

Study of Pre-Surgical Antimicrobial Prescribing Pattern and Correlation with Microbiological Data in a Tertiary Care Hospital

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Abstract

Background: Pre-surgical antimicrobial are antimicrobial agents which are administered just before surgery to prevent the surgical site infections are often used inappropriately. The objective of this study was to evaluate the effectiveness of the pre-surgical antibiotics and correlate with the microbiological data.

Materials and Methods: This prospective study was conducted in the department of microbiology at Father Muller Medical College Mangalore. Inpatients aged above 18 years undergoing surgical procedures were included. Pre-surgical antibiotics and Microbiological data i.e. pathogen isolated, from the specimens [pus and swab] sent from suspected cases of infections and its antibiotic susceptibility was noted.

Results: Most common single pre-surgical antibiotic prescribed was Ceftriaxone and combination of pre-surgical antibiotic was Ceftriaxone-Metronidazole. Infection was suspected in seventeen patients out of 539 patients. Isolated organisms were *Escherichia coli* [ESBL], *Staphylococcus aureus*, *Enterococcus* and *Pseudomonas* species.

Conclusion: Pre-surgical antibiotic prescribed differs from departments and different parameters. High compliance with the institutional pre-surgical antibiotic guidelines was seen with the parameter like selection of pre-surgical antibiotic, route of administration and dosage. Recommended Pre-surgical antibiotic [Cephalosporin] does not prevent infection from the pathogens like ESBL, *Enterococcus* species, *Pseudomonas* species, *Acinetobacter* species, which are intrinsically resistant to betalactams.

Keywords: Pre-surgical prophylaxis; Antibiotics; Surgical site infection; Appropriate; Abuse; Resistant organisms

Abbreviations: g: Gram; BD: twice daily (12 hourly); R: Resistant; I: Intermediate resistant; S: Sensitive; A: Ampicillin; Ac: Amoxicillin-clavulanic acid; Ak: Amikacin; At: Azithromycin; Cf: Ciprofloxacin; CfS: Cefoperazone-sulbactam; Cz: Cefazolin; Cu: Cefuroxime; Ci: Ceftriaxone; Co: Cotrimoxazole; Col: Colistin; G: Gentamicin; Im: Imipenem; Le: Lefloxacin; Mr: Meropenem; PT: Piperacillin-Tazobactam; LSCS: Lower segment caesarean section; MRSA: Methicillin resistant *staphylococcus aureus*; MRCONS: Methicillin resistant coagulase negative staphylococci; SSI: Surgical site infection; ESBL: Extended spectrum betalactam

Introduction

Antibiotic or antimicrobial are used in treatment and prevention of infection caused by pathogens. Antimicrobials are the most commonly administered drugs globally [1]. Pre-surgical antimicrobial [Prophylaxis] refers to an antimicrobial agent which is administered just before surgery to prevent the surgical site infections [SSI]. Appropriate antibiotic prophylaxis can reduce the risk of postoperative morbidity and mortality. The cause for SSI may be endogenous from the patient normal flora or exogenous from the operation theater

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environment i.e. operating infected persons, unsterile instruments or aerosol. Approximately 30-50% of antibiotic use in hospitals is now for pre-surgical prophylaxis of which 30-90% is inappropriate [2]. Abuse of antimicrobials increases the cost of treatment and supports the emergence of resistant bacteria [3,4]. Antibiotics are most often not used in correct doses, or prolonged the duration or use too broad a spectrum of antimicrobial action [5]. Selection of antibiotic for prophylaxis should be based on its activity against expected bacteria at the desired surgical site [6]. The percentage of adherence to guidelines for the use of surgical antibiotic prophylaxis varies between countries, ranging from 0% to 71.9% [7]. To assess the SSI, wound may be classified into class I [Clean], Class II [Clean-contaminated], Class III [Contaminated], and Class IV [Dirty] [8-10].

