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Aerobic Bacterial Profile of Wound Infections and Its Sensitivity Pattern at Tertiary Care Hospital

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A B S T R A C T

A wound is a breach in the skin and the exposure of subcutaneous tissue following loss of skin integrity. Wound infection occurs as a complication of surgery, trauma or disease that may interrupt a mucosal or skin surface. Wound infections are one of the most common hospital acquired infections. They are an important cause of morbidity and mortality. The present study was undertaken to determine the aerobic bacterial agents responsible for different wound infections, its sensitivity pattern and to find out the most common bacterial agent in pathological, trauma and post-operative wound infections. All pus or wound swabs from various wound infections received in the department of Microbiology for culture and sensitivity during January 2012 to December 2012 from IPD and OPD patients attending tertiary care hospital were cultured on 5% sheep blood agar and MacConkey agar. The bacterial isolates were indentified by standard bacteriological techniques. Isolated organisms were further tested for antibiotic sensitivity, MSRA and ESBL productions. Out of 303 samples, 202 (66.66%) were culture positive in which 140 (69.31%) samples were monomicrobil and 62 (30.69%) samples were polymicrobial. Thus total 271 isolates were obtained from 202 culture positive samples. Of the total 271 isolates, 160 (59.04%) were gram negative ans 111 (40.96%) were gram positive organism. The most common isolates was *S.aureus* (37.63%) followed by *Pseudomonas spp*.(20.33%) and *E.Coli* (19.56%), In pathological and post-operative wound infections *S.aureus* was the most common i.e.44.62% and 34.09% respectively. Whereas *pseudomonas species* was most common in trauma wound infections. Isolated strains of *S. aureus* were 78% sensitive to Amikacin and 73% sensitive to Linezoid. *E.coli, Klebsiella spp* and *proteus spp* were 81%, 57% and 91% sensitive to Amikacin respectively. *Pseudomonas spp* were 96% sensitive to imipenem and 56% sensitive to Amikacin. Isolated most of the strains of gram positive and gram negative organisms were sensitive to Amikacin, whereas there was no single common antibiotic to which all isolated gram positive and gram negative bacteria were 100% sensitive. We found 67.65% MRSA and 38.12% ESBL producers in this study.

Introduction

Skin, the largest organ in human body play a crucial role in the sustense of life through the regulation of water and electrolyte balance, thermoregulation and by acting a barrier to external noxious agents including microorganisms, however when the epithelial

integrity of the skin disrupted a wound result. (Zafar *et al.*, 2007) A wound is a breach in the skin and exposure of subcutaneous tissue following loss of skin integrity which provides a moist, warm and nutritive environment that is conductive to microbial colonization and proliferation. (Bowler *et al.*, 2001)

Wound infection occurs as a complication of surgery, trauma or disease that may interrupt a mucosal or skin surface. (Njoku-Obi and Ojiegbe, 1989) Development of wound infection depends on the interplay of many factors. The breaking of the host protective layer, the skin, and thus disturbing the protective function of the layer will induce many cell types into the wound to initiate host response. (Collier, 2003) Infection of wound is the successful invasion and proliferation by one or more species of microorganisms anywhere within the body sterile tissue, sometimes resulting in pus formation. (Mordi and Momoh, 2009)

Wound can be classified as accidental, pathological, or post-operative. Irrespective of the wound nature, infection is the attachment of microorganisms to host cells and their proliferation, colonization ultimately leading to host tissue damage. (Collier, 2003). Wound infection can be caused by different group of microorganisms like bacteria, fungi and protozoa. (Zafar, 2007) Bacteriological studies have also shown that wound infection is universal and that the types of bacteria very with geographical location, bacteria resident on the skin, clothing at the site of the wound, time between wound and examination. (Akinjogunla *et al.*, 2009) The infections are caused by both Gram positive and Gram negative bacteria especially by *Staphylococcus aureus* (*S.aureus*), *Escherichia coli* (*E.coli*) and *Pseudomonas aeruginosa* (*p.aeruginosa*) (Bowler and Duerden, 2001).The common Gram positive organisms are the B-hemolytic *Streptococci, Streptococcus pyogenes* (*S. pygenes*) and *S.aureus*. The facultative anaerobes include *Enterbacter spp, E.coli, Klebsiella spp, Proteus spp* and aerobic Gram negative rods are *P.aeruginosa*. The fungal organisms are *Candida spp* and moulds (*Aspergillus spp*.) (Sani *et al.*, 2012)

