistance, improve patient outcomes and safety and ensure cost effective therapy. This pocket guide of SVIMS Antimicrobial Stewardship (fist Edition) is released on 12-7-2016 by Hon'ble Health Minister of Andhra Pradesh, Dr. Kamineni Srinivas garu. This will be revised 6 monthly and new editions will be released every January and July to inform all health care personnel (doctors, nurses, and allied health staff) of pathogen surveillance, antimicrobial use, infection control measures and outcomes. This programme is jointly monitored by Hospital Infection Control Committee and SVIMS Quality Council.

Dr. B.Vengamma
Director cum Vice Chancellor

From the desk of editors……..

Greetings from Infection Control team,

- Antimicrobial resistance (AMR) results in increased morbidity, mortality, and costs of healthcare
- Prevention of the emergence of resistance and the dissemination of resistant microorganisms will reduce these adverse effects and their attendantcosts.
- Predominant isolates in ICU's were *Escherichia coli* followed by *Klebsiella*, *Acinetobacter*, and *Pseudomonas spp*.
- In ICU's empirical choice of antibiotic in our institute is Cefaperazone + sulbactam.
- Based on Gram staining report prophylactic drug of choice for gram negative bacilli is Cefaperazone + sulbactam, and for gram positive bacteria is Vancomycin in all ICU's.
- We therefore urge everyone to restrict the use of antimicrobial agents.

R. Jayaprada
InfectionControlOfficer
Hospital Infection Control Committee

B. Vengamma
Director cum ViceChancellor

AMS committee members:

- AMS Chairman – Dr Ram
- AMS Co-Chairman's– Dr B.Vengamma, Dr P.V.Ramasubbareddy
  Dr V.V.Ramesh Chandra
- Member Secretary- Dr K.K.Sharma
- Members- Dr.R.Jayaprada, Dr N.Ramakrishna, Dr.P.Hemalatha, Dr J.E.Paul, Dr A.Surekha, B.Ramakrishna, Dr Vikas, Dr V. Manolasya, Dr D.Bhargavi, Dr B. Manilal, Dr K. Vijayachandrareddy, Dr Pranabandhudas, Dr J.Malathi, Dr H.C.Chandramouli, Dr B.V. Phaneedra.
- Senior Pharmacist- P.Subramanyam.
- AMSP nurses- Mrs Indirmma, Mrs Mary suseela, Mrs T.suseela, Mrs P.Muneeswari, Mrs J.M.Malathi, Mrs Geetha bai, Mrs K.Saradamba, Mrs A.Savithri, Mrs T.L.Varalakshmi, Mrs Ramanamma, Mrs Anne Besant, Mrs Kalyani, Mrs Reddy vasantha, Mrs Nirmala, Mrs Stella bai, mrs Dhanarekha, Mrs Sridevi.

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Steps of Procedure Hand Washing

Courtesy : WHO/ CDC

Surgical Hand Wash (3-5mts)

Courtesy : WHO/ CDC

Greeting each other in Health care

Another dimension
in Hand Hygiene!

Spread Goodwill, not Germs

SVIMS

Prevent droplet spread
when coughing, sneezing

Dr.B.Vengamma

Director cum Vice-Chancellor

Sri Venkateswara Institute of
Medical Sciences, Tirupati.

Key messages.....

Prevalence of Multi drug resistance (MDR) from January to June 2020 was – **54.9%**

Predominant isolates in intensive care units (ICU) were *Acinetobacter* followed by *Escherichia coli*, *Klebsiella*, *Enterobacter* and *Pseudomonas spp*. As per our local antibiogram, empirical choice of antibiotic in **ICU's** in our institute is **Cefoperazone+sulbactum.** In case of suspicion of *Pseudomonas* infections, empirical choice of antibiotic is Piperacillin+ Tazobactam. Based on Gram staining report, prophylactic drug of choice for Gram negative bacilli is **Cefoperazone+ sulbactam,** and for Gram positive bacteria is **Vancomycin** in all ICU's depending on the department.

Percentage of Vancomycin Resistance Enterococci (VRE): 5.7%

Percentage of Methicillin resistance *Staphylococcus aureus* (MRSA): 60.2%,

Percentage of Methicillin resistance *Coagulase negative Staphylococcus (*MRCoNS): 54%,

Percentage of Vancomycin resistance *Staphylococcus aureus* (VRSA): Nil.

Percentage of Vancomycin resistance *Coagulase negative Staphylococcus* (VRCoNS): Nil.

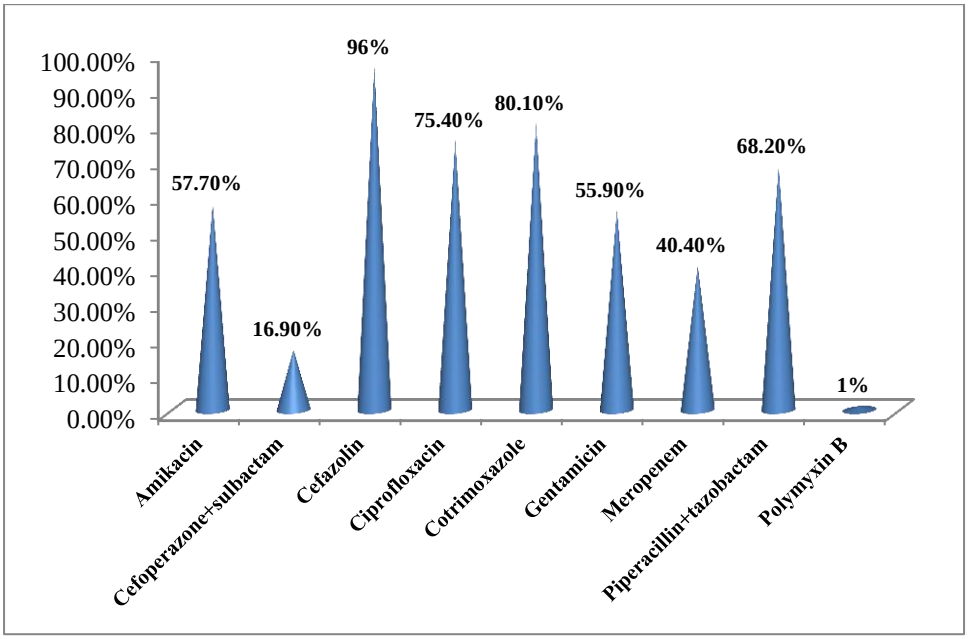
- ✓ Most common Gram negative isolates were *Escherichia coli, Klebsiella spp, Acinetobacter spp and Pseudomonas spp.*
- ✓ *Escherichia coli* isolates were highly resistant to Cefazolin (89.8%), Ciprofloxacin(89.6%), Cotrimoxazole (63.4%) and sensitive to Amikacin (81%), Cefoperazone+sulbactam (84.9%), Gentamicin(75%),Piperacillin+tazobactum(85.4%),Meropenem(97%)and Colistin/Polymyxin B (99.8%).
- ✓ *Klebsiellae spp.* isolates were highly resistant to Cefazolin (97.6%), Cotrimoxazole (87.8%), Ciprofloxacin (78.9%), Cefoperazone+sulbactam (50.7%), Amikacin (64.4%), Gentamicin (66%), Piperacillin +tazobactam (54.6%). All *Klebsiellae spp* were sensitive to Meropenem (69.2%) and Colistin/Polymyxin B(98.1%).
- ✓ *Acinetobacter spp.* isolates were highly resistant to Cefazolin (96%), Ciprofloxacin (75.4%), Cotrimoxazole (80.1%), Amikacin (57.7%), Gentamicin (55.9%), Piperacillin +tazobactam (68.2%), but sensitive to Cefoperazone+sulbactam (83.1%), Meropenem (59.6%) and Colistin/Polymyxin B (99%).
- ✓ *Pseudomonas spp.* isolates were highly resistant to Ciprofloxacin (88%), Ceftazidime (68%), ,Amikacin (60.8%), Gentamicin (77.6%),and sensitive to Piperacillin +tazobactam (76.8%), Cefoperazone+sulbactam (66.4%), Imipenem (55.2%) and Colistin/Polymyxin B(100%).

- ✓ Most of the Gram negative isolates were shown highly resistant to cephalosporins (74.35%), cotrimoxazole (65.65%), and ciprofloxacin (80%).
- ❖ **On the other hand, Gram negative isolates were shown sensitivity to cefoperazone+sulbactum (77.4%), aminoglycosides (64.5%), Meropenem (83.8%), and Polymyxin B (99.2%).**
- ✓ Screening of health care workers (HCW) for Methicillin resistance *Staphylococcus aureus* (MRSA) should be done as MRSA percentage was 60.2% & Methicillin resistance *Coagulase negative Staphylococcus* (MRCoNS) percentage was 54%, and these isolates were predominantly from Emergency, General Surgery and Nephrology departments. HCW's were treated for the same. As percentage of Methicillin resistance being high, mandate recommendation for HCW's is to follow standard precautions (Hand Hygiene, Contact precautions) strictly.
- ✓ *Staphylococcus aureus* has show high resistance against Ciprofloxacin (90%), Erythromycin (68.8%), Clindamycin (56.9%), and Cotrimoxazole (49%).
- ✓ VRE (Vancomycin Resistance Enterococci) percentage was 5.7% and most of the isolates were reported from EMD followed by Nephrology departments.
- ✓ Imipenem resistance was noted high in *Pseudomonas spp* (44.8%) followed by *Acinetobacter spp* (40.4%), *Klebsiellae spp* (30.8%).