Pre-surgical antibiotic administration [8]

Selection should be based on evidence based, pharmacokinetic, bactericidal activity, and patient history of allergy, resistant pattern of the organisms, availability and cost. Patients likely to be colonized or infected with resistant microorganisms should be individualized and the pre-surgical antimicrobial is changed as per the antibiotic susceptibility pattern. Dose should be sufficient to achieve adequate serum and tissue level for the period of that particular surgery. Administered on the basis of body weight is accurate than the fixed dose regimen. Intravenous route preferably 30 minutes before incision is appropriate for most of the procedures. Topical application is indicated only in ophthalmic or burns operations [11]. Vancomycin and Flouroquinolones is given 120 minutes prior incision because of prolonged infusion time. Prolonging the duration of pre-surgical antimicrobial may increase the development of resistant microorganisms. In general a single dose, duration of ≤ 24 hours is preferred. Repeat dose is indicated for the procedure which exceeds two half-lives of the drug and for the procedure where there is blood loss > 1500 ml. It may not be required in renal insufficiency. Controversy is present on duration of prophylaxis and to which specific surgical procedures should receive prophylaxis. Effective use of antimicrobial prophylaxis also requires monitoring of and feedback on patterns of use.

The objective of this study was to evaluate the effectiveness of the pre-surgical antibiotics and to assess the compliance of prescribing pre-surgical antimicrobials based on the departmental antimicrobial prophylaxis policy and to correlate with the microbiological data.

Materials and Methods

This prospective study was conducted in the department of microbiology, after being approved by the institutional ethical committee of Father Muller Medical College Mangalore, a tertiary care hospital of South India with a total capacity of 1250 beds, from January 2015 to May 2015.

In patients undergoing surgical procedures between the age of 18-95 years were included and patients below 18 years, dental and outpatient procedures were excluded. The study involved data collection from patient case records, including name, age, sex, In patient number, diagnosis, surgical procedure performed, pre-, intra- and post-surgical antibiotics, dosage, route, time of full dose, frequency of antibiotic, duration of stay. Microbiological data includes pathogen isolated from the specimen [pus and wound swab] sent from the suspected cases of infection and the antibiogram of the isolated pathogen was noted. Culture and antibiotic susceptibility (Kirby-Bauer disc diffusion) test were performed for all requested samples by aerobic conventional method as per Clinical and laboratory standards institute guidelines [12,13].

Results

A total of 539 patients from various surgical departments were enrolled in the study, consisted of Males 212 [39.3%] and Females 327 [60.7%] [Figure 1]. Departments that are included were General surgery [n = 196], Obstetrics & Gynecology/OBG [n = 207], Orthopedics [n = 60], Hand & Micro [n = 6], Spin [n = 2], Otorhinolaryngology/ENT [n = 8], Ophthalmology [n = 41], Urology [n = 17], Plastic-surgery [n = 1] and Cardiothoracic-surgery [n = 1] [Figure 2]. The duration of stay was minimum 1day and maximum 53 days.

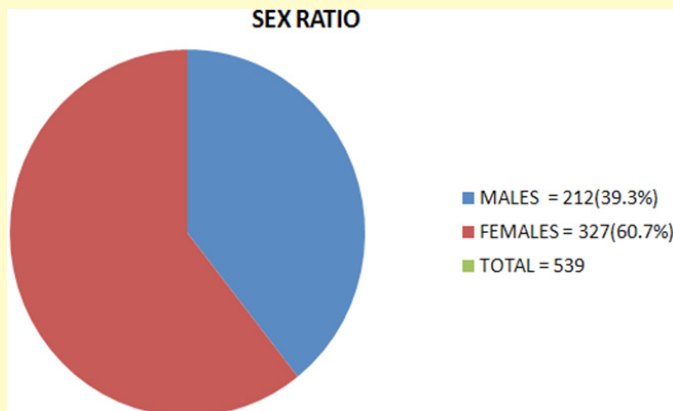


Figure 1: Gender wise distribution of the patients.

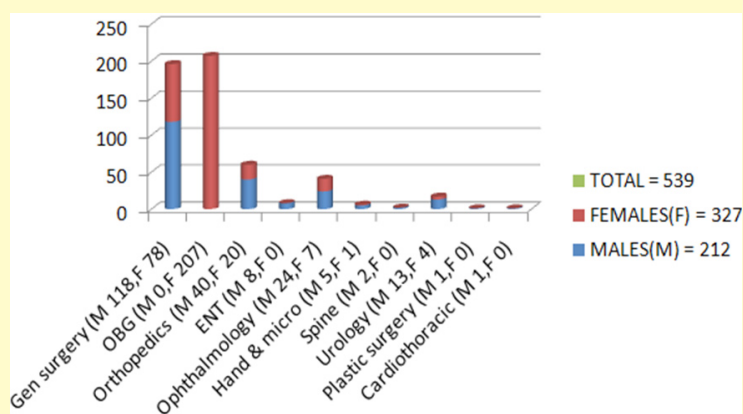


Figure 2: Department wise distribution of patients.