Wound infections are one of the most common hospital acquired infections. They are an important cause of morbidity and account for 70-80% mortality. (Gottarup *et al.*, 2005) Development of such infection represent delayed healing, cause anxiety and discomfort for patient, longer hospital stays and add to the cost of health care services significantly. (Mohanty *et al.*, 2004) The wide spread use of antibiotics together with the length of time over which they have become available have lead to major problem of resistant organisms contributing to high morbidity and mortality. Antimicrobial resistance can increase complications along with increase in cost related to procedure and treatment. (Taiwo *et al.*, 2002) Infection caused by Methicillin-resistant *S.aureus* (MRSA) and multidrug resistant organisms like extended spectrum beta-lactamase (ESBL) producer pose a major challenge in the treatment of wound infection. So, appropriate drug selected by antibiotic sensitivity testing have great importance. (Kaur *et al.*, 2008)

This study was therefore aimed to determine the bacteriological profile of pathological, traumatic and post-operative wound infections and its sensitivity patterns, which is helpful in the management of these wound infections and formulating a Rational Antibiotic Policy in this hospital.

The main and objectives of this study includes to find out the aerobic bacterial agent responsible for causing pathological, trauma and post-operative wound infections.

To find out sensitivity pattern of isolated bacterial agents.

To find out commonest bacterial agents responsible for above wounds.

Materials and Methods

The prospective observational study was conducted after the permission from ethical committee.

An analysis was conducted on 303pus or wound swabs from all types of wound like burns, bed sores, cellulitis, ulcers, abscesses, osteomyelitis, trauma wounds, and postoperative sepsis received in the Department of Microbiology for culture and sensitivity during January 2012 to December 2012 from IPD and OPD patients attending tertiary care hospital. Isolated organisms were tested for antibiotic sensitivity pattern, MRSA and ESBL production.

Inclusion criteria

Pus and wound swabs from all age group and birth sexes received in the department of Microbiology for aerobic bacterial culture and sensitivity were included in this study.

Exclusion criteria

Sample for acid fast bacterial culture were excluded from this study.

Two wound swabs (one for Gram stain and another for culture) or pus from different types of wound were processed. Gram staining was done from one swab and findings were recorded. Another swab was used for culture on 5% sheep blood agar and MacConkey agar. Inoculated plates were incubated at 37℃. After overnight incubation growth if any was identified by standard bacteriological technique including colony morphology, Gram staining from colony and biochemical properties. (Church *et al.*, 2006; Mackie and McCartney, 1989)

Antibiotic sensitivity testing

The antibiotic sensitivity of isolated strain was carried out by using Kirby Bauer disc diffusion method on Muller Hinton agar by using commercially available antibiotic discs (Hi Media). (Kirby *et al.*, 1966). The following antibiotics were used for Gram positive and Gram negative strains in the present study.

For gram positive organisms

Clindamycin 2µg, Cefoxitin 30µg, Ciprofloxacin 5µg, Doxycycline 30µg, Erythromycin 15µg, Linezoid 30µg, Penicillin10 units/disc, Amikacin 30µg, Levofloxacin 5µg, Co-trimoxazole 25 µg.

For Gram negative bacteria

Amikacin 30µg, Levofloxacin 5µg, Co-trimoxazole 25 µg, Amoxycillin- clavulanic acid 20/10µg, Ceftazidime 30µg, Cefexime 30µg, Cefoperazone 75µg, Ceftriaxone 30µg, Cefuroxime 30µg, Ofloxacin 5µg, Piperacillin-Tazobactum 100/10µg, Imipenem 10µg.

