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12 year old boy presented with complains of fever and respiratory distress for 10 days. CT chest showed a centrally placed thick walled ruptured liver abscess with a breach resulting in spillage of contents into the right hemithorax . His IHA titer for Amoeba became positive

**Diagnosis:** Amoebic liver abscess

Courtesy: Dr. Afia Tariq, Dr Ali Faisal Saleem,  
Aga Khan University, Karachi.

## Rabies- a Fatal and Neglected Disease

For centuries rabies has been regarded as the “orphan disease” of underprivileged humanity. In Eastern culture and in the subcontinent particularly, rabies was perceived as a “curse” ordained by destiny, to be treated by mystics and mendicants, but inevitably ending in an agonizing, torturous death. Even today modern medicine has not changed mortality from rabies; and neither have public health authorities in many developing countries made serious efforts towards rabies prevention. The road to elimination is distant and needs serious, concerted effort. The WHO classifies rabies as a Neglected Tropical Disease (NTD).

Animal bites may be accidental and unavoidable, but awareness about immediate and correct action may make the difference between living and dying. Medical Microbiology and Infectious Disease Society of Pakistan (MMIDSP) and the hardworking team at The Indus Hospital (TIH) have made every attempt to spread information to the public to immediately wash the wound with soap and water, and reach a hospital where post exposure prophylaxis (PEP) is done correctly. TIH is the officially designated Training Center for Sindh.

The problems towards control of dog bite and rabies are manifold, the worst of them being poor understanding among physicians who encounter dog bites in the Emergency Department (ED).<sup>1,2,3</sup> Victims are either under treated or over treated, both situations occurring because of insufficient training and application of WHO recommendations for PEP. There is irrational fear of using Rabies Immunoglobulin (RIG), as well as hesitancy over using intramuscular or intradermal schedules. ED doctors also consider PEP as being “too expensive to afford” for the patient. All these misconceptions would clear if health care givers take hands-on training from experienced institutions.

For decades, NIH, Pakistan produced and distributed the obsolete Sheep Brain Vaccine. After intense advocacy by activists, the offensive vaccine was finally discontinued in January 2016, and has been replaced with a cell culture vaccine. Small volume centers or EDs that only occasionally entertain animal bites should use the intramuscular regimen, while large centers are advised to employ the intradermal regimen, which is effective as well as cost effective.<sup>4,5,6,7</sup>

Once symptoms of rabies have set in, death is predictable. Rare survivors have been reported, but there were exceptional circumstances. Counseling the family about impending death of their loved one can be an extremely emotional experience. Realizing the inevitability of death, most take their loved one home or for alternative care. If, on the other hand, the patient is admitted, invasive procedures should be avoided, and the patient should be cared for in a private, quiet, draft-free area. Management should focus on comfort care, with heavy sedation

(midazolam and thiopentone) and avoidance of intubation or life-support measures, which will only prolong the agony.<sup>8</sup>

Nearly 98% human rabies cases occur after dog bite; hence, it is safe to assume that in urban and rural areas of Pakistan dog is the reservoir for the virus. Stray dogs account for majority of bites in humans. Cries from animal rightists to desist from culling stray dogs in the city continue, warning authorities that this cruel method is not the solution to animal rabies elimination. This has been proven repeatedly in studies from countries in South America and in Asian countries. OIE advocates that if 70% dogs in a given perimeter are vaccinated, this will induce herd immunity and protect against human rabies. Reduction of dog population can only be done through neutering- a task that requires massive civic organization through local health authorities along with veterinarians.<sup>9</sup> This practice has shown success in many cities around the world, and should be attempted in Pakistan if long-term measures are to be secured.

Intense discussions over the past year at meetings that this author has attended at WHO, are directed towards making PEP more affordable and convenient for the victim, while maintaining its safety and efficacy. For instance, there is now clear evidence that injecting the wound only with RIG, obviates the need to inject remaining RIG into a distant site into the muscle, so that RIG is not wasted. Shorter one-week schedules for PEP as well as for PrEP instead of the one-month schedule will encourage patient adherence without compromising on efficacy or safety. New published recommendations are due to follow soon.

Finally, it behooves every practicing medical doctor to learn and teach others about rabies prevention. Currently, a *One Health* approach is being advocated universally to control zoonotic diseases. *One Health* recognizes that the health of people is connected to the health of animals and the environment. The goal of *One Health* is to encourage the collaborative efforts of multiple disciplines-working locally, nationally, and globally-to achieve the best health for people, animals, and the environment. Rabies is one such affliction that should be targeted through this concept. MMIDSP should lead the way.

### References

1. Salahuddin N, Mubashar K, Baig-Ansari, Utilization of Rabies Immunoglobulin in Seven Urban Pakistan Emergency Rooms. *NAsian Biomedicine* Vol. 7 No. 2 April 2013; 243-247
2. N.Salahuddin, S Jamali, K Ibraheem S Sardar. Awareness about Rabies Post Exposure Prophylaxis in Pakistan among Patients and Health Care Workers: results from an Asian Rabies Expert Bureau study *JCPSP* Aug 2011 Vol 21(8) 491-4
3. B Dodet, A Goswami, A Gunasekera, F de Guzman, S Jamali, C Montalban, Purba, B Quiambao, N Salahuddin, G Sampath, Q Tang, T Tantawichien, O Wimalaratne. A Ziauddin. Rabies awareness in eight Asian countries. *Vaccine* Volume 26, Issue 50, Nov 2008, p 6344-6348
4. Salahuddin N., Gohar A.M., Baig-Ansari N. Reducing Cost of Rabies

- 
- Post Exposure Prophylaxis: Experience of a Tertiary Care Hospital in Pakistan *PLOS Neglected Tropical Diseases* DOI:10.1371/journal.pntd.0004448 February 26, 2016, 1-8
5. Hampson K, Cleaveland S, Briggs D (2011) Evaluation of cost-effective strategies for rabies post-exposure vaccination in low-income countries. *PLoS Negl Trop Dis* 5: e982. doi: 10.1371/journal.pntd.0000982 PMID: 21408121
  6. Rahim A, Kuppuswamy K, Thomas B, Raphael L (2010) Intradermal cell culture rabies vaccine: a cost effective option in antirabies treatment. *Indian J Community Med* 35: 443–444. doi: 10.4103/0970-0218.69287 PMID: 21031120
  7. Quiambao BP, Dimaano EM, Ambas C, Davis R, Banzhoff A, *et al* (2005) Reducing the cost of post-exposure rabies prophylaxis: efficacy of 0.1 ml PCEC rabies vaccine administered intradermally using the Thai Red Cross post-exposure regimen in patients severely exposed to laboratory confirmed rabid animals. *Vaccine* 23: 1709–1714. PMID: 15705476
  8. WHO Expert Meeting on Rabies (2012). Second report p. 43
  9. Gongal G, Wright AE (2011) Human Rabies in the WHO Southeast Asia Region: Forward Steps for Elimination. *Adv Prev Med* 2011: 383870. doi: 10.4061/2011/383870 PMID: 21991437

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## Comparison of Diathermy and Scalpel Incision in Inguinal Hernia Repair in Terms of Surgical Site Infection

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### Abstract

#### Background

Scalpels are traditionally used for making skin incisions that produce little damage to surrounding tissues. However, potential risk of blood transmitted diseases such as Hepatitis B, Hepatitis C and Human Immunodeficiency Virus (HIV) transmission to both doctor and patient in the presence of scalpel in surgical field promotes continuous surge for identifying other modalities of skin incision. This study aimed to compare the frequency of surgical site infection during inguinal hernia repair between diathermy and scalpel incision in adults who underwent surgical correction at Combined Military Hospital Quetta, Pakistan.

#### Material and Methods

We conducted randomized clinical trial at surgery department in Combined Military Hospital (CMH) Quetta during 15 Sep 2010 to 14 Sep 2011. 212 subjects scheduled for inguinal hernia repair were randomly assigned to either scalpel incision (n=106) or diathermy incision (n=106) by using table of random numbers. Both groups were assessed at post-operative days 2 and 7 for normal healing, mild bruising, erythema with signs of inflammation, clear or hemoserous discharge, pus discharge and tissue separation. Data was recorded on questionnaire. Both groups were compared for superficial surgical site infection and p value for significant difference was calculated by using two sided Chi-Square test.