Surgical procedures were divided into major [>30 minutes] and minor [<30 minutes] depending on duration of surgery. All the patients were given the test dose of the pre-surgical antibiotic 30 minutes prior to full dose. Most common pre-surgical antibiotic for major surgeries was Ceftriaxone 1g, followed by Cefozolin 1g, Cefoperazone-sulbactam 1g and Amoxicillin-Clavulanic acid 1.2g, administered by intravenous route. Minor surgical procedure like suction & evacuation, biopsy were administered single intravenous of Ciprofloxacin 500 mg and later on switched on to oral route. For ophthalmic surgical procedures the pre surgical antibiotic administered was Ciprofloxacin 500 mg by oral route and local antibiotic eye drop was installed two hour prior procedure [Table 1].

All these parameters compiled with the institutional pre surgical antibiotics protocol. Pre-surgical antibiotic was administered for more than 24 hours [3-5days], except ophthalmology and minor procedure. One minor procedure in Obstetrics & Gynecology had adverse reaction for test dose of Ciprofloxacin and was given intravenous Cefazolin 1g after test dose.

Most common combination of pre-surgical antibiotic was Ceftriaxone-Metronidazole, Amoxicillin-Clavulanic acid. Other combinations were Cefoperazone-sulbactam, Piperacillin- Tazobactam, and Ceftriaxone.

Departments	Most Common Administered, Dosage [Percentage]	Dose	Other Single Pre-Surgical Antibiotic Administered [Percentage]	Route of administration
General Surgery	Ceftriaxone 1g [50.5%,N=99],	BD	Cefuroxime 2.25g [7.7%,N=5],	Intravenous
Obstetrics & Gynecology	Cefazolin, 1g [30%,N=62] For Major Operation, & Ciprofloxacin 100ml [Single Dose for minor procedures]	BD	Ceftriaxone 1g [24%,N=50] Cefotaxime 1g [13.5% N=28]	Intravenous
Orthopedics	Ceftriaxone [15%,N=9], 1g	BD	-	Intravenous
ENT	Ceftriaxone [38%], 1g	BD	-	Intravenous
Ophthalmology	Ciprofloxacin [100%], 500mg	SINGLE	-	Oral+ Tropical antibiotic Eye Drops Installed
Hand & Micro	-		-	Intravenous
Spine	Ceftriaxone [50%], 1g	BD		Intravenous
Urology	Ceftriaxone [65%,N=11], 1g	BD	-	Intravenous
Plastic Surgery	Ceftriaxone [100%,N=1], 1g	BD	-	Intravenous
Cardiothoracic	Ceftriaxone [100%], 1.5g	BD	-	Intravenous

Table 1: Department wise commonest single pre-surgical antibiotic prescribed.

Department	Commonest [Percentage], Dose	Other Combinations [Percentage]	Dose	Route Of Administration
General Surgery	Ceftriaxone 1g + Metronidazole 100ml [21% N=42],	Cefuroxime 1g+Metronidazole 100ml [1%]	BD	INTRAVENOUS
Obstetrics & Gynecology	Amoxicillin 1g+Cefozolin 1g[2% N=4]	Amikacin 500+ Cefazoline 1g [<1%]	BD	INTRAVENOUS
Orthopedics	Cefoperazone-Sulbactam 1.5g [28% N=17],	Amoxicillin-Clavulanic Acid 1.2g [10%,N=6]	BD	INTRAVENOUS
ENT	Amoxicillin-Clavulanic Acid 1.2g [37%,N= 3]	Ceftriaxone 1g+Metronidazole 100ml[12.5% N=1]	BD	INTRAVENOUS
Ophthalmology	Cefotaxime 1g+ Metronidazole 100ml [N=1]	-	BD	INTRAVENOUS
Hand & Micro	Cefoperazone-Sulbactam[83%,N=5]	Amoxicillin-Clavulanic acid 1.2g [17%]	BD	INTRAVENOUS
Spine	Cefoperazone-Sulbactam[50% N=1]	-	BD	INTRAVENOUS
Urology	Piperacillin-Tazobactam [17%,N=3]	-	BD	INTRAVENOUS

Table 2: Department-wise commonest combination of pre-surgical antibiotics.