The known ATCC standard strain of *E.coli* (25922), *S.aureus* (25923) and *P. aeuroginosa* (27853) were used as quality control throughout the study for culture and antimicrobial testing.

Detection of MRSA: (Clinical and Laboratory Standards Institute, 2012)

The isolated *S. aureus* strains were tested for MRSA by using cefoxitin disc along with the antibiotic sensitivity testing of different antibiotics used in this study. In case of cefoxitin disc if the Zone of Inhibition was less than or equal to 21mm was considered as

MRSA while more than or equal to 22mm zone of inhibition was considered as MSSA(CLSI2012). Quality control was mentioned by using ATCC MRSA (43300) strain.

Detection of ESBL producing strains: (Clinical and Laboratory Standards Institute, 2012)

Gram negative isolates which showed resistance to ceftazidime were tested for ESBL production by ESBL phenotypic confirmatory test. (CLSI, 2012).

Standard inoculum were prepared from 3-4 colonies of identified Gram negative isolates on peptone water in a tube and incubated at 37° for 4 hours.

After incubation turbidity of inoculums was compared and adjusted to 0.5 McFerlands. Inoculum was inoculated on Muller Hinton agar by using sterile cotton swaband allowed to dry surface of agar for 3-5 minutes.

Then ceftazidime (30µg) and ceftazidime - clavulanic acid (30/10µg) disc were placed 15mm apart on inoculated Muller Hinton agar by using sterile forceps. Similarly cefotaxime (30µg) and cefotaxime-clavulanic acid (30/10µg) discs were placed 15mm apart. The plates were incubated at 37℃ for 16-18 hours.

After incubation zone of inhibition around all these four discs was measured using ruler. A 5mm or more increase in zone of inhibition around ceftazidime-clavulanic acid than ceftazidime alone or cefotaxime-clavulanic acid than cefotaxime alone was considered as ESBL producer. ATCC ESBL producer *Klebsiella pneumoniae* (700603) was used as quality control. (CLSI2012).

Results and Discussion

A total 303 pus or wound swab samples received in the department of microbiology were subjected for culture and bacterial isolates were identified by standard bacteriological techniques. Isolated organisms were further tested for antibiotic sensitivity, MRSA and ESBL production. Out of 303 samples, 101 were culture negative 202 were culture positive; in which 140(69.31%) samples were monomicrobial and 62(30.69%) were polymicrobial. Thus total 271 isolates were obtained from 202 culture positive samples; and following observations were made:

In the present study culture positivity was 66.66%. Out of 202 culture positive samples, 140 (69.31%) samples were monomicrobial and 62(30.69%) were polymicrobial. Thus total 271 organisms were obtained.

Out of 271 bacterial isolates, 160(59.04%) isolates were Gram negative and 111(40.96%) isolates were Gram positive.

Among total the most common isolate was *S. aureus* 102(37.63%) followed by *pseudomonas spp* 55 (20.33%), *E.coli* 53(19.56%), *Klebsiella spp* 37(13.65%), *Proteus spp* 11(4.05%), *Streptococcus spp* 8(2.95%), *Citobacter, Enterobacter spp* 2 each (0.74%) and *Enterococci spp* one (0.34%).

The percentage of culture positivity among pathological and post-operative wound infection was 67.39% and 67.33% respectively. In trauma wound infections it was 57.14%.

In pathological wound infections 100% culture positivity was seen in bed sores and cellulitis. In ulcers it was 69.86%, burns 69.23%, osteomyelitis 66.66%, abscesses 64.77% and in others 50.00%.
In the present study, out of total 121 isolates from pathological wound infections, *S.aureus* was the most common i.e. 54(44.62%)

followed by *E.Coli* 24 (19.83%), *Pseudomonas spp* 18 (14.88%), *Klebsiella spp* 14 (11.57%), *Streptococcus spp* 5 (4.13%), *Proteus spp* 4 (3.31%), *Citrobacter spp* and *Enterococci spp* one (0.83%) each.