#### Results

Difference in the frequencies of infection between the two groups (as shown in table 1) was not statistically significant. In Group A, which received scalpel incision, 95 patients had normal healing, 4 patients had mild bruising/ erythema and erythema with signs of inflammation each and 3 patients had clear or hemoserous discharge. In group B, which received diathermy incision 98 patients healed normally, 6 had mild bruising/ erythema, 2 patients had erythema with sings of inflammation and no patient developed hemoserous discharge. Difference between two groups as regards to the development

of SSI is statistically non-significant with p value of 0.47 (as it is more than 0.05).

#### Conclusion

Scalpel incision has no superior advantage over diathermy incision in terms of superficial surgical site infection in elective inguinal hernia repair.

#### Keywords

Diathermy, Incision, surgical site infection, scalpel.

#### Introduction

A hernia is a protrusion of a viscus or part of a viscus through an abnormal opening in the walls of its containing cavity.<sup>1</sup> All hernias occurring through the anterior abdominal wall, excluding groin hernia, constitute ventral abdominal wall hernias.<sup>2</sup> Each year, approximately 90,000 men, women and children undergo surgery for abdominal hernia repair in the United States of America alone.<sup>3</sup>

A lack of consensus exists among practicing general surgeons, on the most appropriate option for skin incision in inguinal hernia repair. Traditionally scalpel incision is used in inguinal hernia repair but recently electrosurgical incision with diathermy is also getting popularity among the surgeons as it rules out the scalpel from surgical field and provides an attractive preventive option against blood-transmitted diseases like AIDS, Hepatitis B and Hepatitis C; which carry significant risk of transmission to both doctor and patient.<sup>1-4</sup> National and international studies carried out on inguinal hernia repair incisions have shown that diathermy has significant advantage over scalpel incision on the basis of incision related blood loss, incision time (longer in scalpel group p=0.001) and post-operative pain (markedly reduced in diathermy group p=0.000).<sup>5</sup> However, in terms of superficial surgical site infection, its use as incision modality is still controversial due to fear of surgeons for acquiring post-operative infection due to heat damage of skin and subcutaneous tissues, but same study has shown that there is no significant difference between scalpel and diathermy as incision modality in terms of post-operative wound complications.<sup>5</sup>

#### Objective

To compare diathermy and scalpel incision in inguinal hernia

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repair in terms of surgical site infection.

### Material and Methods

This quasi experimental study was carried out in Combined Military Hospital Quetta, Pakistan over a period of 1 year from 15 Sep 2010 to 14 Sep 2011. The patients reporting in surgical outpatient department with clinical diagnosis of inguinal hernia of either gender between 15 to 60 years of age were included in study. Patients with recurrent hernia, concurrent anticoagulant therapy, concurrent corticosteroid therapy, diabetics and immunocompromised were excluded from study. The sample was calculated using WHO sample size calculator. A sample of 212 patients was selected by convenience sampling technique. It was then randomized by using lottery method into two groups, A and B comprising of 106 patients in each group. Written and informed consent was obtained from the patients in the language they understood the best. The patients of group A underwent scalpel incision while the patients of group B received diathermy incision. Pre Anesthesia assessment of all the patients was done before surgery. Operation was performed by consultant surgeon. General surgical set, scalpel, disposable blade, standard diathermy and pen electrode were used. Patients were operated in supine position under spinal/general anesthesia. All patients were given injection Augmentin 1.2 gram intravenously at the time of induction, after a test dose. Approval from hospital ethical committee was obtained.

### Data Collection Procedure

The Patients were admitted from outpatient department and followed up post-operatively in ward and outpatient department. Patients were randomly allocated into Group A and B by using the lottery method. The patients of Group A underwent scalpel incision while Group B received diathermy incision for inguinal hernia repair. Following operation, both groups of patients were given similar analgesics. Patients were assessed on post-operative days 2 and 7 by the PI. Demographic information like name, age, gender and address were obtained and entered in pre designed proforma. Information regarding surgical site infections, as per the operational definitions was entered in the proforma. Telephone contacts of patients were obtained to ensure follow-up.

### Operational Definitions

#### ● Early Post Operative Complications

These include postoperative pain, surgical site infection, hematoma or seroma formation occurring within four weeks of surgery.

### Data Analysis Procedure

Data was analyzed by using SPSS version 17.0. Sample size was 106 patients in each group using non probability consecutive sampling. Quantitative data, like age was calculated in terms of mean and Standard Deviation (SD). Qualitative data like gender and post operative surgical site infection were presented in terms of percentages and frequencies. Both groups were

compared for superficial surgical site infection by applying Chi-Square. With level of significance 5 % and Power of test was 80 %, P value  $\leq 0.05$  was considered statistically significant.

### Results

The ages of the participants ranged from 16-60 years ( $32\pm 9$ ). Majority of them were males ( $n=205$ , 97%). The frequencies of surgical site infections according to Southampton scoring system is summarized in Table 1. In Group A, who received scalpel incision, 95 (89.6%) patients had normal healing. 11 (10.3%) patients had SSIs out of which 4 patients had mild bruising/ erythema, 4 had erythema with signs of inflammation and 3 patients had clear or hemoserous discharge. In Group B, which received diathermy incision, 98 (92.4%) patients healed normally, while 8 (7.5%) developed SSIs, out of which 6 had mild bruising/ erythema, 2 patients had erythema with signs of inflammation and no patient developed hemoserous discharge. Difference between two groups as regards to the development of SSIs is statistically non-significant ( $p=0.47$ ).

### Discussion

In pre Halothane era, use of electro surgical instruments in human surgery was very selective due to explosive nature of anesthetic agents. After its introduction diathermy has been increasingly used for hemostasis and dissection of tissue planes. But, its use for making skin incisions is still infrequent due to the fear of increased amounts of necrotic tissue produced within the wound which may result in wound infection leading to delayed wound healing and excessive scarring.<sup>5-7</sup>

- Trend in the use of diathermy for making skin incisions has been increased after the introduction of oscillator units, which produce pure sinusoidal current. Recent literature has shown that results of diathermy and scalpel in inguinal hernia repair are comparable in terms of operating time, diminished blood loss, and reduced pain after surgery using the diathermy method of skin incision when compared to scalpel incision.<sup>5</sup>

In our study we have observed 11 cases (10.37%) of Superficial Surgical Site Infection in scalpel group as compared to 8 cases (7.5%) in diathermy incision group. A randomized clinical trial conducted in Royal College of surgeons Ireland in 2001 revealed that diathermy has significant advantages over scalpel incision in abdominal wall incisions in terms of incision time, blood loss and post operative pain.<sup>5</sup> A prospective, double-blind, RCT compared outcomes of elective or emergency general surgery performed using either diathermy ( $n = 185$ ) or surgical scalpels ( $n = 184$ ) at Fatima Hospital, Baqai Medical University and Shamsi Hospitals in Karachi, Pakistan, from January 2006 to December 2007. Results: diathermy patients experienced 7.9% complications, a similar incidence to the 10.6% experienced by patients whose surgery was performed with scissors ( $P = 0.74$ ) within groups.<sup>8</sup>