Infection was suspected in seventeen [3.1%] patients out of 539 patients. Out of 14 pus and 4 swabs sent to microbiology, pathogens were isolated in nine and three samples respectively.

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Out of nine culture growth from the pus samples, the pathogens isolate were *Escherichia coli* (E-coli) in three samples, *Staphylococcus aureus* in two samples, *Citrobacter koseri*, *Klebsiella pneumoniae*, *Enterococcus species* in each samples and *Acinetobacter species* and *Pseudomonas species* was isolated in one pus sample.

Diagnosis	Surgical procedure	Presurgical antibiotic administered	Pathogen Isolated From the Pus sample	R	I	S
Perineal Abscess	Incision & Drainage	Ceftriaxone & Metronidazole	<i>Staphylococcus aureus</i>	A,Co	Cf	Ac, Cz, Cu, Ci, GAK, Le At, Cl
Cholecystolithiasis	Open Cholecystectomy	Ceftriaxone	<i>E-coli</i>	A,Cz,Cu,Ci, Cf,Le	--	Ac, Co, G, Ak, Pt Cfs, Im, Mr Col, Tg
Perforated Appendicitis	Appendicectomy	Ceftriaxone & Metronidazole	<i>E-coli</i>	A, Cz, Cu, Ci, Co,	--	Ac,Cf,Le,Pt, Cfs,Im,Mr
Dry Gangrene	Amputation	Ceftriaxone & Piperacillin-Tazobactam	<i>Citrobacter koseri</i>	-	--	A, Ac, Cz, Cu, Ci, Co, G, Ak, Cf, Le
Acute Appendicitis	Appendicectomy	Piperacillin-Tazobactam & Metronidazole	<i>Klebsiella pneumoniae</i>	A	-	Ac, Cz, Cu, Ci, Co, G, Ak, Cf, Le
Cholecystitis With Perforation, Umbilicalhernia	Open Cholecystectomy	Ceftriaxone & Metronidazole	<i>Enterococcus Species</i>	Intrinsic resistant to Cephalosporins		Cf,Le,G[High Level],Va,Te,Lz,
Acute Appendicitis	Appendicectomy	Ceftriaxone & Metronidazole	<i>E-coli</i>	A, Ac, Co, Cf, Le	--	Cz,Cu,Ci,G,Ak
Emergency LSCS	Laparotomy	Ceftriaxone	<i>Staphylococcus aureus</i>	A,Cf,Le	--	Ac, Cz, Cu, Ci, Co, G, Ak, At, Cl
Non Healing Ulcer	Wound Debridement	Ceftriaxone & Amoxicillin-clavulanic Acid	<i>Acinetobacter species & Pseudomonas Species</i>	A,Ac,Cz,Cu, Ci, Ca, Co, Le, Pt, Cfs, Mr	--	Col, Polymyxin B

Table 3: Pathogens isolated from the pus samples and antibiotic susceptibility pattern.

Pathogens isolated from the swab samples are *E-coli* & *Enterococcus species* from one swab and *Pseudomonas aeruginosa* from the second swab and from third swab sample *Enterococcus species* and *Pseudomonas species*. Isolated pathogens i.e. *E-coli* was extended spectrum beta-lactam producer [ESBL], *Enterococcus species* and *Pseudomonas species* are intrinsically resistant to beta-lactams like Amoxicillin and Cephalosporins.