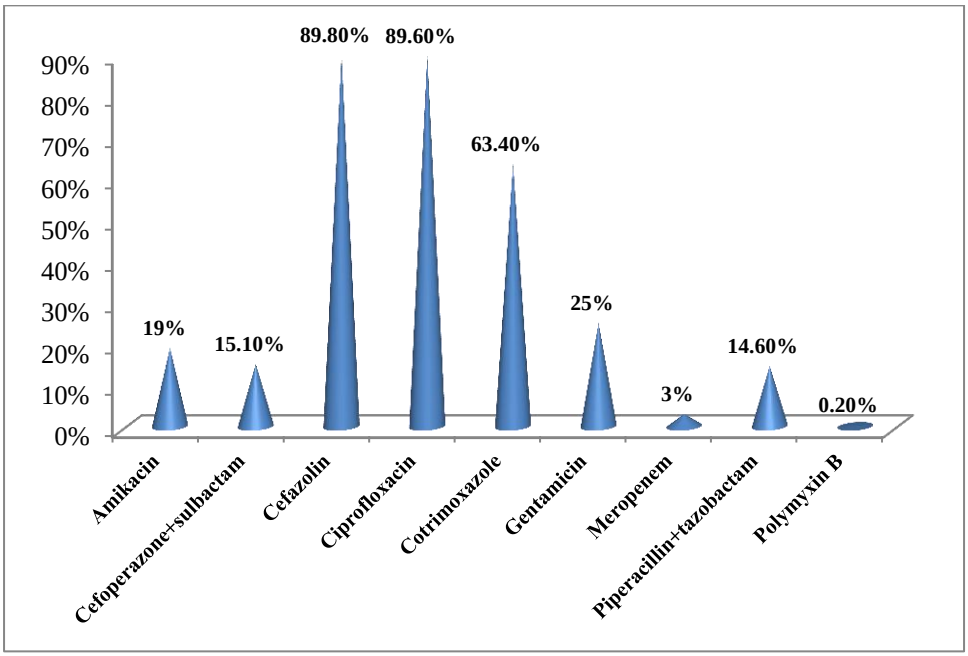
  So cautious prescription of carbapenems required.

Note : Empirical therapy should be reviewed once the culture and susceptibility results are ready (usually within 72 hours) and targeted therapy should be done whenever possible to give the narrowest spectrum antibiotic based on culture and sensitivity data, the site of infection and the clinical status of the patient.

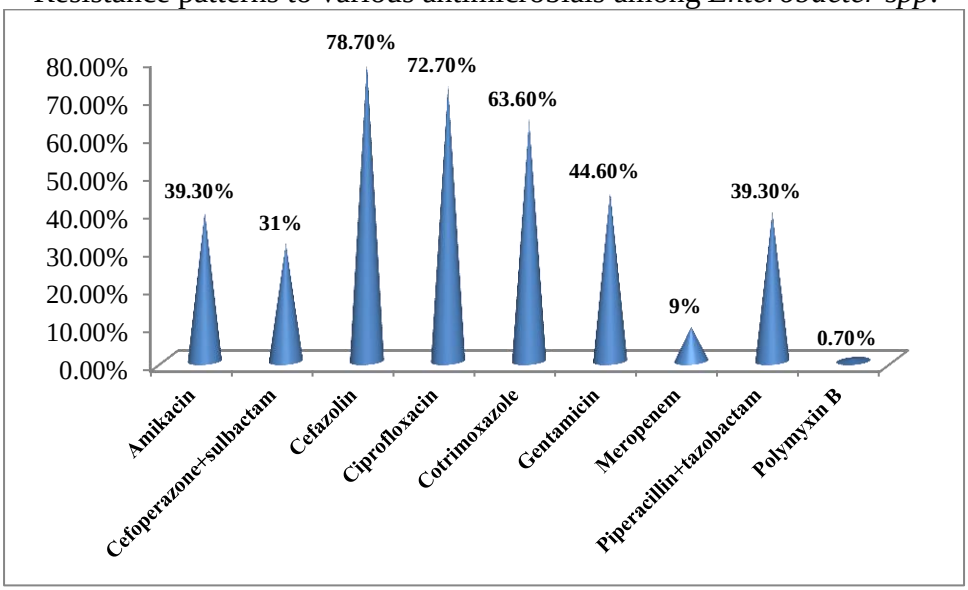
Resistance patterns to various antimicrobials among *Acinetobacter spp*.



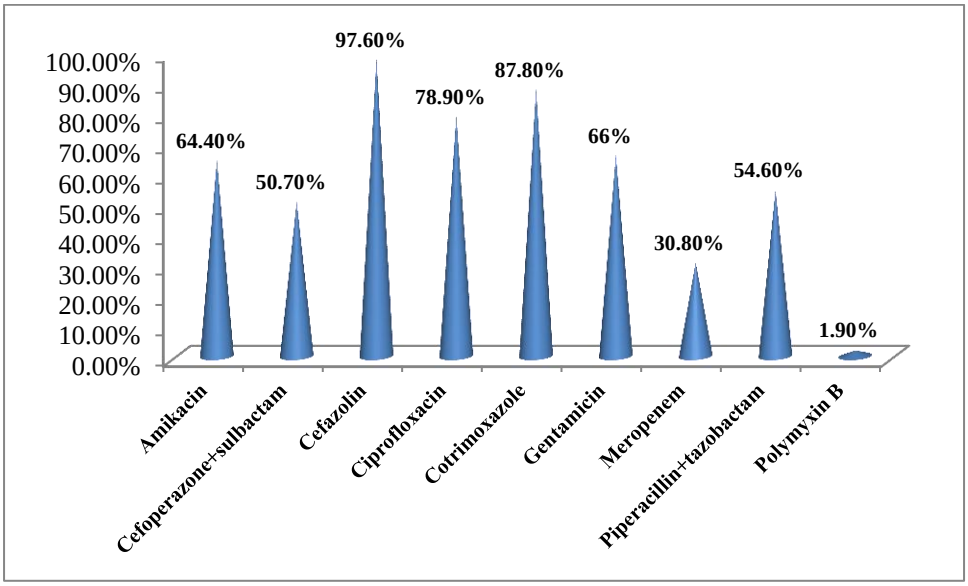
Resistance patterns to various antimicrobials among *Escherichia.coli*



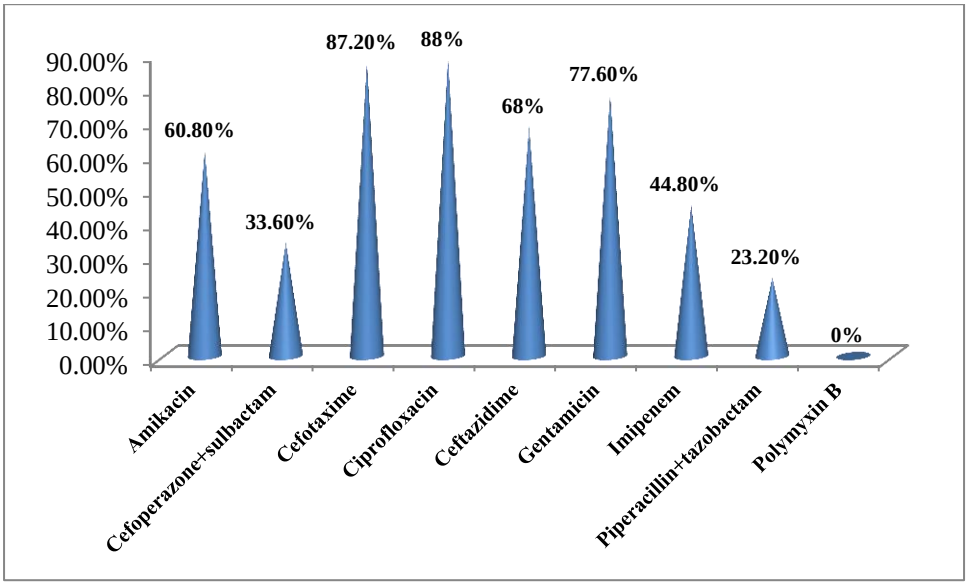
Resistance patterns to various antimicrobials among *Enterobacter spp*.



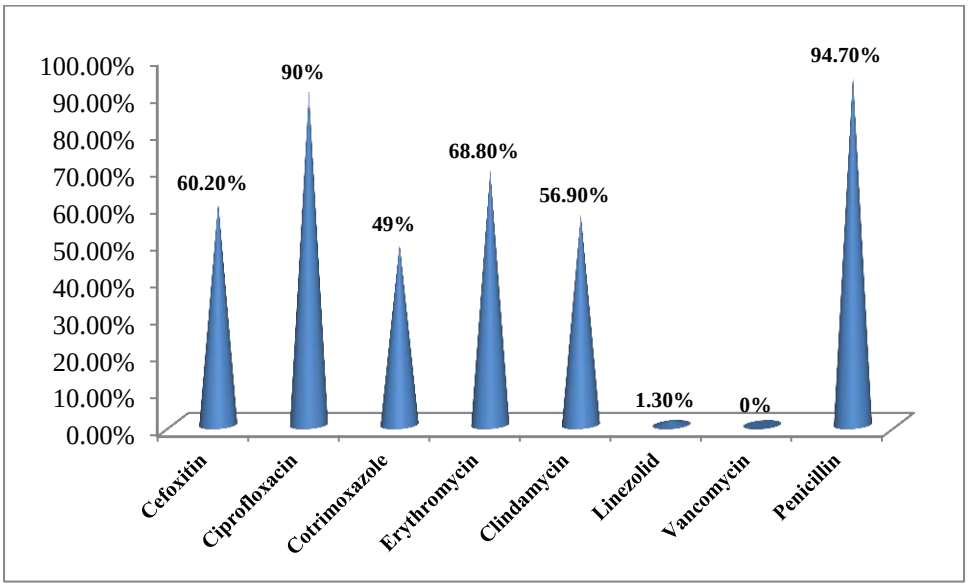
Resistance patterns to various antimicrobials among *Klebsiella spp.*