A controlled clinical study published in 1990 by Dixon AR and

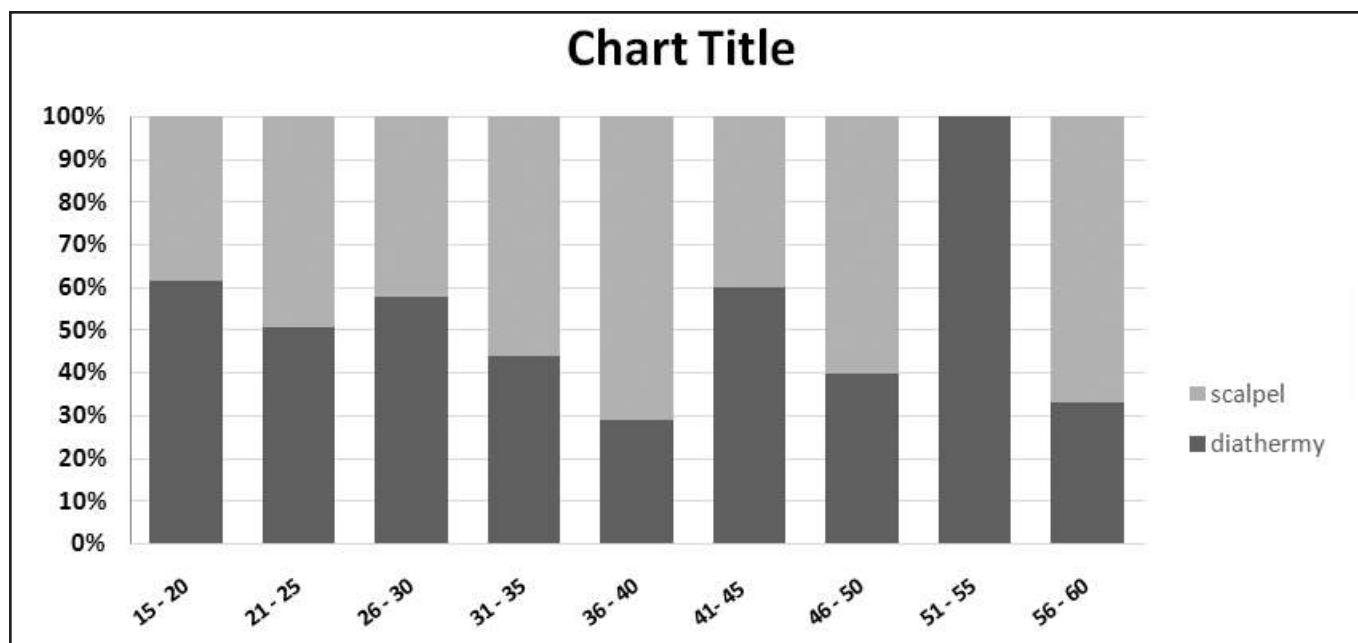


Fig 1. Frequencies of surgical site infections according to Southampton scoring system with age stratification

Table 1: Age Range \* Southampton Wound Score \* Procedure Cross-tabulation

Procedure	Age Range (in Years)	Southampton wound score				Total
		Normal Healing	Mild bruising / Erythema	Erythema with signs of inflammation	Clear or Hemoserous discharge	
Diathermy	15 - 25	32	2	2		36
	26 - 35	45	2	0		47
	36 - 45	15	1	0		16
	46 - 55	5	0	0		5
	56 - 60	1	1	0		2
	<b>Total</b>		<b>98</b>	<b>6</b>	<b>2</b>	
Scalpel	15 - 25	27	2	2	1	32
	26 - 35	40	1	1	2	44
	36 - 45	21	1	1	0	23
	46 - 55	3	0	0	0	3
	56 - 60	4	0	0	0	4
	<b>Total</b>		<b>95</b>	<b>4</b>	<b>4</b>	<b>3</b>

P value = 0.47

Watkin DF comparing skin incision by conventional scalpel with electrosurgical needle incision has shown the latter technique to be highly effective, quicker, and to give better cosmetic results with minimal complications. Skin diathermy burns and wound haematomas were only seen after conventional scalpel

incision. Fears of delayed wound healing, keloid formation and high infection rates were not found.<sup>9</sup>

A Prospective study comparing diathermy and scalpel incisions in tension-free Inguinal hernioplasty was published in THE

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AMERICAN SURGEON in April 2005 in which 125 consecutive patients submitted to inguinal hernioplasty using the tension-free technique were allocated alternately to either scalpel (n = 60), or diathermy (n = 57) groups.<sup>10</sup> The parameters measured included blood loss during the skin incision and underlying tissue dissection, postoperative pain and requirements for analgesics, the presence of wound dehiscence in the absence of infection, and postoperative wound infection on the day of discharge, on the day staples were removed, and 1 month after surgery. There was no difference between the two groups in terms of Infectious complications, so diathermy incision is safe option in hernia repair.<sup>10</sup>

A prospective, randomized, blinded clinical trial was conducted to determine that electrocautery incision does not increase wound infection; published in THE AMERICAN JOURNAL OF SURGERY in 1994 in which 492 patients were studied consecutively. The results revealed that wound infections developed in 38 of the 250 scalpel patients (15%) and in 30 of the 242 cautery patients (12%). The inference was concluded that the use of electrocautery to create surgical wounds does not increase wound infection.<sup>11</sup>

Increased prevalence of blood borne diseases like Hepatitis B, C and HIV signifies the use of diathermy in skin incisions to keep the scalpel out of operative field. Our study is one of the attempts towards comparison of effectiveness of the two incision techniques. However, like any other study our study also had some limitations as comparison was only between two methods of open hernia repair, laparoscopic procedure was not included in the study. Long term complications, like recurrence of hernia could not be assessed in this study. It was not possible for us to detail more than one person for assessment of clinical outcomes due to limitations of resources but there was no compromise on consistent and reliable measurements.

### Conclusion

We conclude that scalpel incision has no superior advantage

over diathermy incision in terms of superficial surgical site infection in elective inguinal hernia repair. Diathermy for skin incision is safe for both patients and surgeon in terms of avoiding transmission of Hepatitis B, C and HIV by keeping the scalpel away from surgical field.

### Acknowledgments

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### References

1. Murphy EL, Bryzman SM, Glynn SA. Risk Factors for Hepatitis C Virus Infection in United States Blood Donors. *Hepatology* 2000; 31:756.
2. Garfein RS, Vlahov D, Galai N. Viral infections in short-term injection drug users: The prevalence of the hepatitis C, hepatitis B, human immunodeficiency, and human T- lymphotropic viruses. *Am J Public Health* 1996; 86:655.
3. Stark K, Hanel M, Berg T, Schreier E. Nosocomial transmission of hepatitis C virus from an anesthesiologist to three patients--epidemiologic and molecular evidence. *Arch Virol* 2006; 151:1025.
4. Alter MJ. Healthcare should not be a vehicle for transmission of hepatitis C virus. *J Hepatol.* 2008; 48:2. doi: 10.1046/j.1365-2168.2001.01625.x.
5. Emmanuel C, Elias A, Sokratis A, Evaghelos X, Odysseas Z. A prospective study comparing diathermy and scalpel incisions in tension-free inguinal hernioplasty. *The American Surgeon.* 2005;71:326-9.
6. Kearns SR, Connolly EM, McNally S, McNamara DA, Deasy J. Randomized clinical trial of diathermy versus scalpel incision in elective midline laparotomy. *Br J Surg.* 2001;88:41-4.
7. Ozgun H, Tuncyurek P, Boylu S, Erpek H, Yenisey C, Kose H, et al. The right method for midline laparotomy: what is the best choice for wound healing? *Acta Chir Belg.* 2007; 107:682-6
8. Shamim M. Diathermy vs. scalpel skin incisions in general surgery: double blind, randomized, clinical trial. *WJS.* 2009;33:1594-9.
9. Dixon AR, Watkin DFL. Electrosurgical skin incision versus conventional scalpel: a prospective trial. *F R Coll Surg Edinb.* 1990;35:299-301.
10. Chrysos E, Athanasakis E, Antnakakis S, Xynos E, Zoros O. A prospective study comparing diathermy and scalpel incision in tension free inguinal hernioplasty. *Am Surg.* 2005;71:326-9.
11. Groot G, Chappell EW. Electrocautery used to create incisions does not increase wound infection rates. *The American journal of surgery.* 1994;167:601-3.

## Antimicrobial Susceptibility Pattern of Urinary Bacterial Isolates – Local experience at Rawalpindi, Pakistan

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### Abstract

#### Background

Bacteria are the most common cause of urinary tract infections in all age groups. Drug resistance is rising in uropathogens worldwide, highlighting the importance of local antibiotic susceptibility patterns. We have aimed to determine the antimicrobial susceptibility pattern of uropathogens isolates among in and outdoor patients referred to CITI Lab (private sector) Rawalpindi.