Out of 18 isolates in trauma wound infection, Pseudomonas spp was the most common isolates i.e 6 (33.33%), in trauma/ RTA wound infactions followed by *E.Coli* 5(27.77%), *S.aureus* and *Klebsiella spp* 3 (16.67%) each; and *Proteus spp* one (5.56%). In this study even a single sample of animal/insect bite wound infection was not received.

Out of 132 isolates from post-operative wound infections, 45 (34.09%) isolates were *S.aureus* the most common isolates followed by *Pseudomonas spp* 31 (23.48%), *E.Coli* 24 (18.18%), *Klebsiella spp* 20 (15.15%), *Proteus spp* 6 (4.54%). *Streoptococcus spp* 3 (2.27%), *Enterobacter spp* 2 (1.52%) and *Citrobacter spp* one (0.76%).

In the present study, the most common organism in pathological and postoperative wound infection was *S.aureus* i.e. 54 (44.62%) and 45 (34.09%) respectively. In trauma wound infection commonest organism was *Pseudomonas spp* i.e. 6 (33.33%).

In the present study isolated *S.aureus* were 78% sensitive to amikacin, 75% to linezolid, 70% to levofloxacin, 68% to doxycycline and 54% sensitive to clindamycin.

Pseudomonas spp were 96% sensitive to imipenem, 56% sensitive to amikacin and 51% sensitive to levofloxacin.

E.Coli were 81% sensitive to amikacin, 42% sensitive to levofloxacin and 38% sensitive to piperacillin-tazobactum.

Klebsiella spp were 57% sensitive to amikacin and 49% sensitive to levofloxacin. Whereas 100% resistant to amoxycylin + clavulanic acid, cefexime and cefuroxime.

Proteus spp were sensitive to amikacin, levofloxacin and piperacillin tazobactum, 91%, 82% and 82% respectively.

Streptococcus spp were 30% sensitive to amikacin, 57% and 63% sensitive to levofloxacin and doxycycline respectively.

Citrobacter spp were 50% sensitive to amikacin, levofloxacin, piperacillin tazobactum and ofloxacin. Whereas 100% resistant to cotrimoxazole, amoxycycline – clavulanic acid, ceftazidime, cefexime, cefoperazone, ceftrizone, cefuroxime.

*Enterobacter spp*were 100% sensitive to amikacin, levofloxacin, piperacilline tazobactum, ofloxacin and were 100% resistant to amoxycilline clavulanic acid, ceftazidine, cefexime and cefuroxime.

Enterococci spp were 100% sensitive to mikacin, levofloxacin, linezolid, doxycycline and clindamycin. Whereas 100% resistant to ciprofloxacin, erythromycin, penicillin, cotrimoxazole.

Isolated most of the strains of Gram positive (*S.aureus*, *Streptococcus spp* and *Enterococci spp*) and Gram negative (*E.Coli*, *Proteus spp*, *Enterobacter spp*) organisms were sensitive to amikacin.

Whereas there was no single common antibiotic to which all isolated Gram positive and Gram negative bacteria were 100% sensitive.

Out of 102 *S.aureus* isolates 69(67.65%) were MRSA and out of 160 Gram negative isolates, 61(38.12%) were ESBL producers.

Table.1 Culture positivity in different sub types of wound infections

Nature of wound infections	Total no of samples	No of samples showing growth	Sterile samples	% of culture positivity
A. Pathological				
1. Burn	13	9	4	69.23%
2. Bed sore	2	2	0	100%
3. Cellulitis	5	5	0	100%
4. Ulcer	23	16	7	69.86%
5. Abscess	88	57	31	64.77%
6. Osteomyelitis	3	2	1	66.66%
7. others	4	2	2	50.00%
B. Trauma				
Trauma/RTA	21	12	9	57.14%
C. Postoperative	144	97	47	67.36%
Total	303	202	101	66.66%

Table.2 Organisms isolated from different sub types of pathological wound infection