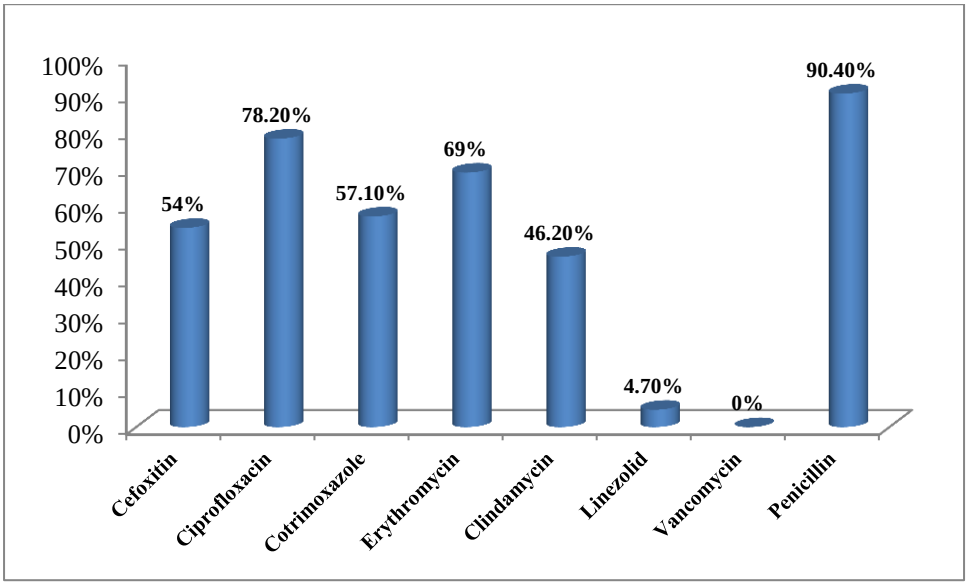
Resistance patterns to various antimicrobials among *Pseudomonas spp.*



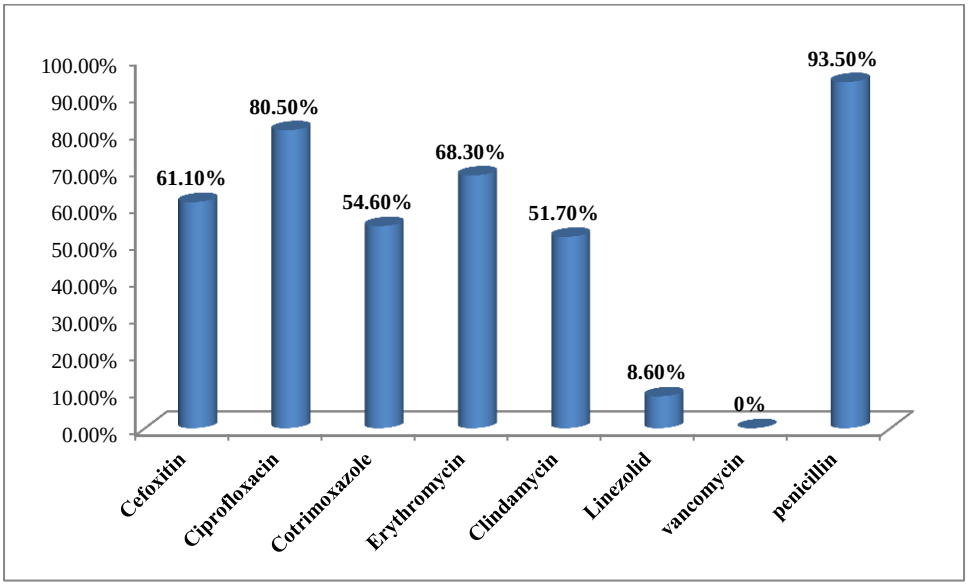
Resistance patterns to various antimicrobials among *S.aureus*



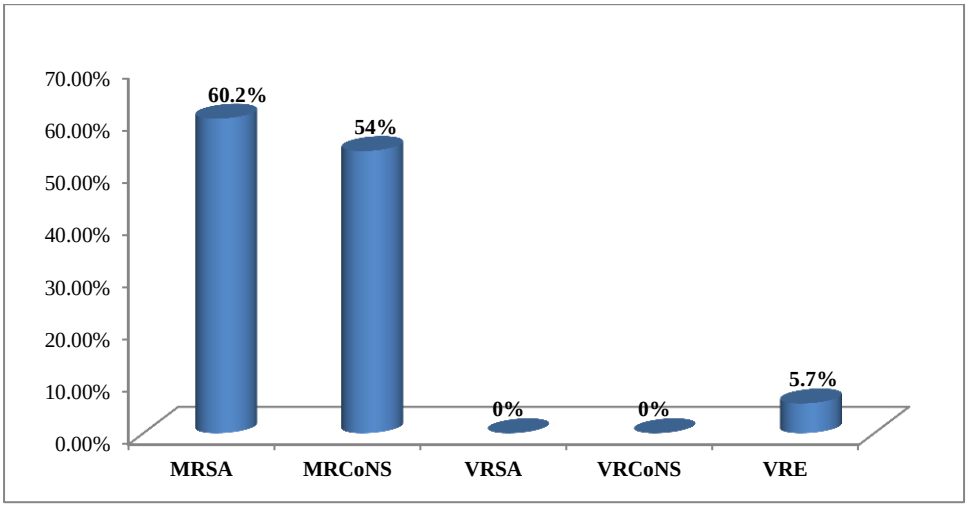
Resistance patterns to various antimicrobials among Coagulase negative *staphylococcus* (CoNS)



Resistance patterns to various antimicrobials among *S.hemolyticus*

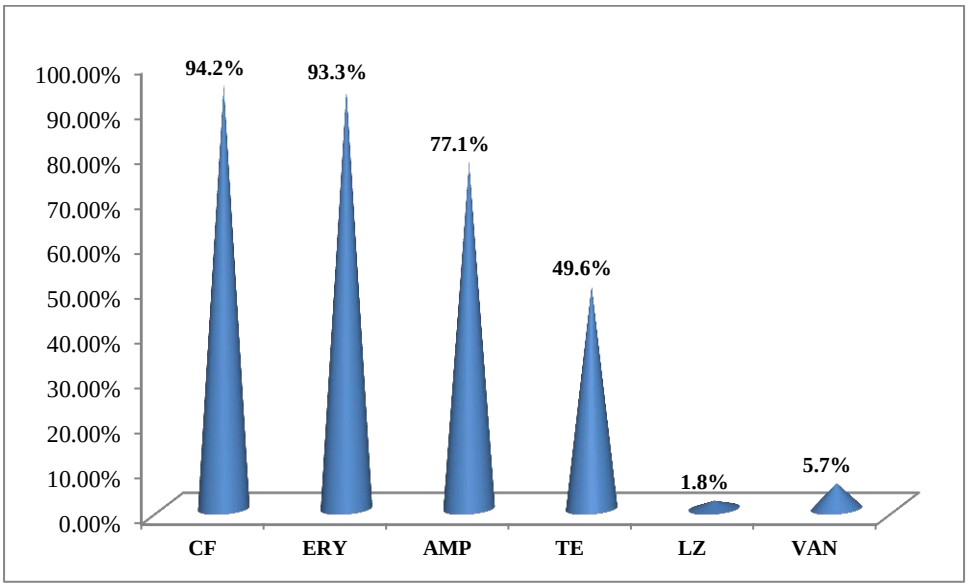


Resistance patterns among Gram positive isolates



MRSA= Methicillin resistance *Staphylococcus aureus,* MRCoNS= Methicillin resistance *Coagulase negative Staphylococcus,* VRSA= Vancomycin resistance *Staphylococcus aureus,* VRCoNS= Vancomycin resistance *Coagulase negative Staphylococcus,* VRE= Vancomycin Resistance *Enterococcus*

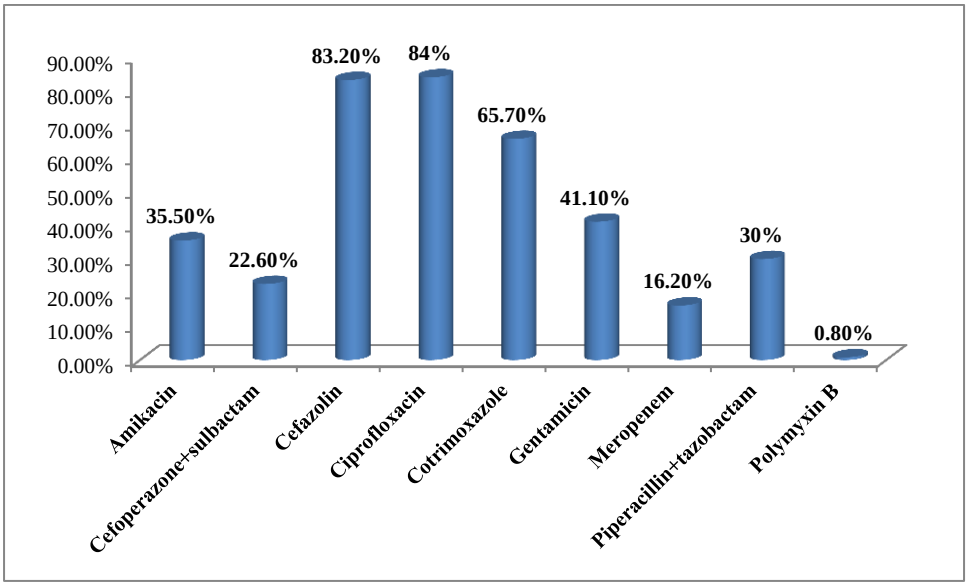
Resistance pattern to various antimicrobials among *Enterococcus spp.*



CF= Ciprofloxacin, ERY= Erythromycin, AMP=Ampicillin, TE= Tetracycline, LZ= Linezolid, VAN= Vancomycin

Among *Enterococcus* spp, vancomycin resistance noted was 5.7%. All VRE isolates were sensitive to Linezolid.