Diagnosis	Surgical procedure	Pre-surgical antibiotic administered	Isolated from the culture of wound swab	R	I	S
Wet Gangrene	Knee-Amputation	Amoxicillin-Clavulanic & Metronidazole	<i>E-Coli & Enterococcus</i>	Ac, Cz, Cu, Ci, PT	Mr	Im
Osteomyelitis	Forefoot-Amputation	Amoxicillin-Clavulanic	<i>Pseudomonas Aeruginosa</i>	Intrinsic resistant to A, Ac and Cephalosporins,		Ca, G, Ak, Cf, Le
Dry Gangrene	Foot-Amputation And Wound Debridment	Piperacillin-Tazobactam	<i>Enterococcus & Pseudomonas Species</i>	Ca,G, G[High Level] Pt,Ak,Cf,Le		A, Ac, Te Lz, Ca, Col

Table 4: Pathogens isolated from swab sample and antibiotic susceptibility pattern.

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Departments	Most common surgeries conducted	Institutional protocol Recommended for surgical prophylaxis	Most Common administered,dosage [Percentage]
General Surgery	Appendicectomy	Inj. Ceftriaxone	Ceftriaxone 1g [50.5%,N=99]
Obstetrics & Gynecology	lower segment caesarean section.	Inj Cephazolin	Cefazolin,1g [30%,N=62]
Orthopedics	bone grafting, nailing, laminectomy, discectomy and implant removal	Inj Ceftriaxone	Ceftriaxone [15%,N=9],1g
ENT	septoplasty and tracheotomy	Inj. Co-amoxiclav 1.2g IV or Ceftriaxone	Ceftriaxone [38%],1g
Ophthalmology	cataract extraction,	Inj Ciprofloxacin	Ciprofloxacin [100%],500mg
Urology	Trans urethral resection of prostate,ureterectomy,DJ stunting	Inj Ceftriaxone	Ceftriaxone [65%,N=11],1g

Table 5: Comparison with the institutional protocol with the present prescribed pre-surgical antibiotics.

NOTE: De - escalate according to culture and sensitivity. Check for MRSA infection. For the patients allergic to Penicillin, preferred pre-surgical antibiotic is Cefuroxime/Gentamycin.

Discussion

Administration of pre-surgical antibiotic no doubt prevents morbidity and mortality related to surgical site infection, provided it is appropriate. Selection of an appropriate pre-surgical antimicrobial is still a major problem. Many national, international and institutional guidelines have been framed to overcome these issues [14,15]. Despite these guidelines, studies show that adherence to these guidelines is low. Inappropriate and abuse of antibiotics can lead to emergence of resistant strains in the microorganisms and also increase the morbidity, mortality rate, duration, and cost of therapy. It is estimated that in United States acute care hospital 16 million operative procedures were performed in 2010 [16]. And study found that SSIs were the most common healthcare-associated infection [HAI], accounting for 31% of all HAI among hospitalized patients [17]. The selection of prophylactic antibiotic may vary from, surgeons, departments, type of procedure, local antibiotic sensitivity pattern, co-morbid condition etc.

As per SIGN [Scottish Intercollegiate Guidelines Network] and ASHP [American Society of Health-System Pharmacists] guidelines, first generation Cephalosporin [Cefazolin] is the drug of choice for most of the surgical procedures. Third generation Cephalosporin are not preferred for SSI prophylaxis [18]. However in this study Ceftriaxone [third generation cephalosporin] was most common pre-surgical antibiotic administered. Most common combination among pre-surgical agents was Ceftriaxone and Metronidazole. Most of the pre-surgical antibiotic was administered at the time of incision or at the time of induction.

In the department of General-surgery, most common surgery performed was appendicectomy [25%]. Others include hernioplasty, cholecystectomy, Tredlenberg ligation, Thyroidectomy, lump excision and circumcision. Most common pre-surgical antibiotic was Ceftriaxone 1g [50.5% n=99], Cefuroxime 2.2g was administered intravenously in five [7.7%] surgical procedures. Ceftriaxone and Metronidazole combination was administered in 42 [21%] patients. Four surgical procedures were administered Piperacillin-Tazobactam 4.5g intravenously and one hernia repair procedure was administered Meropenem intravenous route, three procedures were administered Amoxicillin-Clavulanic acid, which was not appropriate. Twenty six hernioplasty were administered intravenous Ceftriaxone 1g as pre-surgical prophylaxis. Seventeen surgical procedures were suspected infection. Fourteen pus and four swab samples collected intra operative were processed for culture and sensitivity. Out of which nine pus sample we could isolate the pathogens [Table 2]. Pathogens isolated were *Staphylococcus aureus*, *E-coli*, *Citrobacter koseri*, *Klebsiella pneumoniae* and *Enterococcus* species. Three patient from which *E-coli* was isolated was resistant to Ceftriaxone [ESBL] which was administered for the surgical prophylaxis. From one patient diagnosed having acute appendicitis underwent appendicectomy, from the pus sample isolated *Klebsiella pneumoniae* and was administered Piperacillin-Tazobactam and Metronidazole for prophylaxis, which was higher than the recommended antibacterial. Four