#### Methods

A retrospective review of lab records of 3802 urine samples processed from Jan. 2010 to Dec. 2010 was reviewed. Urine culture was performed using conventional microbiological techniques. Biochemical testing was used to identify the organisms and antibiotic sensitivity was done by the modified Kirby Bauer method as per Clinical Laboratory Standards Institute recommendations.

#### Results

Out of total 3802 urine samples 2244 (59%) were culture negative, whereas significant isolates were obtained in 1368 (36%) samples and mixed growth (more than two organisms) was obtained in 190 (5%). Out of these significant isolates, 123 (9%) were *Candida* species and 1245 (91%) were bacterial isolates. *Escherichia coli* (70%) was the most common isolate followed by *Klebsiella pneumoniae* (15%). Imipenem/meropenem, amikacin, cefoperazon-sulbactam, piperacillin-tazobactam and nitrofurantoin were sensitive to more than 85% of isolates while fluoroquinolones, amoxi-clave, cotrimaxazole and ampicillin were sensitive to less than 40% of isolates.

#### Conclusion

More than 60% of uropathogens are resistant to conventional oral antibiotics like fluoroquinolones and cotrimaxazole limiting to injectable antibiotics. Nitrofurantoin is the only oral antibiotic left which is effective.

#### Key words

Antibiotics, Drug resistance, Urinary tract infections, Uropathogens

#### Introduction

Clinical infection of urinary tract is said to exist when a significant number of microorganisms, usually greater than  $10^5$  CFU/mL of urine, are detected in properly collected mid-stream/clean catch urine.<sup>1</sup> Urinary tract infections (UTIs) are amongst the most common infections in hospitalized patients.<sup>2</sup> It is the second most common infections in community settings. About 150 million people are diagnosed with UTI each year worldwide and it cost the global economy in excess of six billion US dollars.<sup>3</sup> Urinary tract infection can be divided into complicated and uncomplicated infections for the purpose of treatment.<sup>4</sup> Empirical antimicrobial therapy is given to reduce the incidence of postoperative infections including UTI, to prevent development of sepsis, to reduce duration of hospital stay and cost of patient care.<sup>5</sup> There is rising trend of multidrug resistance for the common antibiotics recently all around the globe. Due to this rise in antibiotic resistance among uropathogens, it is important to have local antibiograms. This information would be relevant not only for the local hospitals but would also be a vital for regional database. In view of this, a retrospective analysis was carried out to determine the frequency and resistance pattern of uropathogens in patients of Rawalpindi/Islamabad region referred to Citi lab Rawalpindi, Pakistan.

#### Material and Methods

This laboratory based retrospective descriptive cross sectional study was carried out from Jan. 2010 to Dec. 2010 in Microbiology department, Citi Lab Rawalpindi, Pakistan. Citi lab is a private lab in which samples from different government and private hospitals and clinics are submitted. Mid stream clean catch urine samples were collected in sterile containers. Non probability consecutive sampling was done. All age groups of both genders who have suspicion of UTI referred to Citi lab were included in the study. Repeated samples from the same patients were excluded.

Bacterial concentration of  $\geq 10^5$  CFU/mL was considered as significant obtained after incubating 0.2 ul of urine on cystein lactose electrolyte deficient agar (Oxoid UK) using semi-

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quantitative strip method (MAST bacteruritest).<sup>6</sup> These plates were incubated aerobically at 37 °C for 24-48 hours. The colony count was expressed in colony-forming units per mL of urine. Isolations and identifications were performed using biochemical tests. After biochemical identification anti-microbial sensitivity testing was done for the isolates using modified Kirby Bauer disk diffusion methods on Mueller Hinton agar.

Antimicrobial sensitivity was interpreted as per the clinical laboratory standard institute (CLSI) guidelines.<sup>7</sup> The production of ESBL enzyme among gram negative rods was detected employing double disc synergy (DDS) test using 30µg discs of aztreonam, ceftazidime and 10µg cefpodoxime (Oxoid, Basingstoke, UK) placed 15 mm (edge to edge) from amoxicillin-clavulanate; (20/10µg) disc. Inoculated plates were incubated overnight at 35 ± 2 °C. A zone of enhancement between amoxicillin-clavulanate and any one of the above (aztreonam, ceftazidime and cefpodoxime) for an organism was considered as ESBL producer.<sup>8</sup>

*Staphylococcus aureus* (ATCC 25923), *Escherichia coli* (ATCC 25922) and *Pseudomonas aeruginosa* (ATCC 27853) were used as control strains. Data was entered in SPSS-15 for statistical evaluation. Descriptive statistics was applied to calculate mean, standard deviation for age, percentages for different variables like gender and antibiograms.

## Results

A total of 3802 samples were included in the study. Age range of patients was between 1 and 92 years with a mean of 35.28 years. Most (87%) isolates were from females. Out of total 3802 urine samples 2244 (59%) were culture negative, whereas significant isolates were obtained in 1368 (36%) samples and mixed growth (more than two organisms) was obtained in 190 (5%). Out of these significant isolates, 123 (9%) were *Candida* species and 1245 (91%) were bacterial isolates. *Escherichia coli* 871(70%) was the most common bacterial isolate followed by *Klebsiella pneumonia* 187(15%), *Enterococcus species* 100(8%), *Pseudomonas aeruginosa* 37(3%), *Staphylococcus aureus* 19(1.5%) and others are 31(2.5%) as shown in figure below. The others include *Enterobacter cloacae*, *Citrobacter freundii*, *Proteus mirabilis*, *Morganella morganii* and *Providencia* species. Susceptibility pattern of the isolates is shown in Table 1 and 2.

Among gram negative organisms, extended spectrum β-lactamase (ESBL) production was detected as 41% in *Escherichia coli* and 44% in *Klebsiella pneumoniae*. In Gram positive organisms, three vancomycin resistant enterococci and three methicillin resistant *Staphylococcus saprophyticus* were detected but no MRSA was detected.