Resistance pattern to various antimicrobials among isolated Gram Negative Bacilli



Antimicrobial sensitivity pattern of organisms isolated from Medical wards:

Antimicrobial disc	***Acinetobacter* spp.(%)**	***Escherichia. coli*(%)**	***Klebsiella* spp.(%)**	***Enterobacter* spp.(%)**	***Pseudomonas* spp.(%)**
AMIKACIN	**40.5**	**80.4**	**37.3**	**57.4**	**36.4**
CEFOPERAZONE+SULBACTAM	**84.3**	**82.6**	**47.1**	**63**	**70.5**
CEFAZOLIN	**2.5**	**9**	**1**	**24.1**	**43.2 (CTX)**
CIPROFLOXACIN	**22.3**	**9**	**24.5**	**27.8**	**25**
COTRIMOXAZOLE	**23.2**	**35**	**11.8**	**35.2**	**22.8 (CTZ)**
GENTAMICIN	**40**	**73.6**	**30.4**	**48.1**	**22.8**
IMIPENEM	**46.3**	**93.5**	**64.8**	**83.4**	**59.1**
PIPERACILLIN+TAZOBACTAM	**34**	**83.4**	**44.1**	**55.6**	**81.8**
POLYMYXIN B	**97.5**	**99.7**	**98**	**100**	**100**

CTX-CEFOTAXIME, CTZ-CEFTAZIDIME

<50% susceptible
>80% susceptible

50-80% susceptible

Antimicrobial sensitivity pattern of organisms isolated from ICUs:

Antimicrobial disc	*Acinetobacter* spp.(%)	*Escherichia coli* (%)	*Klebsiella* spp.(%)	*Enterobacter* spp.(%)	*Pseudomonas* spp.(%)
AMIKACIN	45.8	77	29.4	0	50
CEFOPERAZONE+SULBACTAM	81.4	88.5	53	25	50
CEFAZOLIN	6.8	3.8	11.8	0	7.1(CTX)
CIPROFLOXACIN	22	3.8	23.5	0	7.1
COTRIMOXAZOLE	8.5	38.5	17.6	0	28.6(CTZ)
GENTAMICIN	45.8	77	35.3	0	21.4
IMIPENEM	32.2	92.3	53	50	36.6
PIPERACILLIN+TAZOBACTAM	27.1	80.8	53	25	64.3
POLYMYXIN B	100	100	100	0	100

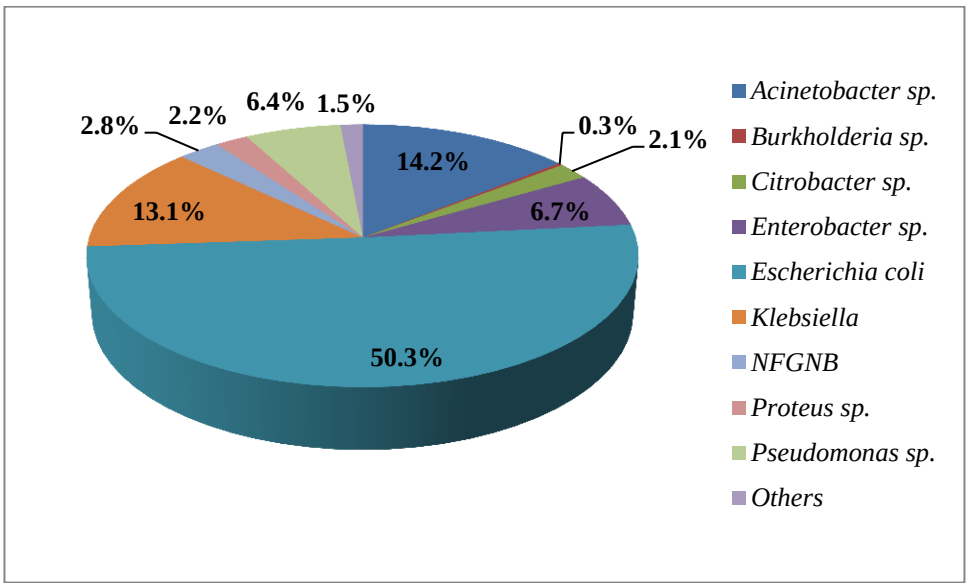
CTX-CEFOTAXIME, CTZ-CEFTAZIDIME

Antimicrobial sensitivity pattern of organisms isolated from surgical wards:

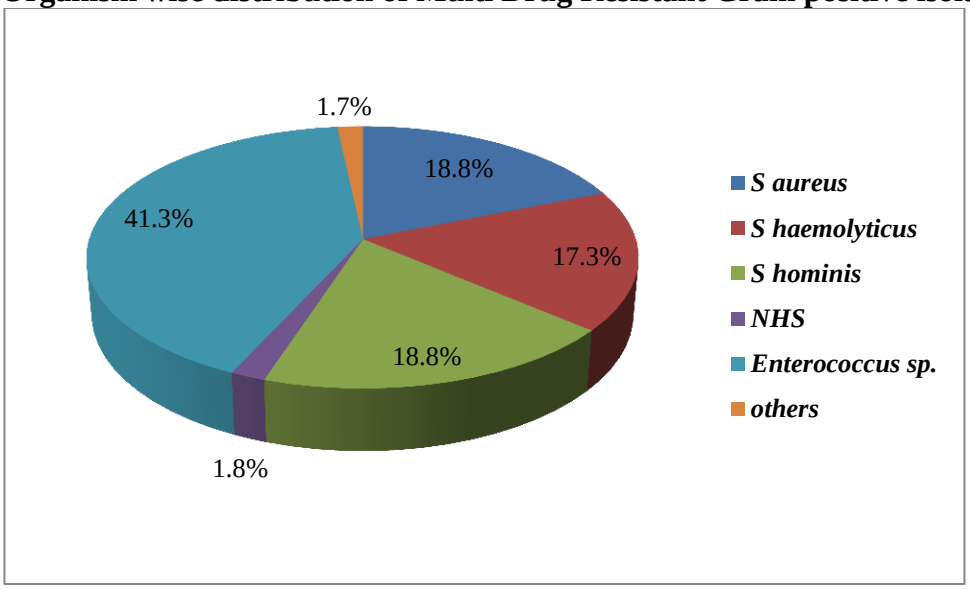
Antimicrobial disc	*Acinetobacter spp.(%)*	*Escherichia .coli* (%)	*Klebsiella* spp.(%)	*Enterobacter* spp.(%)	*Pseudomonas* spp.(%)
AMIKACIN	46.2	82.5	30.6	74	42.1
CEFOPERAZONE+SULBACTAM	82.7	87.4	47	80.4	73.7
CEFAZOLIN	7.7	13.4	2	17.4	26.3(CTX)
CIPROFLOXACIN	30.8	10.8	31.6	30.1	5.3
COTRIMOXAZOLE	27	38.4	10.2	37	7.9(CTZ)
GENTAMICIN	53.8	77.7	31.7	70	23.7
IMIPENEM	55.8	95.4	55.1	93.5	63.2
PIPERACILLIN+TAZOBACTAM	30.8	87.6	42.9	65.2	86.8
POLYMYXIN B	100	99.7	98	100	100

CTX-CEFOTAXIME, CTZ-CEFTAZIDIME

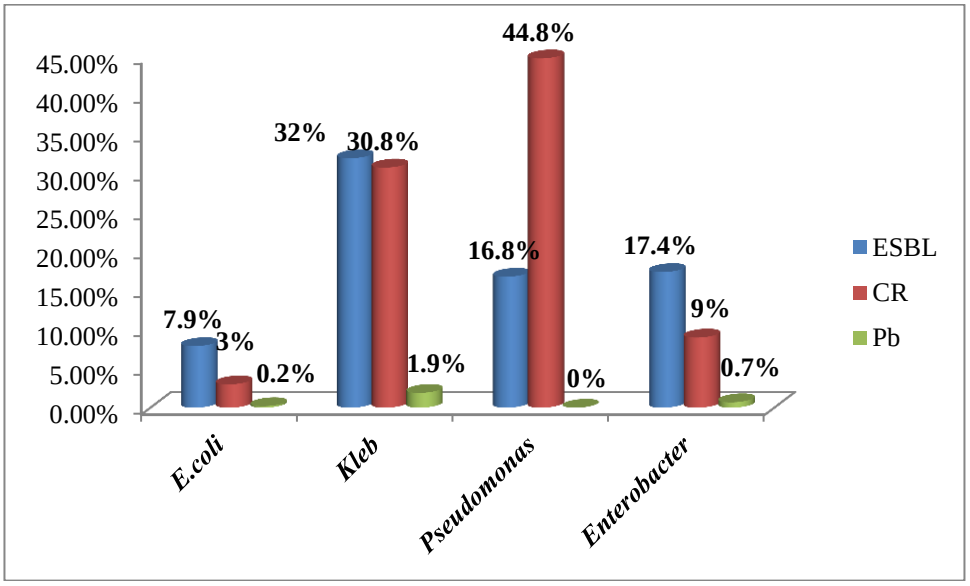
Organism wise distribution of Multi Drug Resistant Gram negative isolates