lump excision was performed, were administered pre-surgical antibiotic [Intravenous Ceftriaxone 1g >24 hours] which is not recommended. One out of three, *E-coli* [resistant to Ceftriaxone] was isolated from a case of perforated appendicitis underwent appendectomy procedure, was administered injection Ceftriaxone as surgical prophylaxis instead of injection Piperacillin-Tazobactam as per the institutional protocol, which was not appropriate. *Citrobacter koseri* was isolated from the pus sample collected from the patient who underwent amputation of toe for dry gangrene, which was sensitive to administered injection Ceftriaxone and Piperacillin Tazobactam as prophylaxis.

One patient diagnosed with acute calculous cholecystitis with perforation and umbilical hernia underwent cholecystectomy, was administered Ceftriaxone 1g intravenous route. From the pus sample isolated *Enterococcus* species which is intrinsically resistant to the Cephalosporins.

From the department of Obstetrics & Gynecology most common major surgical procedure was lower segment caesarean section. Other procedures were hysterectomy, myomectomy. Commonest pre-surgical antibiotic was Cefazolin [30% n=62] administered 1g intravenous route. Next common pre-surgical antibiotic was Ceftriaxone 1g [24% n = 50] administered intravenous route. Cefotaxim 1g was administered in [13.5% n =28] procedures by intravenous route. Surgical prophylaxis was continued for >24 hours. For minor procedures such as suction & evacuation, biopsy, polyopectomy and salphingoopherectomy, commonest pre-surgical antibiotic administered was Ciprofloxacin 500 mg intravenously. One patient diagnosed as pus collection in the uterus and underwent drain, was suspected for Infection and pus was cultured and isolated *Staphylococcus aureus* who was administered Ceftriaxone 1g as prophylaxis.

From department of Plastic surgery one case diagnosed as post-traumatic non healing ulcer underwent wound debridement and flap delay, was administered Ceftriaxone as prophylaxis and suspected for infection. Pus was processed for culture and sensitivity. *Acinetobacter* and *Pseudomonas* species was isolated, which are intrinsically resistant to the beta-lactam antibiotics.

Out of four swab samples requested for culture and sensitivity from the suspected infection from department of Gen surgery, three had culture growth. One patient diagnosed as wet gangrene of foot underwent below knee amputation, received Amoxicillin-Clavulanic acid and Metronidazole as surgical prophylaxis, the isolated organism was *E-coli* and *Enterococcus* species which were resistant to administered pre-surgical antibiotic. Second patient with diabetic foot and Osteomyelitis underwent forefoot amputation was administered Amoxicillin-Clavulanic acid, the isolated pathogen was *Pseudomonas aeruginosa* which is intrinsically resistant to beta-lactam. Third patients diagnosed as dry gangrene underwent forefoot amputation, from swab sample, isolated *Enterococcus* species and *Pseudomonas* species which was resistant to the administered pre-surgical antibiotic Piperacillin-Tazobactam [Table 3].

From the direct Gram's staining examination of the pus and swab samples requested for culture which had growth, showed numerous pus cells and respective Gram positive cocci or gram negative bacilli, thus contamination was excluded. After the culture and sensitivity of the samples, Patients were treated as per antibiotic sensitivity pattern.

The most common surgical procedure in Orthopedic-department was bone grafting, nailing, laminectomy, discectomy and implant removal. Commonest pre-surgical administered was Ceftriaxone 1g [50%] for clean elective surgeries. Others were administered Cefepazone-sulbactam by intravenous route daily two doses for 3-5 days. No infection was suspected.