Organism isolated	Toatal no. of isolates (%)	Burn	Bedsore	Cellul ities	Ulcer	Abscess	Osteo mylitis	Other
S.aureus	54 (44.62%)	3	1	1	6	40	2	1
E.Coli	24(19.83%)	-	1	-	4	19	-	-
Pseudomonas spp	18(14.88%)	7	-	2	5	4	-	-
Klebsiella spp	14(11.57%)	2	-	1	7	3	-	1
Streptococcus spp	5(4.13%)	-	-	3	2	-	-	-
Proteus spp	4(3.31%)	-	1	-	1	2	-	-
Citrobacter spp	1(0.83%)	-	-	-	-	1	-	-
Enterococci spp	1(0.83%)	1	-	-	-	-	-	-
Total	121(100%)	13	3	7	25	69	2	2

Table.3 Organisms isolated from sub types of trauma wound infections

Organisms isolated	Total no. of isolates	Trauma/RTA
Pseudomonas spp	6 (33.33%)	6
E.Coli	5 (27.77%)	5
S.aureus	3 (16.67%)	3
Klebsiella spp	3 (16.67%)	3
Proteus spp	1 (5.56%)	1
Total	**18 (100%)**	**18**

Table.4 Organisms isolated from postoperative wound infection

Organisms isolated	Total no.of organisms (%)
S.aureus	45 (34.09%)
Pseudomonas spp	31 (23.48%)
E.Coli	24 (18.18%)
Klebsiella spp	20 (15.15%)
Proteus spp	06 (4.54%)
Streptococcus spp	03 (2.27%)
Enterobacter spp	02 (1.52%)
Citrobacter spp	01 (0.76%)
Total	**132 (100%)**

Table.5 Most common isolates from pathological, trauma and post-operative wound infections

Nature of wound	Most common organism	No. of isolates	% of most common isolates
Pathological	*S.aureus*	54 (n=121)	44.62%
Trauma	*Pseudomonas spp*	06 (n=18)	33.33%
Postoperative	*S.aureus*	45 (n=132)	34.09%

Table.6 Drug sensitivity (%) pattern of isolates from different type of wound infection

Organism isolated(n=)		CD	CX	CIP	DO	E	LZ	P	AK	LE	COT	AMC	CAZ	CFM	CPZ	CTR	CXM	OF	PIT	IPM
S.aureus (n=102)	S	55 54%	33 32%	38 37%	69 68%	33 32%	74 73%	07 7%	80 78%	71 70%	32 31%	-	-	-	-	-	-	-	-	-
	R	47 46%	69 68%	64 63%	33 32%	69 68%	28 27%	95 93%	22 22%	31 30%	70 69%									
Pseudo Monas spp. (n=55)	S	-	-	-	-	-	-	-	31 56%	28 51%	12 22%	13 24%	14 25%	10 18%	16 30%	14 25%	12 22%	23 42%	24 44%	53 96%
	R								24 44%	27 49%	43 78%	42 76%	41 75%	45 82%	39 70%	41 75%	43 78%	32 58%	31 56%	03 04%
E.Coli (n=53)	S	-	-	-	-	-	-	-	43 81%	22 42%	08 15%	06 11%	12 23%	06 11%	11 21%	13 25%	07 13%	09 17%	20 38%	-
	R								10 19%	31 58%	45 85%	47 89%	41 77%	47 89%	42 79%	40 75%	46 87%	44 83%	33 62%	-
Klebsiella spp(n=37)	S	-	-	-	-	-	-	-	21 57%	18 49%	06 16%	Nil	04 11%	Nil	05 14%	03 08%	Nil	09 24%	08 22%	-
	R								16 43%	19 51%	31 84%	37 100%	33 89%	37 100%	32 86%	34 92%	37 100%	28 72%	29 71%	-
Proteus spp (n=11)	S	-	-	-	-	-	-	-	10 91%	09 82%	04 36%	04 36%	06 55%	02 18%	03 27%	07 64%	04 36%	06 55%	09 82%	-
	R								01 09%	02 18%	07 64%	07 64%	05 45%	09 82%	08 73%	04 36%	07 64%	05 45%	02 18%	-
Strepto Coccus spp (n=8)	S	03 38%	01 13%	03 38	05 63%	03 38%	04 50%	02 25%	06 75%	05 63%	02 25%	-	-	-	-	-	-	-	-	-
	R	05 62%	07 87%	05 62%	03 37%	05 62%	04 50%	06 75%	02 25%	03 37%	06 75%									
Citro Bacter spp (n=2)	S	-	-	-	-	-	-	-	01 50%	01 50%	Nil	Nil	Nil	Nil	Nil	Nil	Nil	01 50%	01 50%	-
	R								01 50%	01 50%	02 100 %	02 100%	02 100%	02 100%	02 100 %	02 100 %	02 100%	01 50%	01 50%	-
Entero Bacter spp (n=2)	S	-	-	-	-	-	-	-	02 100%	02 100 %	01 50%	Nil	Nil	Nil	01 50%	01 50%	Nil	02 100%	02 100%	-
	R								Nil	Nil	01 50%	02 100%	02 100%	02 100%	01 50%	01 50%	02 100%	Nil	Nil	-
Enterococci spp (n=one)	S	01 100 %	Nil	Nil	01 100 %	Nil	01 100 %	Nil	01 100%	01 100 %	Nil	-	-	-	-	-	-	-	-	-
	R	Nil	01 100 %	01 100 %	Nil	01 100 %	Nil	01 100 %	Nil	Nil	01 100 %									