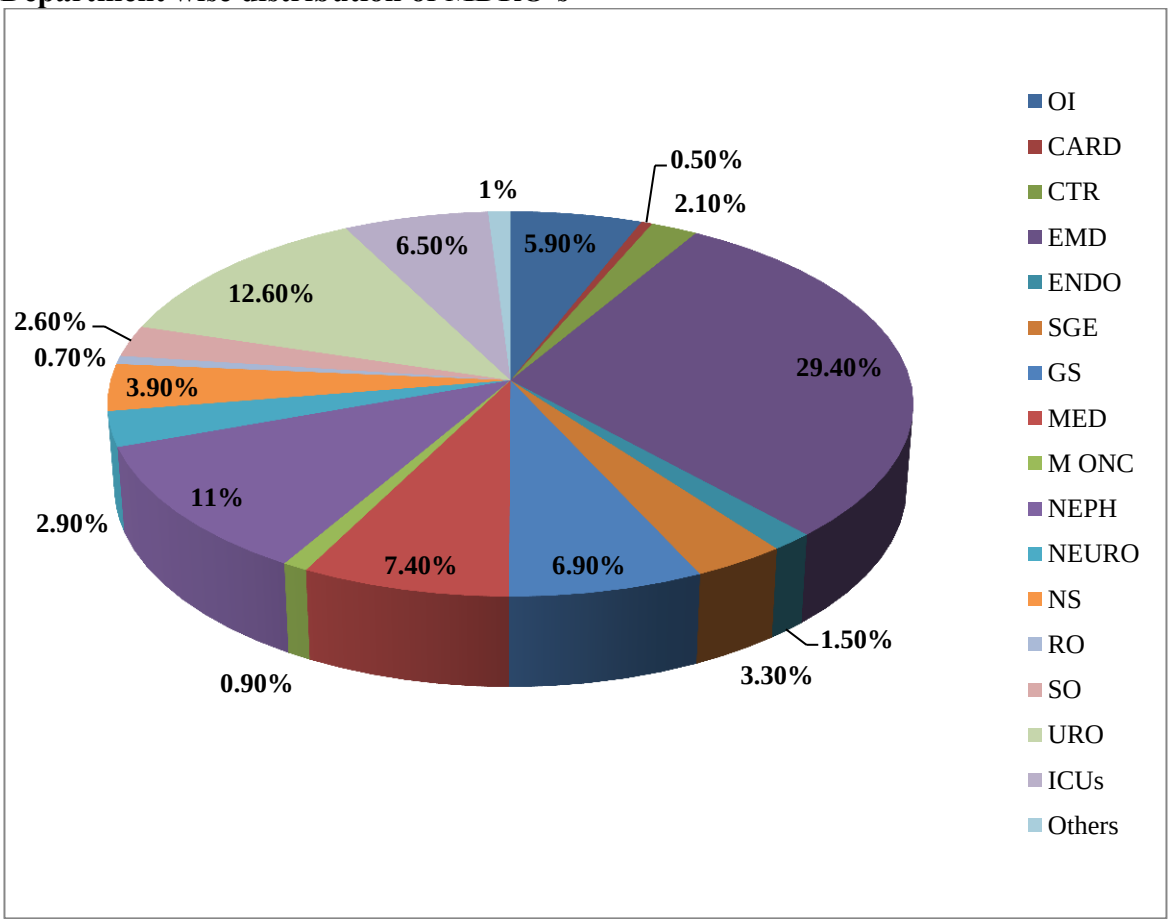
Organism wise distribution of Multi Drug Resistant Gram positive isolates



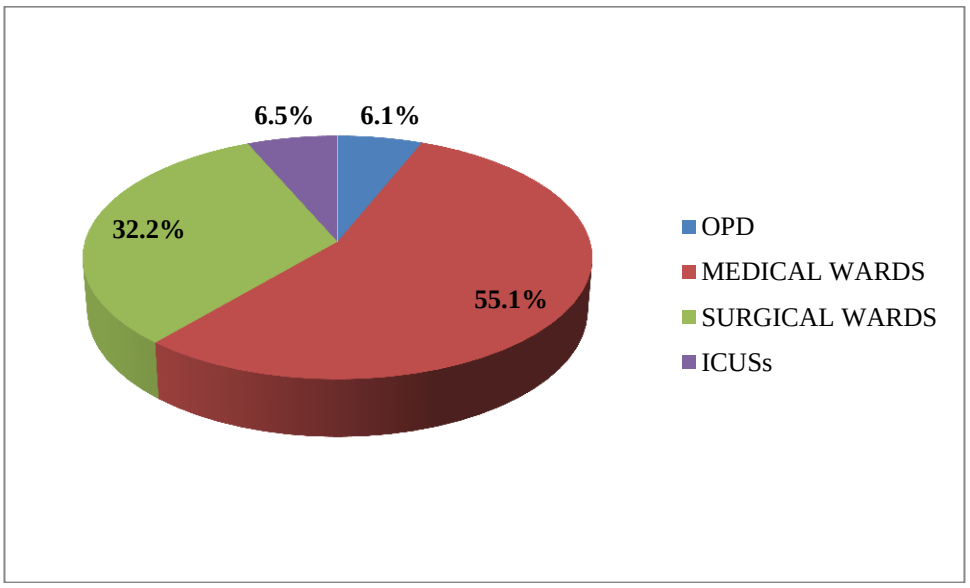
Percentage of Resistant pattern among most common isolated **Multi Drug Resistant Organisms** - MDRO's (ESBL, Carbapenem resistance and Polymixin B)



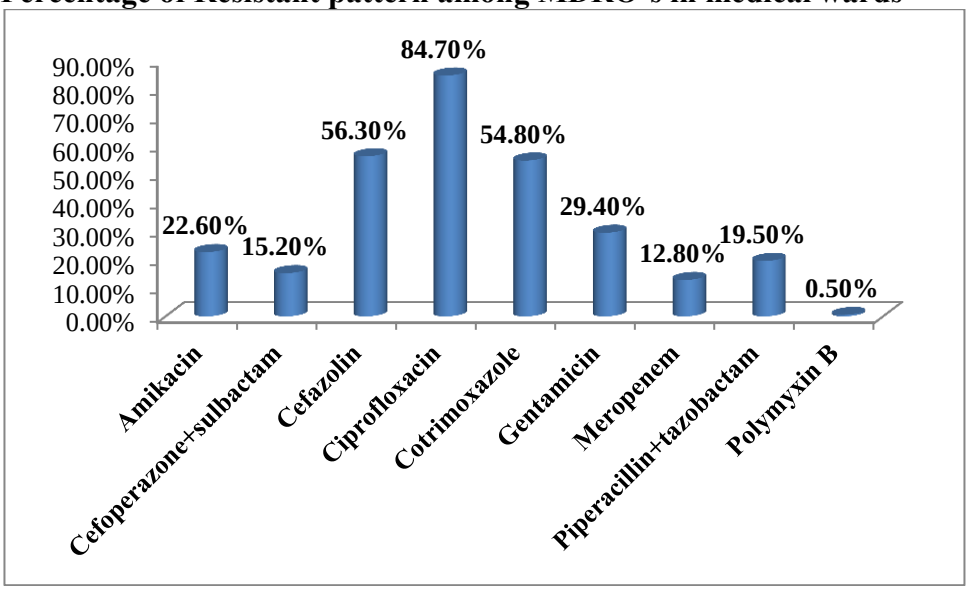
Department wise distribution of MDRO's



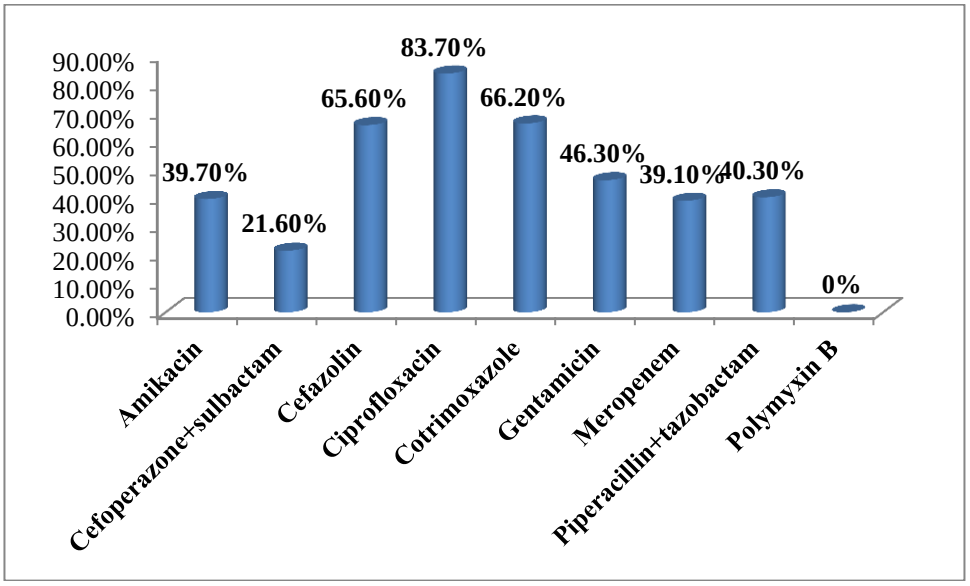
Unit wise distribution of MDRO's



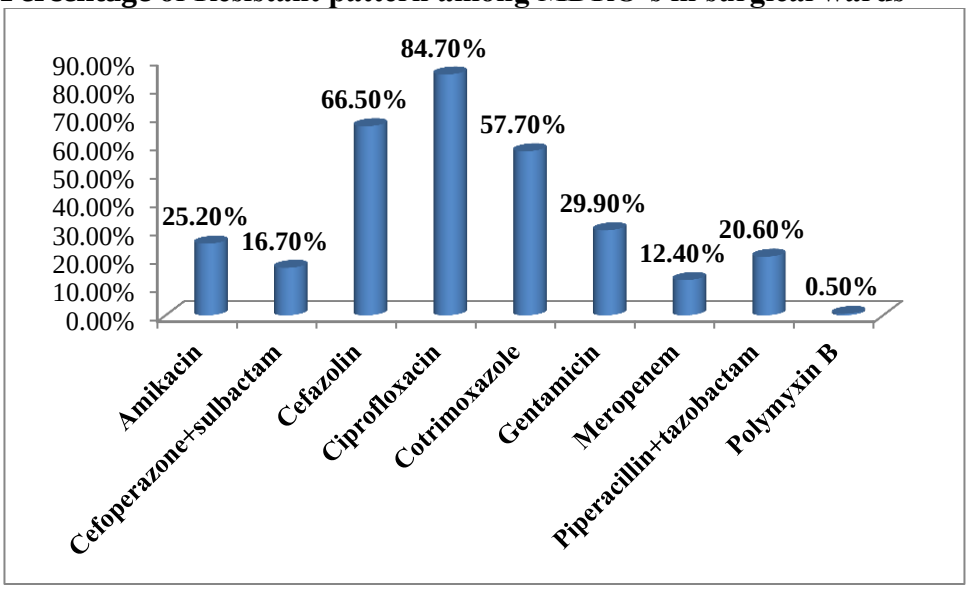
Percentage of Resistant pattern among MDRO's in medical wards