## Discussion

We found gram negative pathogens to be the predominant cause

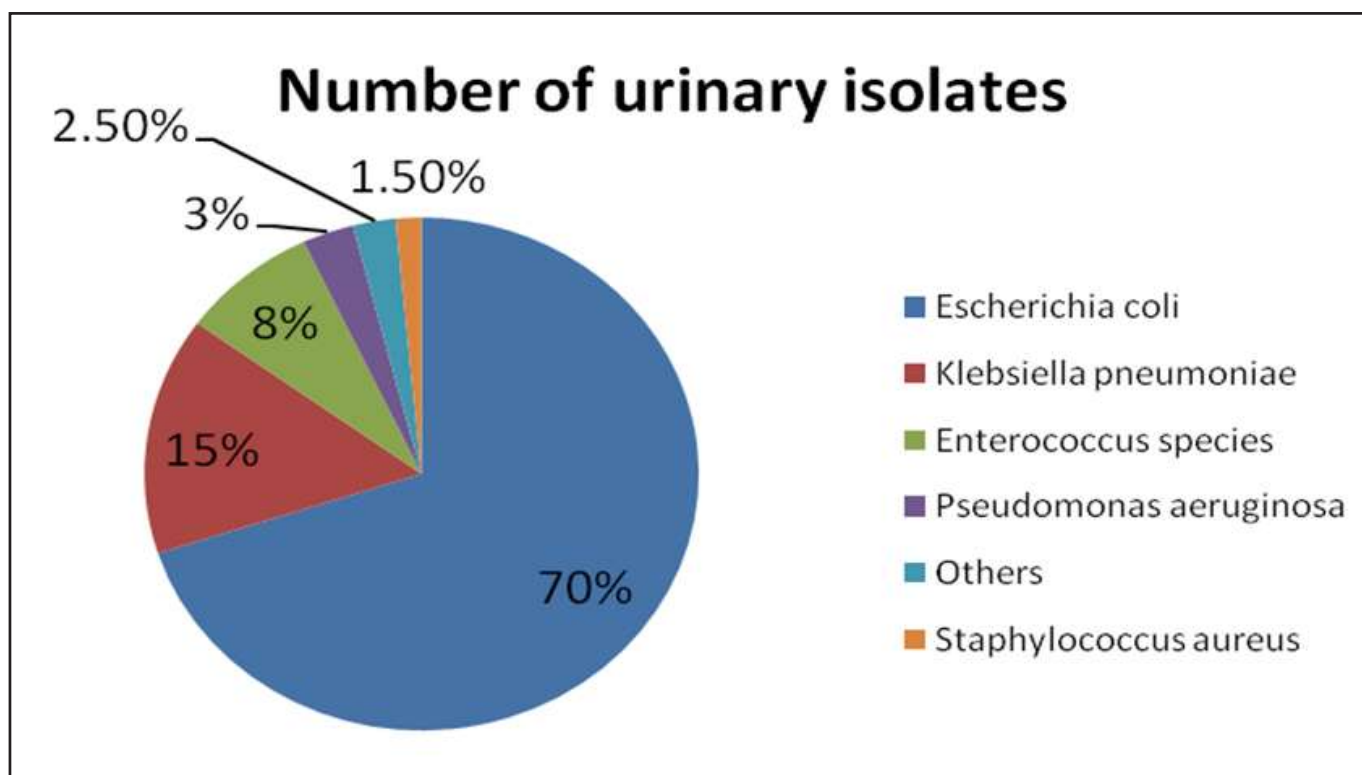


Fig. 1 Spectrum of urinary pathogens isolated

of UTI and almost 40% of them were resistant to the commonly used antibiotic, ciprofloxacin. In our community, bacterial urinary tract infection is one of the common causes for seeking medical advice. Isolation of bacteria by appropriate culture methods is one of the diagnostic tools in UTI.<sup>9</sup> In our study we found that UTI was most common in females, which is similar to reports published elsewhere.<sup>10</sup>

*Escherichia coli* were the predominant bacterial pathogens

**Table 1: Percentage of antimicrobial susceptibility in Gram negative isolates**

Antibiotics	<i>Escherichia coli</i> n=631	<i>Klebsiella pneumoniae</i> n=135	<i>Pseudomonas aeruginosa</i> n=26
Ampicillin	16%	00%	--
Amoxi-clav	40%	07%	--
Gentamicin	63%	66%	65%
Amikacin	94%	92%	96%
Ciprofloxacin	39%	36%	61%
Cotrimoxazole	21%	25%	--
Ceftriaxone	56%	54%	--
Ceftazidime	56%	54%	81%
Cefoperazone	56%	54%	81%
Aztreonam	58%	56%	77%
Pipera-tazo	85%	74%	92%
Imipenem/meropenem	99%	98%	96%
Cefoperazon-sulbactam	87%	83%	92%
Norfloxacin	35%	28%	50%
Nitrofurantoin	85%	60%	--

**Table 2: Percentage of antimicrobial susceptibility in Gram positive isolates**

Antibiotics	<i>Enterococcus</i> spp. n=71	<i>Staphylococcus aureus</i> n=13
Ampicillin/penicillin	77%	15%
Amoxi-clav	77%	100%
Gentamicin	--	92%
Amikacin	--	92%
Ciprofloxacin	27%	69%
Cotrimoxazole	--	46%
Pipera-tazo	83%	--
Imipenem/meropenem	86%	--
Norfloxacin	20%	61%
Nitrofurantoin	86%	100%
Vancomycin	96%	100%
Linezolid	100%	100%

followed by *Klebsiella pneumoniae* similar to the reports from other regional and local studies.<sup>2,5,9,10,11</sup> In Gram positive organisms *Enterococcus* species was most common followed by *Staphylococcus aureus*.

This study shows *Escherichia coli* was 99% sensitive to imipenem/meropenem, similar results (96%) were shown by Khan et al at AFIP Rawalpindi.<sup>12</sup> But results were contrary to a similar study conducted in Lahore by Sabir et al which showed only 66% sensitivity to carbapenems.<sup>13</sup> These differences may be due to isolates from hospital settings where carbapenems may be used more frequently. Among third generation cephalosporins, ceftriaxone was 54% sensitive and similar pattern was noted by Khan et al in 2014.<sup>12</sup>

Antimicrobial susceptibility pattern of commonly used oral antibiotic ciprofloxacin was 39% for *E. coli* and 36% for *Klebsiella pneumoniae* that somewhat more than 15% reported from Rawalpindi.<sup>12</sup> This has serious implications for treatment of UTI in the community setting and physicians should be alerted to these findings. A similar susceptibility pattern has been reported earlier from Pakistan and India.<sup>14</sup>

Fluoroquinolones are common antibiotics which are prescribed empirically in community settings and could be underlying reason for the high resistance rates.<sup>5,15</sup> Piperacillin-tazobactam, cefoperazone-sulbactam and nitrofurantoin were >80% effective against *E. coli* isolates but it was less effective in *Klebsiella pneumoniae* isolates. Reason may be that they are not routinely used by general practitioners for UTI, so uropathogens may have lower exposure.<sup>5,9,15</sup> Extended spectrum  $\beta$ -lactamase production is also common as described by Jain et al.<sup>15,16</sup>

From this study, it is obvious that cotrimoxazole is no more useful against uropathogens as only one fourth of the isolates were susceptible to it. Previously this antibiotic was used as the drug of choice for empirical treatment of UTI.<sup>17</sup> It is shown in our study that nitrofurantoin has tremendous effect against *Enterococcus* spp., *E. coli* and *Klebsiella pneumoniae*, which are responsible for UTI in community setup. Hence our study recommends nitrofurantoin as the drug of choice for empirical treatment in community acquired UTI. This is laboratory based review of record this may not show the true picture of whole community but can be used for local antibiotic policies. Another limitation of this study that hospital and community acquired isolates were not separated and fosfomycin disc was not available in our lab at that time.

### Conclusion & Suggestions

In view of the above findings it is concluded that uropathogens are becoming resistant to commonly used oral antibiotics limiting to injectables which are more costly. We suggest that inappropriate and empiric antimicrobial therapy should be avoided to prevent emergence of resistance.

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## References

1. Ehinmidu JO. Antibiotic susceptibility patterns of urine bacterial isolates in Zaria, Nigeria. *Tropical Journal of Pharmaceutical Research* 2003; 2: 223-228.
2. Beyene G, Tsegaye W. Bacterial uropathogens in urinary tract infection and antibiotic susceptibility pattern in Jimma University specialized hospital, Southwest Ethiopia. *Ethiop J Health Sci.* 2011; 21: 141-146.
3. Foxman B. Epidemiology of urinary tract infections: incidence, morbidity, and economic costs. *Am J Med* 2002; 113 Suppl 1A:5S-13S.
4. Kashef N, Djavid GE, Shahbazi S. Antimicrobial susceptibility patterns of community-acquired uropathogens in Tehran, Iran. *J Infect Dev Ctries* 2010; 4: 202-206.
5. Sonavane A, Mathur M, Turbadkar D, Baradkar V. Antimicrobial susceptibility pattern in urinary bacterial isolates. *Bombay Hospital Journal* 2008; 50: 240-244.
6. Butt T, Leghari M. J, Mahmood A. *In-Vitro* Activity of Nitrofurantoin in Enterococcus Urinary Tract Infection. *JPMA* 2004; 54(9):466-9.
7. Wayne PA. Clinical and Laboratory Standards Institute (CLSI) performance standards for antimicrobial disk diffusion susceptibility tests 22nd ed. approved standard, CLSI document M100-S19, Vol. 32. CLSI, January 2016.
8. Menon T, Bindu D, Kumar C, Nalini S, Thirunarayan MA. Comparison of double disc and three dimensional methods to screen for ESBL producers in a tertiary care hospital. *Indian J Med Microbiol.* 2006; 24: 117-120.
9. Kebira AN, Ochola P, Khamadi SA. Isolation and antimicrobial susceptibility testing of *Escherichia coli* causing urinary tract infections. *J. Appl. Biosci* 2009; 22: 1320-1325.
10. Hasan AS, Nair D, Kaur J, Baweja G, Deb M, Aggarwal P. Resistance patterns of urinary isolates in a tertiary Indian hospital. *J Ayub Med Coll Abbottabad* 2007; 19: 39-41.
11. Yengkokpam C, Ingudam D, Yengkokpam IS, Jha BK. Antibiotic susceptibility pattern of urinary isolates in Imphal (Manipur), India. *NMCJ* 2007; 9: 170-172.
12. Khan I U, Mirza I A, Ikram A, Afzal A, Ali S, Hussain A et al. Antimicrobial Susceptibility Pattern of Bacteria Isolated from Patients with Urinary Tract Infection. *J Coll Physicians Surg Pak* 2014, Vol. 24 (11): 840-844
13. Sabir S, Anjum AA, Ijaz T, Ali MA, Khan MR, Nawaz M. Isolation and antibiotic susceptibility of *E. coli* from urinary tract infections in a tertiary care hospital. *Pak J Med Sci* 2014; 30: 389.
14. Orrett FA. Antimicrobial susceptibility patterns of urinary pathogens in Trinidad, 1996-1999. *Am J Public Health* 2003; 95: 352-362.
15. Ullah F, Malik SA, Ahmed J. Antimicrobial susceptibility pattern and ESBL prevalence in *Klebsiella pneumoniae* from urinary tract infections in the North-West of Pakistan. *Afr J Microbiol Res* 2009; 3: 676-680.
16. Jain A, Mondal R. Detection of extended spectrum beta lactamase production in clinical isolates of *Klebsiella* spp. *Indian J Med Res* 2008; 127: 344-346.
17. Vasquez Y, Hand WL. Antibiotic susceptibility pattern of community acquired urinary tract infection isolates from female patients on the US (Texas)-Mexico Border. *J Appl Res Clin Exp Therapeut* 2004; 4: 321-326.