(S-Sensitivity, R-Resistanat, n-number of isolates, CD-Clindamycin, CX-Cefoxitin, CIP-Ciprofloxacin, DO-Doxycyclin, E-Erethromycin, LZ-Lenezolid, P-Penicillin, AK-Amikacin, LE-Levofloxacin, COT-Cotrimaxazole, AMC-Amoxycyclin=Clavulonic acid, CAZ-Caftazidime, CFM-Cefezime, CPZ-Cefoperazone, CXM-Cefuroxime, OF-Ofloxacin, PIT-Piperacilline + Tazobactum, IPM-Imipenem)

Table.7 Isolation of MRSA and ESBL producer in wound infections

Organisms isolated	Total no. of isolates	MRAS (%)	ESBL Produceres (%)
S.aureus	102	69(67.65%)	-
Gram negative organisms	160	-	61(38.12%)

Infection in a wound delays healing, causes wound breakdown, dehiscence, prolongation hospital stay, increased trauma and treatment cost. (Akinjogunla *et al.,* 2009) Wound infection is an importatant cause of morbidity and mortality among surgical patients.

Infections of hospital acquired wounds are among the leading nosocomial causes of morbidity and increasing medical expenses. (Giacometti *et al.,* 2000) The control of wound infections has become more challenging due to wide spread bacterial resistance to antibiotics and to a greater incidence of infections caused by Methicillin resistance *S.aureus* (MRSA) and polymicrobic flora. (Akinjogunla *et al.,* 2009)

The knowledge of the causative agents of wound infection has therefore proved to be helpful in the selection of emphiric antimicrobial therapy and on infection control measures in hospital.

The present study was carried out from January 2012 to December 2012. Total 303 wound swabs or pus samples were received out of which 202 (66.66%) were culture positive whereas in 101 (33.33%) of cases there was no growth. In the present study culture positivity of wound infection was 66.66% which was in accordance with Azane and Beyene (2011). -70.5%, Egbe *et al.,* (2011)-64.8%, Karia *et al.,* (2013)-54.09%, Anubumani *et al.,* (2006)-47% Whereas Sisirak *et al.,* (2010), Shitto *et al.,* (2002), and Mordi *et al.,* (2009) reported high rate of culture positivity (84%), (95%) and (97.5%) respectively.

In the present study out of 271 isolates, 160 (59.04%) isolates were Gram negative and 111(40.96%) isolates were Gram positive. This was in accordance with Azene *et al.,* (2011), where Gram negative isolates were 56.6% and Gram positive isolates were 43.4%, Zafer *et al.,* (2007), Goswami *et al.,* (2011) and Mohanty *et al.,* (2004) have also reported higher isolation of Gram negative organisms in a range of 50-70% as compare to Gram positive organisms in a range of 30-49% in their study.