Commonest surgical procedure in the department of Otorhinolarygology was septoplasty and tracheotomy. Commonest pre-surgical antibiotic was Ceftriaxone [38%], others were Cefoperazone and Amoxicillin-Clavulanic acid. One infection was suspected and pus was cultured. No organism was isolated.

Commonest surgical procedure in Urology department was Trans urethral resection of prostate, others were ureterectomy and DJ stunting. Commonest pre-surgical antibiotic administered was Ceftriaxone 1g administered intravenous route, daily two doses for > 24 hours. No Infection was suspected.

From the department of plastic-surgery and cardiothoracic-surgery, pre-surgical antibiotic administered was Ceftriaxone 1g intravenous route BD for > 24 hours. One pus sample from surgical procedure performed in department of plastic surgery was processed for culture and sensitivity, from which *Acinetobacter* species and *Pseudomonas* species was isolated. These pathogens are intrinsically resistant to the beta-lactams.

Commonest surgical procedure performed in the department of Ophthalmology was cataract extraction, Intra ocular lens implant and Dacryocystorhinostomy. Commonest pre-surgical antibiotic administered was Ciprofloxacin 500 mg, oral route and local antibiotic eye drop application two hours prior to the procedure. No infection was suspected.

Thirty five cases [Gen-surgery 19, Urology 11, OBG 2, Orthopedic 2, Hand & micro 1] who were administered pre-surgical antibiotic prior [1-3days] surgical procedure were also included to study the effectiveness of prolonged duration of surgical prophylaxis, From a patient, diagnosed with Cholecystitis with perforation also had umbilical hernia, isolated *Enterococcus* species from the pus sample who was administered injection Ceftriaxone 1g 12 hourly two days before the surgical procedures as risk of infection was suspected. As *Enterococci* species are intrinsically resistant to Cephalosporins, administered pre-surgical Ceftriaxone was not effective.

The institutional protocol has recommended the 3rd generation cephalosporin as the preferred pre-surgical prophylaxis because, pathogens have shown resistant to most of the narrow spectrum antibiotics. The results of this study have been discussed with the inter-departmental clinicians/surgeons for necessary measures and implementation.

The magnitude of SSI and adherence to the pre-surgical prophylaxis varies considerably in different parts of the world. Several studies conducted worldwide have documented that noncompliance is mainly due to inappropriate selection, timing and duration of the pre-surgical antibiotics [19]. The rate of adherence to the pre-surgical prophylaxis guidelines from various countries is as follows Iran with 0.9%, Korea 0.8%, Jordan 1.7%, Canada 5% and 7% in Nicaragua. Turkey [26%] [20], Lebanon [32%], Greece [36.3%] and France with 40% [7]. Low rate of adherence to the guideline have to be analyzed and addressed by a health personnel. Preferably a clinical pharmacist should take the initiation in improving the quality and outcome of surgical procedures through health education, interdepartmental discussions, verifying all the pre-surgical preparations, monitoring of antibiotic susceptibility pattern of the organism and follow-up of the cases. Overall morbidity and mortality rate related to surgical procedures and Hospital associated infections can be minimized by implementing the guidelines not by an individual but by the team effort.

Conclusion

This prospective study on pre-surgical antibiotic administration pattern revealed that the pattern differed among the various surgical departments studied. High compliance was seen with the parameter like selection of pre-surgical antibiotic, route of administration and dosage. Most common pathogens isolated were *Escherichia coli* [ESBL], *Staphylococcus aureus*, *Enterococcus* and *Pseudomonas* species recommended Pre-surgical antibiotic [Cephalosporin] does not prevent infection from the pathogens like ESBL, MRSA, MRCONS, *Enterococci*, *Pseudomonas* and *Acinetobacter* species, which are intrinsically resistant to beta-lactam antibiotics. Narrow spectrum antibiotic appropriate to the site of surgery should be preferred for surgical prophylaxis. Institutional surgical prophylaxis protocols should be regularly updated as resistant bacteria in hospitals are subject to frequent change. Inappropriate and abuse of antibiotics and development of resistant organism can be prevented by inter-departmental coordination and creating awareness of local antibiotic sensitivity pattern of commonly isolates organisms. Further more studies required to determine the rate of surgical site infections and to assess the burden of resistant organisms.

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