*In Vitro* Activity of Ceftaroline against Methicillin-Resistant *Staphylococcus* Species

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**Abstract****Objectives**

To determine the *in vitro* susceptibility of Ceftaroline against Methicillin-resistant *Staphylococcus species*.

**Methodology**

This observational study was conducted at the Department of Microbiology, Ziauddin University Hospital, Karachi, from July 2014 to March 2015. Consecutive clinical isolates of *Staphylococcus species* were collected and identified by conventional microbiological techniques. Antimicrobial susceptibility testing was carried out by Kirby-Bauer disc diffusion method. The results were interpreted by using Clinical Laboratory Standard Institute criteria. Methicillin resistance was detected by using Cefoxitin disk as a surrogate marker. Statistical analysis was performed by Statistical Package for the Social Sciences version-17.

**Results**

A total of 276 clinical isolates of Methicillin-Resistant *Staphylococci* were obtained during the study period. In these 276 isolates, 103 (37.3%) were Methicillin-Resistant *Staphylococcus aureus*, and 173 (62.7%) were Methicillin resistant Coagulase negative *Staphylococci*. All 276 (100%) isolates of Methicillin-Resistant *Staphylococci* were sensitive to Ceftaroline.

**Conclusion**

Ceftaroline exhibited potent antimicrobial activity against Methicillin-Resistant *Staphylococci* isolates including Methicillin-Resistant *Staphylococcus aureus*. Ceftaroline is equally effective as other options for treating Methicillin-Resistant *Staphylococci* isolates.

**Keywords**

*In vitro* susceptibility. Ceftaroline. Methicillin-resistant. *Staphylococcus species*.

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**Introduction**

*Staphylococcus species* are significant source of infections worldwide. They are also the major causes of hospital-acquired infections. *Staphylococcus aureus* (*S. aureus*) is among the most prevalent causes of clinical infections globally and has garnered substantial public attention due to increasing mortality associated with multi-drug resistance (MDR).<sup>1</sup> Other *Staphylococcus species* like strains of *Staphylococci epidermidis* (*S. epidermidis*) are resistant to various antimicrobials by forming biofilm and colonization. They can also serve as a reservoir for antibiotic resistant genes that can be transferred to other bacteria.<sup>2</sup> For the previous several years Methicillin-Resistant *Staphylococcus aureus* (MRSA) has become a common pathogen in hospital settings and characterize about 33% to 55% of all isolated *S. aureus* strains from hospital and 60% from critical care units.<sup>3</sup> The rate of MRSA in all community-associated *S. aureus* infections in Asian countries ranges from 2.5% to 39%.<sup>4</sup> In a study from Karachi, 38.6% of *S. aureus* isolates were found to be MRSA.<sup>5</sup> Many of the MRSA isolates are becoming MDR and they are susceptible only to the glycopeptide antibiotics such as Vancomycin (VA) which has considerable adverse effects. Linezolid (LZD) has been shown to achieve a higher clinical and microbiological response rate.<sup>6</sup> However, LZD is an expensive alternative with its own adverse side effects.<sup>5</sup>

Ceftaroline (CPT) is a novel, parenteral, bactericidal, anti-MRSA cephalosporin which exhibits a broad spectrum of activity against important community and hospital-acquired pathogens.<sup>7</sup> CPT has high affinity to bind Penicillin binding protein 2a making it effective against MRSA.<sup>8</sup> CANVAS-1 trial results for complicated skin or skin structure infections (cSSSI) proved a good safety profile for CPT and good clinical cure rates.<sup>9</sup>

CPT is an effective therapeutic option against MRSA as well as others Methicillin-Resistant *Staphylococcus species* (MRS) as the therapeutic options are narrowing. There is a strong need in developing countries to introduce new antibiotics to deal with these MDR bacteria in order to provide effective treatment which will decrease the cost of treatment, limit the stay in hospital, and decrease the selection pressure. Very limited data is published in Pakistan against usefulness of CPT against

MRS. Furthermore; local data is of prime importance. The objective of our study was to determine *in vitro* susceptibility of CPT against MRS. We also document the susceptibility pattern of other antimicrobials against *Staphylococcus species*.

### Methodology

This observational study was conducted over a period of nine months from July 2014 to March, 2015 at the Department of Clinical Microbiology of Ziauddin University Hospital. Two hundred and seventy six consecutive clinical isolates of MRS including MRSA were collected from different clinical samples by convenient sampling. These isolates were included in the study. Sources were blood, respiratory secretions, wound swabs, central venous pressure (CVP) lines tips, and pus. All the duplicate isolates were excluded from the study. Written approval from the institutional ethical committee was obtained. Informed consent was taken from either the patient or any other patient's relative.

Clinical samples were received in a sterile container or in an Amies transport medium supplied from the Microbiology laboratory. These samples were processed and incubated at  $37^{\circ}\text{C} \pm 2^{\circ}\text{C}$  in ambient air for 24-48 hours, using standard microbiological techniques.<sup>10</sup> *Staphylococcus species* including *S. aureus* were identified using conventional techniques (colony morphology, gram staining, catalase test, coagulase test, mannitol salt agar, and DNase test).<sup>10</sup>

Antimicrobial susceptibility testing was performed on Mueller Hinton agar (MHA) medium (Oxoid Ltd., England) using modified Kirby-Bauer disk diffusion method according to Clinical and Laboratory Standards Institute (CLSI) 2014 guidelines.<sup>11</sup> A 0.5 McFarland equivalent suspension of organism was prepared and inoculated onto a MHA plates. This is followed by the application of antimicrobials discs. CPT (30µg-Oxoid Ltd., England) disc was used. These plates were then incubated overnight at  $37^{\circ}\text{C}$  in an ambient air incubator. The isolates were considered resistant to CPT if the zone of inhibition around the disc was  $\leq 20$  mm and susceptible if zone was  $\geq 24$  mm. *S. aureus* American Type Culture Collection (ATCC®) 25923 was used as control. Methicillin resistance was detected by using Cefoxitin (30µg-Oxoid Ltd., England) disk as a surrogate marker.<sup>11</sup>

A research proforma was used to document the essential data including age and gender. Data analysis was performed by using Statistical Package for Social Sciences (SPSS) version-17. Frequencies and percentages were computed for presentation of all categorical variables like microorganisms, gender, sensitivity and resistance. Mean values and standard deviation was calculated for quantitative variables like age of patients.