The most common organism isolated from wound infections in this study was *S.aureus* 102 (37.63%) followed by *Pseudomonas spp* 55(20.30%), *E.Coli* 53(19.56%), *Klebsiella spp* 37(13.65%), *Proteus spp* 11(4.05%), *Strptococcus spp* 8(2.95%), *Citrobacter spp* and *Enterobacter spp* 2(0.74%; each and *Enterococci spp* one(0.73%).The proportion of bacterial isolates was in agreement with previous study done by Azene *et al.,* (2011)[17], where *S.aureus* (41.6%) was the most common isolate in their study followed by *Pseudomonas spp* (18.4%), *E.Coli* (16.4%), *Proteus spp* (11.0%), *Citrobacter* and *Enterobacter spp* (4.2%) each, and *Klebsiella spp,* (2.4%). Several previous studies (Zafer *et al.,* 2007, Anubamani *et al.,* 2006, Mordi *et al.,* 2009, Karia *et al.,* 2013 and Egbe *et al.,* 2011) reported *S.aureus* was the most common organism followed by *Pseudomonas spp, E.Coli, Klebsiella spp, Proteus spp,* and *Streptococcus spp*. Whereas Sule *et al.,*

(2002) reported *Klebsiella spp* was the most prevalent in the obsteritcs and gynaecological wounds and *P.aeruginosa* was the commonest in orthopaedics wounds. This might be due to geographical variations because bacterial etiology can show geographic variations and may even vary over time within a population.

The culture positivity of pathological wound infection was 67.69%, trauma wound infection was 57.14%, and post-operative wound infection was 67.33% in the present study. In the previous study done by Mordi *et al.,* (2009) and Pramodhini *et al.,* (2012) reported 100% culture positivity in pathological wound infection in their study.

Mordi *et al.,* (2009) and Akinjogunla *et al.,* (2009) reported 97.85% and 97.5% culture positivity in trauma wound infection respectively.

Shanthi *et al.,* (2012) reported 67% incidence of post-operative wound infection which is similar to our study. Whereas in several previous studies done by Ranjan *et al.,* (2010), Kownher *et al.,* (2008) and Patel *et al.,* (2012) reported higher incidence of postoperative wound infection i.e.91%, 88.46%, and 87.5% respectively. Above findings shows that incidence of all 3 types of wound infections is low in our hospital may be due to proper wound care, proper hygiene standard within a hospital. Postoperative sepsis rate in any hospital depends much on the case material, hospital environment, irrational use and availability of antibiotics.

In the present study isolated *S.aureus* were 78% sensitive to Amikacin, 73% to Linezolid, 70% to levofloxacin and 68% sensitive to Doxycyclin. In isolated Gram negative bacteria, *Pseudomonas spp* were 96% sensitive to imipenem and 56% sensitive to Leofloxacin. *E.Coli, Klebsiella spp* and *Proteus spp* were 81%, 57% and 91% sensitive to Amikacin respectively. Whereas *Proteus spp* were also 82% sensitive to Levofloxacin and Piperacillin-tazobactum, *Klebsiella spp* were 100% resistance to Amoxicillin-clavulanic acid, Cefexime and Cefuroxime. In the present study isolated most of the strains of Gram positive (*S.aureus, Streptococcus spp and Enterococci spp)* and Gram negative (*E.Coli, Proteus spp*and *Enterobacter spp*) organism were sensitive to Amikacin.