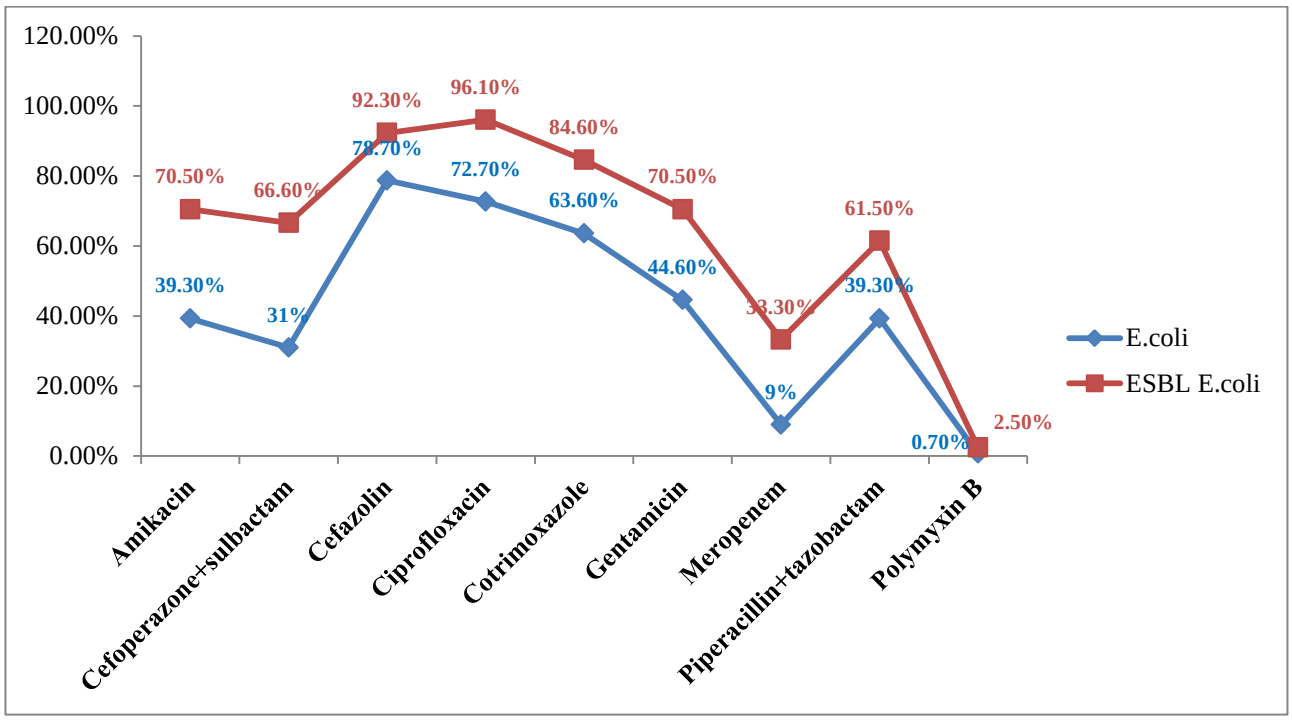
Percentage of Resistant pattern among MDRO's in ICU's



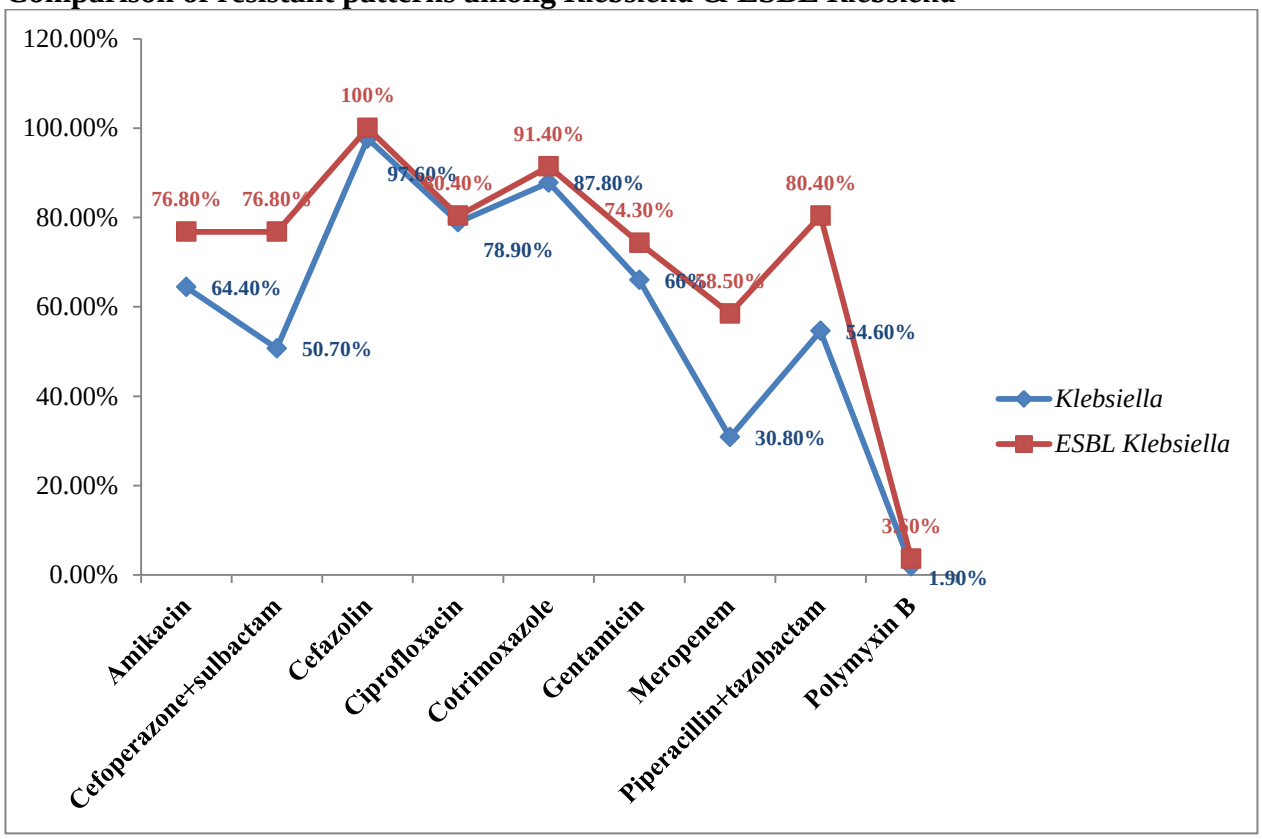
Percentage of Resistant pattern among MDRO's in surgical wards



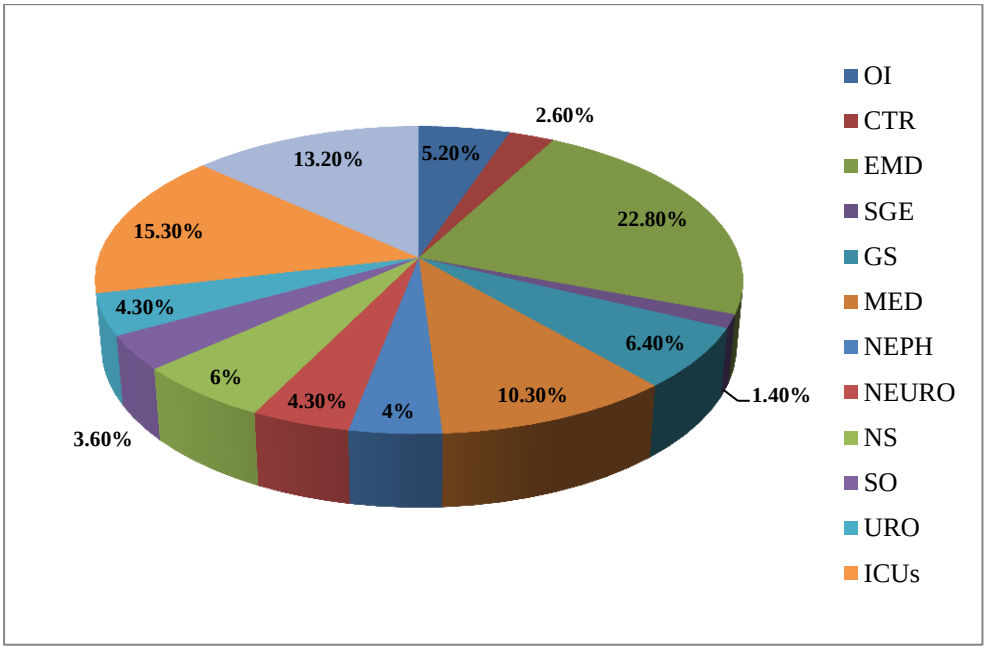
Comparison of resistant patterns among *E.coli* & ESBL *E.coli*



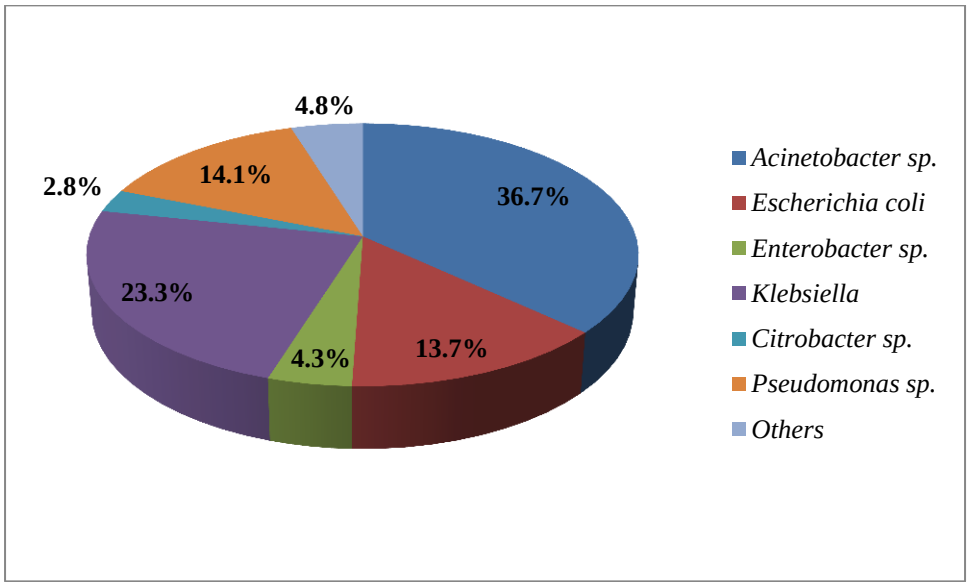
Comparison of resistant patterns among *Klebsiella* & ESBL *Klebsiella*