### Results

A total of 276 clinical isolates of MRS were obtained during the study period. Distribution of isolates of MRS from different clinical samples is shown in Figure 1. In these 276 isolates,

103 (37.3%) were MRSA, and 173 (62.7%) were Methicillin resistant Coagulase negative *Staphylococci* (MRCoNS). Predominantly, the isolates were from female patients 156/276 (56.5%), while isolates from male patients were 120/276 (43.5%). Female to male ratio was 1.3:1. The mean age of patients with MRS isolates was  $36.1 \pm 27.7$  years. All 276 (100%) isolates of MRS were sensitive to CPT, Linezolid, and Teicoplanin. Overall, 241/276 (87.3%) were sensitive to Amikacin, 84/276 (30.4%) were sensitive to Ciprofloxacin, 162/276 (58.6%) were sensitive to Clindamycin, 122/276 (44.2%) were sensitive to Co-trimoxazole, 52/276 (18.8%) were sensitive to Erythromycin, and 22/276 (8%) were sensitive to Penicillin. Sensitivity pattern of antimicrobials tested against MRSA and MRCoNS is shown in Figure 2.

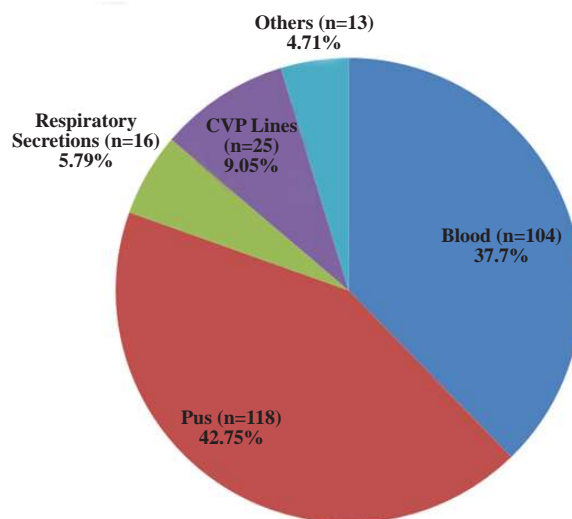


Fig 1. Distribution of isolates of MRS from different clinical samples.

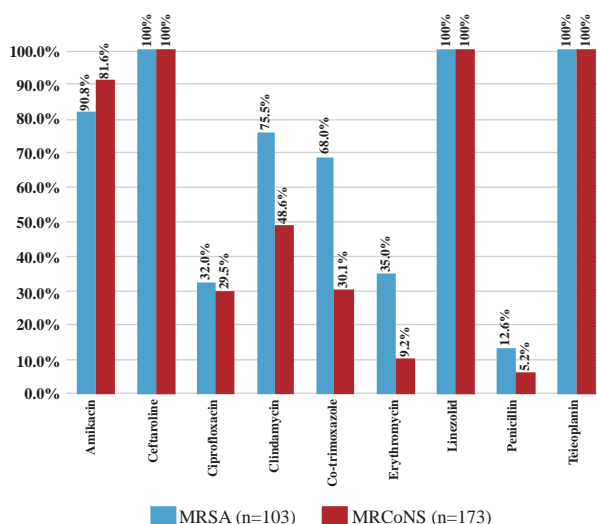


Fig 2. Sensitivity pattern of antimicrobials tested against MRSA and MRCoNS.

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## Discussion

Antimicrobial resistance is rising during the past years. There is a need to foster new antimicrobials especially for treating Gram-positive organisms. MRSA and MRCoNS are foremost origins of both health-care and community-associated infections.<sup>12-14</sup> Gu *et al.* reported emerging LZD resistance among *Staphylococcus species*.<sup>15</sup> Taj *et al.* reported emergence of VA resistant and VA-intermediate *S. aureus*.<sup>5</sup> Both LZD and VA are considered the last options for treating MRS. CPT is a new effective option for treating cSSSI and community-acquired bacterial pneumonia due to MRS and is approved by FDA. Iizawa *et al.* reported that infections caused by MRSA like osteomyelitis and endocarditis can be treated by CPT.<sup>16</sup> In our study, MRS isolates were 100% sensitive to CPT, LZD, and Teicoplanin (glycopeptide). These three antimicrobials are highly effective and favorable treatment choice. From different parts of the world, slightly different results representing the demographic variation. Sader *et al.* reported 97.5% sensitivity to CPT while Yigong *et al.* showed 98% sensitivity to CPT against the isolates of MRSA from USA and Europe.<sup>17,18</sup> A study conducted in Islamabad, Hafeez *et al.* reported 96% sensitivity to CPT against MRSA.<sup>19</sup> Moreover, in an international study CPT demonstrated 100% sensitivity against the isolates of MRCoNS.<sup>7</sup>

## Conclusion

CPT exhibited potent antimicrobial activity against MRS isolates including MRSA. CPT might be effective on the basis of *in vitro* data like other options for treating MRS isolates. CPT should be used judiciously especially against Gram positive organisms on the basis of culture and sensitivity. CPT might reduce selection pressure on other antimicrobials for treating MRS related infections. This will curtail antimicrobial resistance against MRS isolates. Further studies are needed for the effectiveness of CPT especially on bacteremic isolates.

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## References

1. Waters AE, Contente-Cuomo T, Buchhagen J, Liu CM, Watson L, Pearce K, *et al.* Multidrug-Resistant *Staphylococcus aureus* in US Meat and Poultry. *Clin Infect Dis* 2011; 52:1227-30.
2. Leid JG, Shirliff ME, Costerton JW, Stoodley P. Human leukocytes adhere to, penetrate, and respond to *Staphylococcus aureus* biofilms. *Infect Immun* 2002; 70:6339-45.
3. Sakoulas G, Moellering RC. Increasing antibiotic resistance among methicillin-resistant *Staphylococcus aureus* strains. *Clin Infect Dis* 2008; 46:360-7.
4. Chuang YY, Huang YC. Molecular epidemiology of community-associated methicillin-resistant *Staphylococcus aureus* in Asia. *Lancet Infect Dis* 2013; 13:698-708.
5. Taj Y, Abdullah FE, Kazmi SU. Current pattern of antibiotic resistance in *Staphylococcus aureus* clinical isolates and the emergence of vancomycin resistance. *J Coll Physicians Surg Pak* 2010; 20:728-32.
6. Ramirez P, Fernández-Barat L, Torres A. New therapy options for MRSA with respiratory infection/pneumonia. *Curr Opin Infect Dis* 2012; 25:159-65.
7. Brown SD, Traczewski MM. *In vitro* antimicrobial activity of a new cephalosporin, ceftaroline, and determination of quality control ranges for MIC testing. *Antimicrob Agents Chemother* 2009; 53:1271-4.
8. Laudano JB. Ceftaroline fosamil: a new broad-spectrum cephalosporin. *J Antimicrob Chemother* 2011; 66:11-8.
9. Corey GR, Wilcox MH, Talbot GH, Thye D, Friedland D, Baculik T. CANVAS 1: the first Phase III, randomized, double-blind study evaluating ceftaroline fosamil for the treatment of patients with complicated skin and skin structure infections. *J Antimicrob Chemother* 2010; 65:41-51.
10. Koneman EW, Allen SD, Janda WM, Procop GW, Schreckenberger PC, Woods GI, *et al.* Color atlas and textbook of diagnostic microbiology, 6<sup>th</sup> ed. Philadelphia: Lippincott Williams & Wilkins, 2006:211-302.
11. Clinical and Laboratory Standards Institute (CLSI). Performance Standards for Antimicrobial Susceptibility Testing: Twenty-Fourth Informational Supplement, M100-S24. Vol. 34. Wayne, PA: CLSI, 2014:1-226.
12. MacKenzie FM, Bruce J, Struelens MJ, Goossens H, Mollison J, Gould IM *et al.* Antimicrobial drug use and infection control practices associated with the prevalence of methicillin-resistant *Staphylococcus aureus* in European hospitals. *Clin Microbiol Infect* 2007; 13:269-76.
13. Widerström M, Wiström J, Sjöstedt A, Monsen T. Coagulase-negative *Staphylococci*: update on the molecular epidemiology and clinical presentation, with a focus on *Staphylococcus epidermidis* and *Staphylococcus saprophyticus*. *Eur J Clin Microbiol Infect Dis* 2012; 31:7-20.
14. Chua K, Laurent F, Coombs G, Grayson ML, Howden BP. Antimicrobial resistance: Not community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA)! A clinician's guide to community MRSA - its evolving antimicrobial resistance and implications for therapy. *Clin Infect Dis* 2011; 52:99-114.
15. Gu B, Kelesidis T, Tsiodras S, Hindler J, Humphries RM. The emerging problem of linezolid-resistant *Staphylococcus*. *J Antimicrob Chemother* 2013; 68:4-11.
16. Iizawa Y, Nagai J, Ishikawa T, Hashiguchi S, Nakao M, Miyake A *et al.* *In vitro* antimicrobial activity of T-91825, a novel anti-MRSA cephalosporin, and *in vivo* anti-MRSA activity of its prodrug, TAK-599. *J Infect Chemother* 2004; 10:146-56.
17. Sader HS, Flamm RK, Jones RN. Antimicrobial activity of ceftaroline tested against *Staphylococci* with reduced susceptibility to linezolid, daptomycin, or vancomycin from U.S. hospitals, 2008 to 2011. *Antimicrob Agents Chemother* 2013; 57:3178-81.
18. Ge Y, Biek D, Talbot GH, Sahn DF. *In vitro* profiling of ceftaroline against a collection of recent bacterial clinical isolates from across the United States. *Antimicrob Agents Chemother* 2008; 52:3398-407.
19. Hafeez A, Munir T, Rehman S, Najeeb S, Gilani M, Latif M *et al.* Comparative Efficacy of Ceftaroline with Linezolid against *Staphylococcus aureus* and Methicillin Resistant *Staphylococcus aureus*. *J Coll Physicians Surg Pak* 2015; 25:247-9.

## Instructions to Authors

### Scope

The Infectious Diseases Society of Pakistan sponsors the Infectious Disease Journal of Pakistan (IDJ). The Journal accepts Original Articles, Review Articles, Brief Reports, Case Reports, Short Communications, Letter to the Editor and Notes and News in the fields of microbiology, infectious diseases, public health; with laboratory, clinical, or epidemiological aspects.

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Manuscripts must be formatted according to submission guidelines given below, which are in accordance with the "Uniform Requirements for Manuscripts Submitted to Biomedical Journals" (originally published in *N Engl J Med* 1997;336:309-15). The complete document appears at [www.icmje.org](http://www.icmje.org). Please submit one complete copy of the manuscript and all enclosures to **The Managing Editors, Infectious Diseases Journal of Pakistan, Department of Pediatrics & Child Health, The Aga Khan University, Stadium Road, P.O. Box 3500, Karachi 74800, Pakistan**. An electronic copy of the manuscript must also be sent to [pak\\_idj@yahoo.com](mailto:pak_idj@yahoo.com). All manuscripts submitted to IDJP must be accompanied by an Authorship Declaration stating that 'The authors confirm that the manuscript, the title of which is given, is original and has not been submitted elsewhere. Each author acknowledges that he/she has contributed in a substantial way to the work described in the manuscript and its preparation'. Upon submission a manuscript number will be assigned which should be used for all correspondence.

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Articles should report original work in the fields of microbiology, infectious disease or public health. The word limit for original articles is 2000.

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This should list the (i) title of the article, (ii) the full names of each author with highest academic degree(s), institutional addresses and email addresses of all authors. (iii) The corresponding author should also be indicated with his/her name, address, telephone, fax number and e-mail address. (iv) A short running title of not more than 40 characters (count letters and spaces) placed at the foot end of the title page. (v) a conflict of interest statement should also be included in this section.

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Abstract should not exceed 250 words and must be structured in to separate sections headed *Background, Methods, Results and Conclusions*.

Please do not use abbreviations or cite references in the abstract. A short list of four to five key words should be provided to facilitate.

### Background

The section must clearly state the background to the research and its aims. Controversies in the field should be mentioned. The key aspects of the literature should be reviewed focusing on why the study was necessary and what additional contribution will it make to the already existing knowledge in that field of study. The section should end with a very brief statement of the aims of the article.

### Materials and Methods

Please provide details of subject selection (patients or experimental animals). Details must be sufficient to allow other workers to reproduce the results. The design of study and details of interventions used must be clearly described. Identify precisely all drugs and chemicals used, including generic name(s) and route(s) of administration. All research carried out on humans must be in compliance with the *Helsinki Declaration*, and animal studies must follow internationally recognized guidelines. The authors are expected to include a statement to this effect in the Methods section of the manuscript. A description of the sample size calculation and statistical analysis used should be provided.

### Results

Present results in logical sequences in the text, tables and illustrations. Articles can have a maximum of 5 illustrations (in a combination of figures and tables) per article. The results should be in past tense and repetition of results presented in the tables should be avoided. Exact *P*-values should be reported along with reporting of OR and RR with their Confidence Intervals where applicable.

### Discussion

Emphasize the new and important aspects of the study and conclusions that follow from them. Do not repeat the details from the results section. Discuss the implications of the findings and the strengths and limitations of the study. Link the conclusions with the goals of the study but avoid unqualified statements and conclusion not completely supported by your data.

### Acknowledgments

Acknowledge any sources of support, in the form of grants, equipment or technical assistance. The source of funding (if any) for the study should be stated in this section. Please see below for format of **References, Figures and Tables**.

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## II. Review Articles

Authoritative and state of the art review articles on topical issues are also published, with a word limit of 2000. It should consist of critical overview of existing literature along with reference to new developments in that field. These should be comprehensive and fully referenced. Articles should contain an Abstract; Main Text divided into sections, Conclusions and References.

## III. Brief Reports

Short clinical and laboratory observations are included as Brief Reports. The text should contain no more than 1000 words, two illustrations or tables and up to 10 references.

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Instructive cases with a message are published as case reports. Routine syndromes or rare entities without unusual or new features are invariably rejected. The text should contain no more than 1000 words, two illustrations or tables and up to 10 references. The authorship should not exceed 3-4 persons.

## V. Letter to the Editor

These may relate to material published in the IDJP, topic of interest pertaining to infectious diseases, and/or unusual clinical observations. A letter should not be more than 300 words, one figure and 3-5 references.

## VI. News and Views

Informative, breaking news updates in infectious diseases from around the world (approx. 200 words).

## VII. Notices

Announcements of conferences, symposia or meetings may be sent for publication at least 12 weeks in advance of the meeting date. Details of programs should not be included.

## References

Number references consecutively in the order in which they are first mentioned in the text. Identify references in text, tables and legends by Arabic numerals (in superscript). References cited only in tables or in legends to figures should be numbered in accordance with a sequence established by the first identification of the particular table or illustration. Bibliography should be given in order. Authors, complete title, journal name (Abbr), year, vol, issue, page numbers. According to "Uniform

Requirements of Manuscripts submitted to Biomedical Journals", as cited in N Engl J Med 1997; 336:309-15.

## Tables and Figures

Data reported either in a table or in a figure should be illustrative of information reported in the text, but should not be redundant with the text. Each table must be presented on a separate sheet of paper and numbered in order of appearance in the text. Table should be numbered consecutively in Arabic numerals. Tables and Figures legends should be self-explanatory with adequate headings and footnotes. Results which can be described as short statements within the text should not be presented as figures or tables.

## Illustrations

Illustrations should be numbered, given suitable legends and marked lightly on the back with the author's name and the top edge indicated. Original drawings may be submitted although high quality glossy photographs are preferable. They should be kept separate from the text. If possible, figures should be submitted in electronic format as either a TIFF (tagged image file format) or JPEG format. Minimum resolution for scanned artwork is:

- √ Black & white line illustration (e.g. graphs): 600 dpi
- √ Black & white halftone illustrations (e.g. photographs): 300 dpi
- √ Color illustrations: 400 dpi (note that color images should be split CMYK not RGB)

## Plagiarism

Authors should refrain from plagiarism and should double check their work before submitting it for publication. Adequate references should be provided for text from other sources.

## Authorship criteria

Those who have contributed sufficiently to the conceptualization, design, collection and analysis of data and writing of the manuscript should be granted authorship. Ideally all authors should be from the same department except for studies that are multi center or multispecialty.

**Instructions updated - April 2012.**

**Editor IDJ**