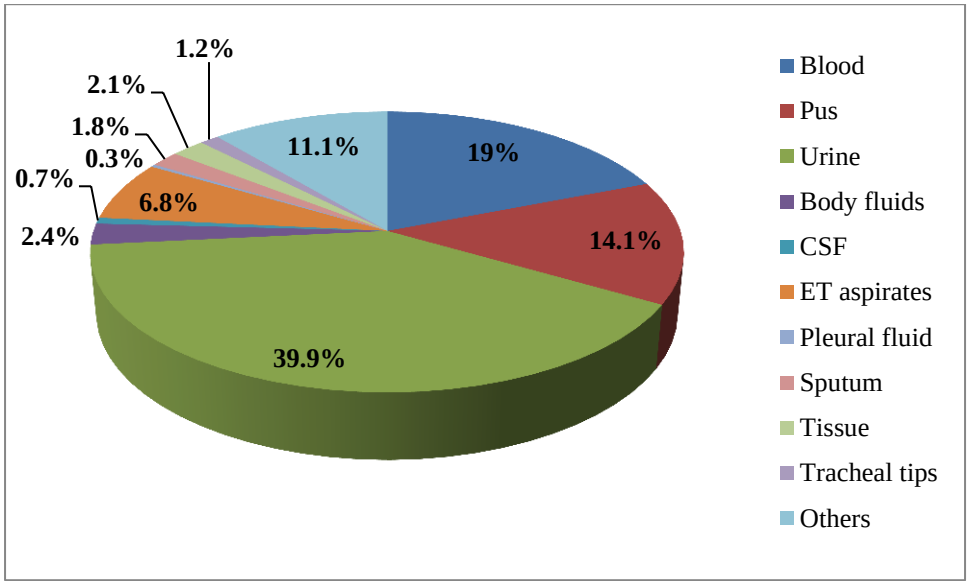
Department wise distribution of Carbapenem resistant isolates



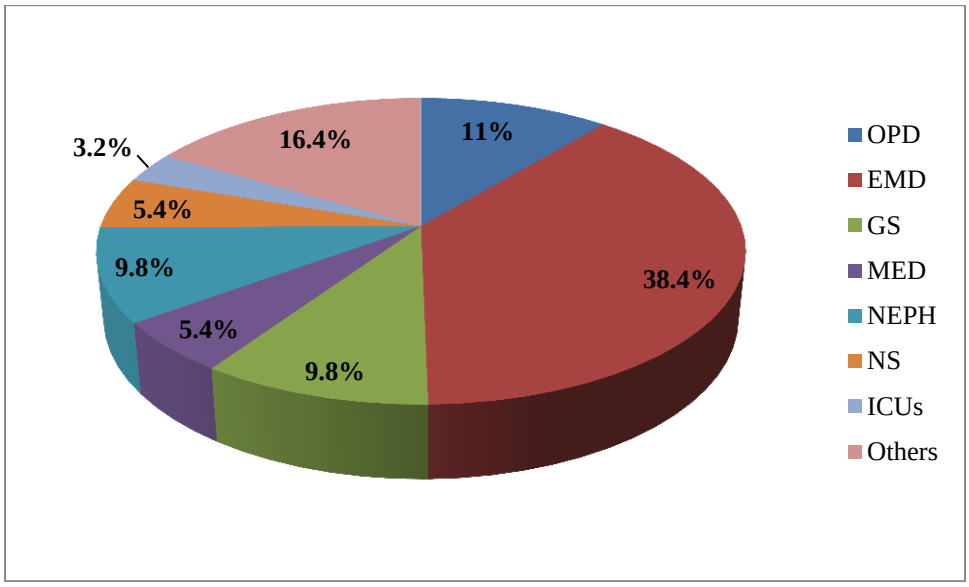
Organism wise distribution of Carbapenem resistant isolates



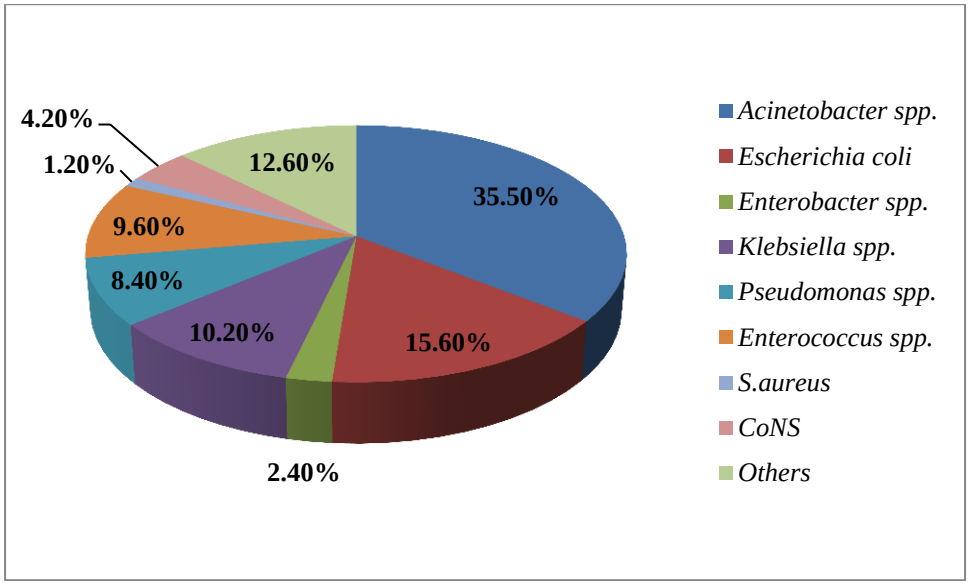
Sample wise distribution of MDRO's



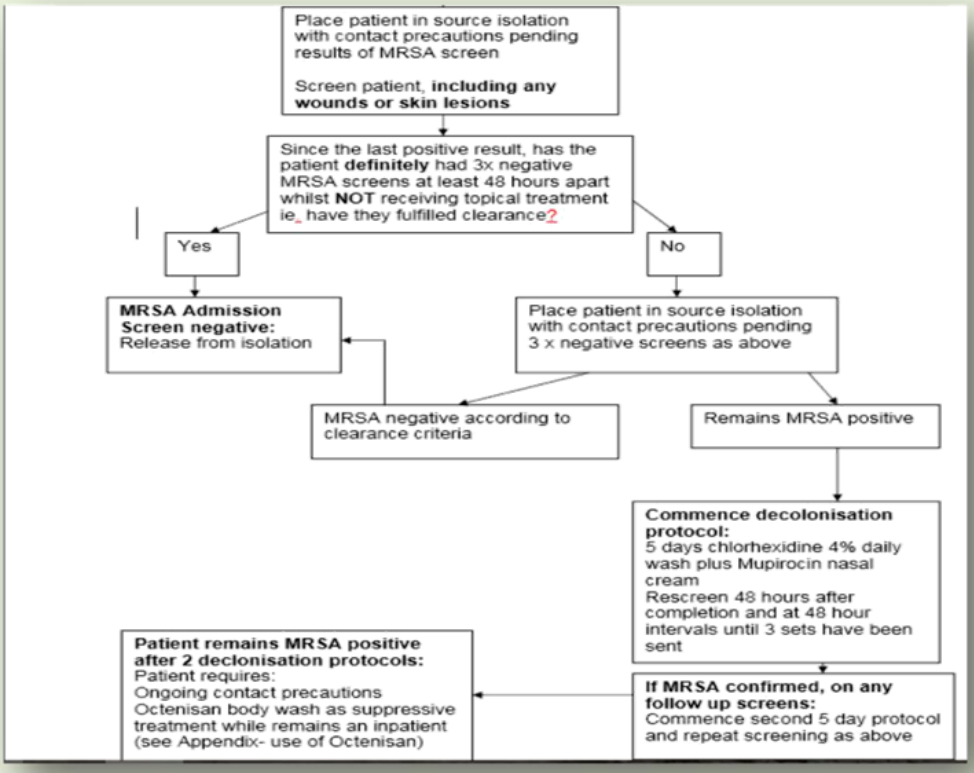
Department wise distribution of *MRSA* samples



Organism's wise distribution of ICU isolates

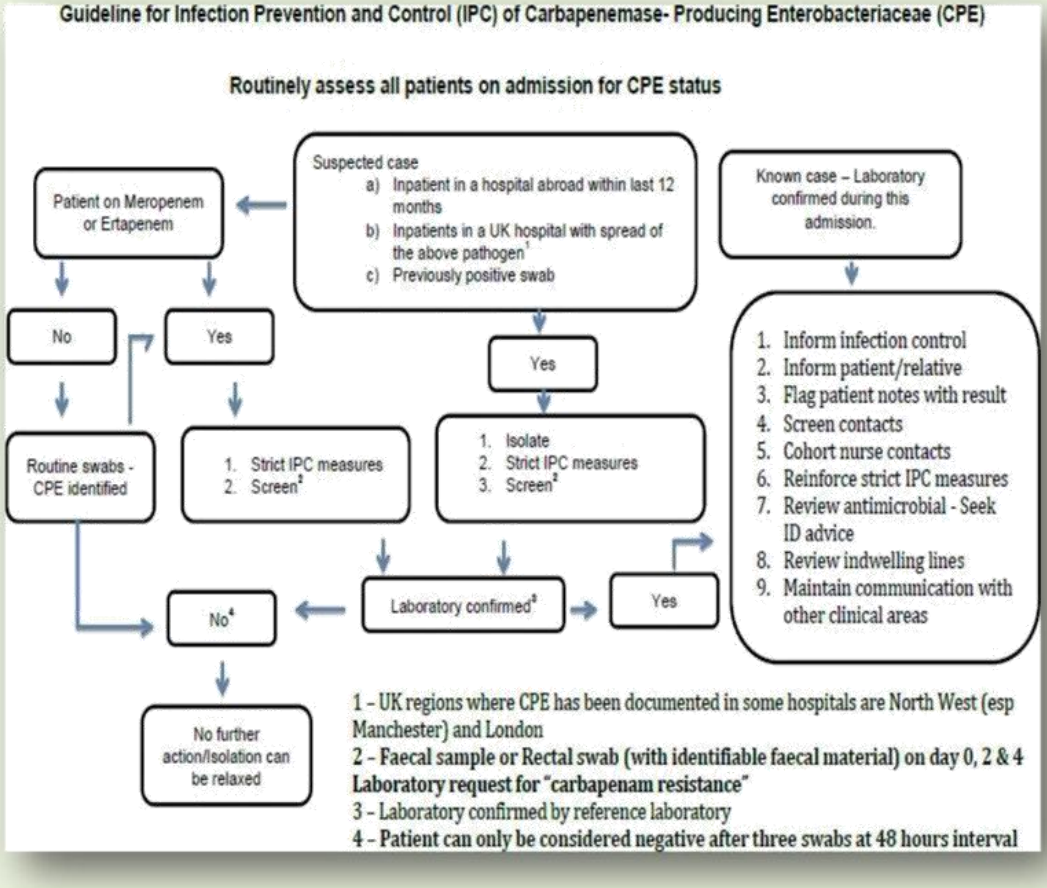


Flow diagram for known MRSA positive patients



Routinely assess all patients on admission for CPE status

Guideline for Infection Prevention and Control (IPC) of Carbapenemase-Producing Enterobacteriaceae (CPE)



Revision of Antibiotic policy as per WHO 2016 guidelines:

As part of the review of antibacterial agents, a new categorization of antibacterial agents into three groups was proposed:

- ACCESS – first and second choice antibiotics for the empiric treatment of most common infectioussyndromes;
- WATCH – antibiotics with higher resistance potential whose use as first and second choice treatment should be limited to a small number of syndromes or patient groups;and
- RESERVE – antibiotics to be used mainly as 'lastresort'treatment options

Access group antibiotics			
Beta-lactam medicines		**Other antibacterials**	
amoxicillin	cefotaxime*	Amikacin	**Gentamicin**
amoxicillin + clavulanic acid	ceftriaxone*	azithromycin*	**Metronidazole**
ampicillin	Cloxacillin	Chloramphenicol	**Nitrofurantoin**
benzathinebenzylpenicillin	Phenoxymethylpenicillin	ciprofloxacin*	**spectinomycin (EML only)**
benzylpenicillin	piperacillin + tazobactam*	clarithromycin*	**sulfamethoxazole + trimethoprim**
cefalexin	procaine benzyl penicillin	Clindamycin	**vancomycin (oral)***
cefazolin	*meropenem**	Doxycycline	***vancomycin (parenteral)****
cefixime*			

Watch group antibiotics
Quinolones and fluoroquinolones e.g. ciprofloxacin, levofloxacin, moxifloxacin, norfloxacin
3rd-generation cephalosporins (with or without beta-lactamase inhibitor) e.g. cefixime, ceftriaxone, cefotaxime,ceftazidime
Macrolides e.g. azithromycin, clarithromycin, erythromycin
Glycopeptidese.g. teicoplanin, vancomycin
Anti-pseudomonalpenicillins with beta-lactamase inhibitor e.g. piperacillin +tazobactam
Carbapenems e.g. meropenem, imipenem + cilastatin
Penemse.g. faropenem

Reserve group ('last-resort') antibiotics	
Aztreonam	Fosfomycin (IV)
4th generation cephalosporinse.g. cefepime	Oxazolidinones e.g. linezolid
5th generation cephalosporinse.g. ceftaroline	Tigecycline
Polymyxins e.g. polymyxin B, colistin	Daptomycin

Sri Venkateswara Institute of Medical Sciences
Segregation of Biomedical Waste

Yellow (Non-Chlorinated Plastic Bags)	Red (Non-Chlorinated Plastic Bags)	BLUE CONTAINERS	White (Translucent Puncture Proof Container)
Human Anatomical, Infectious Waste & Cytotoxic Waste ➢ Human tissues, organs, body parts and foetus ➢ Items contaminated with blood, body fluids like dressings, plaster casts, cotton swabs ➢ Bags containing residual or discarded blood and blood components ➢ Antibiotics, cytotoxic drugs along with glass or plastic ampoules, vials (with cytotoxic labelled bag) ➢ Discarded disinfectants ➢ Discarded linen, mattresses, beddings contaminated with blood or body fluid ➢ Blood bags ➢ Laboratory culture, stocks or specimens of microorganisms ➢ Live or attenuated vaccines	**Contaminated Waste (Recyclable)** ➢ Disposable items ➢ Tubing ➢ Bottles ➢ Intravenous tubes & sets ➢ Catheters ➢ Urine bags ➢ Gloves ➢ Syringes (without needles and fixed needle syringes) ➢ Vaccutainers with their needles cut	**Glassware** ➢ Broken or discarded and contaminate glass including medicine vials and ampoules except those contaminate with cytotoxic wastes **metallic body implants**	**Waste Sharps Including Metals** ➢ Needles ➢ Syringes with fixed needles ➢ Needles from needle tip cutter or burner ➢ Scalpels ➢ Blades ➢ Any other contaminated sharp object that may cause puncture and cuts ➢ Contaminated sharps

Black/ Green – General Garbage (domestic waste, papers, packaging material, left over food)

BMW 2018 Amendment

- Establish a Bar- code system for bags
- Phase out use of chlorinated plastic bags (excluding blood bags) and gloves (By the 27th March, 2019)
- Health Care Facilities having less than ten beds shall have to install Sewage Treatment Plant by the 31st December, 2019.
- All the health care facilities (any number of beds) shall make available the annual report on its web-site within a period of two years from the date of publication of Bio-Medical Waste Management (Amendment) Rules, 2018;"

(h) Microbiology, Biotechnology and other clinical laboratory waste: Blood bags, Laboratory cultures, stocks or specimens of micro-organisms, live or attenuated vaccines, human and animal cell cultures used in research, industrial laboratories, production of	Autoclave safe plastic bags or containers	Pre-treat to sterilize with non-chlorinated chemicals on-site as per National AIDS Control Organisation or World Health Organisation guidelines thereafter for Incineration.

- Autoclave, Microwave and Hydroclave
- As per World Health Organisation guidelines on Safe management of wastes from health care activities and WHO Blue Book, 2014 and thereafter sent for incineration
- Routine mask and gown – yellow
- Cardboard boxes with blue colored marking - Puncture proof and leak proof boxes or containers with blue colored marking
- Chemical treatment using at least 10% Sodium Hypochlorite – corrected 1-2%

Autoclave

Condition:

- 121°C, 15 pounds pressure for 60 minutes
- 135°C, 31 pounds pressure for 45 minutes
- 149°C, 52 pounds pressure for 30 minutes

- Validation:
  - *Geobacillus stearothermophilus* with at least $1X10^6$ spores
  - Three monthly interval
- Daily - Chemical indicator strip

BMW 2019 Amendment

1. Update on day to day basis the bio-medical waste management register and display the monthly record on its website according to the bio-medical waste generated in terms of category and colour coding as specified in Schedule I.

2. Annual report on its web-site within a period of two years from the date of publication of the Bio-Medical Waste Management (Amendment) Rules, 2018 is made available.

3. Health Care Facilities having less than ten beds shall have to comply with the output discharge standard for liquid waste by 31st December, 2019.

Biomedical Waste Management (BMW) RULES 2016

Category	Type ofwaste	Type of Bag/ container	Treatment/ Disposal options
Yellow	Human anatomical waste	Yellow coloured	Incineration/ Plasma pyrolysis/ deepburial
	Animal anatomical waste		
	Soiledwaste	non chlorinated plasticbags	Incineration/ Plasma Pyrolysis/ deepburial/ autoclaving or hydroclaving+ shredding/mutilation
	Expired/ discarded medicines-pharmaceutical waste,cytotoxic Drugs	Yellow coloured containers/ non chlorinated plastic bags	Incineration (cytotoxic drugs at temperature > 1200□C)
	Chemicalwaste	Yellow coloured containers/ non chlorinated plastic bags	Incineration or Plasma pyrolysis orEncapsulation
	Discarded linen contaminated with blood/ bodyfluids	Non- chlorinated yellow plastic bags / suitable packing material	Non- chlorinated chemical disinfection followedby incineration/ plasmapyrolysis
	Microbiology, other clinical lab waste, blood bags, live/attenuated Vaccines	Autoclave safe plastic bag/container	Pre-treattosterilizewith non-chlorinated chemicals on-site asper NACO/ WHOguidelines+Incineration
Red	Contaminated Waste(Recyclable)	Red coloured non- chlorinated Plastic bags or containers	• Autoclaving/ micro- waving/ hydroclaving + shredding • Mutilation/ sterilization+ shredding. Treated waste sent to registered or authorized recyclers or for energy recovery or plastics to diesel or fuel oil or for road making,
White (Translucent)	Waste sharps including Metals	Puncture proof, Leak proof, tamper proof containers	• Autoclaving/dry heat sterilization+ shredding/ mutilation • Encapsulation in metal container or cement concrete • Sanitary landfill/ designated concrete waste sharppit
Blue	Glassware, Metallic body implants	Glass test tubes Empty glass Bottles Contaminated glass bottles Broken glass ampoules containing discarded/Expired medicines except chemotherapeutic medicines Metallic body implants Reusable glass slide	Disinfection (by soaking the washed glass waste after cleaning with detergent and Sodium Hypochlorite treatment)/ through autoclaving/ microwaving/ hydroclaving + recycling