In previous studies reported that *S.aureus* was sensitive to Amikacin (Garg *et al.,* 2009, Siguan *et al.,* 1990, and Tayfour *et al.,* 2005). Kaur *et al.,* (2008) also reported that *S.aureus* was 74.4% sensitive to Amikacin and 97.5% sensitive to Linezolid. Whereas in the same study *E.Coli, Klebsiella spp, Proteus spp,* and *P.aeruginosa* were 80%, 60%, 50%, and 50% sensitive to Amikacin respectively which were in accordance with present study. In previous study Goswami *et al.,* (2011) reported that levofloxacin is sensitive to both Gram positive and Gram negative organisms. Amikacin is sensitive to both Gram positive and Gram negative isolates was reported in studies done by Siguan *et al.,* (1990) and Dhar *et al.,* (2007). Amikacin is effective for all Gram negative isolates was reported in various previous studies Shanthi *et al.,* (2012), Kauer *et al.,* (2008), Kownhar *et al.,* (2008), and Dhar *et al.,* (2007). *Pseudomonas spp* were 96% sensitive to imipenem in the present study. This was comparable with Tayfour *et al.,* (2005), Mehta *et al.,* (2007), and Ranjan *et al.,* (2010) who reported that *Klebsiella spp* were 100% resistant to Amoxicillin-clavulanic acid which was similar to this study.

In the present study there was no single common antibiotic to which all isolated Gram positive and Gram negative isolates were increasingly resistant to routinely used antibiotics.

In the present study we found 69 (67.65%) Methicillin resistant *S.aureus*. This was less than previous study done by Etok *et al.,* (2012) who reported 100% Methicillin resistance in *S.aureus* (MRSA) from surgical wound infection. Pramodhini *et al.,* (2012) and Mohanty *et al.,* (2004) who reported 32.7% and 38.58% MRSA respectively.

In present study out of 160 Gram negative bacteria isolated, 61(38.12%) were ESBL producers. This is comparable to that reported previously (32.6%) by Pramodhini *et al.,* (2012). Higher rate of ESBL producers were reported by Mohanty *et al.,* (2004)-66.75% and Shanthi *et al.,* (2012)-65.2% in their study.

Finally this study concludes that contracting wound infection remains an ongoing problem. The main culprits for wound infection are Methicillin resistant *S.aureus*, ESBL producing Gram negative bacteria like *Pseudomonas spp, E.Coli, Klebsiella spp*, and *Proteus spp*. Although complete eradication of wound infections is not possible however we recommend that by taking preventive measures, adopting prompt clean surgical procedures, instituting sensitivity based antibiotic treatment and proper surgical care of wounds, the incidence of wound infection can be reduced. Therefore there is need of ongoing studies on wound infections for isolating different causative organisms, to know its sensitivity pattern for management of wound infections and minimize emergence of drugs resistant organisms.

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References

Akinjogunla OJ, Adegoke AA, Mboto CI, Chukwudebelu IC, Udokang IP. Bacteriology of automobile accident wound infection. Int J Med Sci 2009; 1(2): 19-22.

Anumani N, Kalyan J, Mallika M. Epidemiology and microbiology of wound infections. Indian Journal for the Practicing Doctor 2006; 3(5): 1-5.

Azene MK, and Beyene BA. Bacteriology and antibioGram of pathogens from wound infections at Dessie laboratory, North East Ethopia. Tanza J Health Res 2011; 13(4): 1-10.

Bowler PG, and Duerden BI, Armstrong DG. Wound microbiology and associated approaches to wound management. Clin Microbiol Rev 2001; 14(2): 244-69.

Church D, Elsayed S, Reid O, Winstone B, Lindsay R. Burn wound infections. Clin Microbiol Review 2006; 19(2): 403-34.

Clinical and Laboratory Standards Institute. Performance standard for antimicrobial susceptibility testing: Twenty second informational supplement. CLSI Document M100-S22, 2012; 32(3): 1-188.

Collier M. Understanding wound inflammation. Nursing times 2003; 99(25): 63-64.

Dhar S, Saraf R, Singh K, Raina B. Microbiological profile of chronic burn wound among patients admitted in burn unit. J Med Edu Res 2007; 9(4): 182-85.

Egbe CA, Omeregie R, Jgbarumah IO, Onemu S. Microbiology of wound infections and its associated risk factors among patients of a tertiary hospital in Benin city, Nigeria. J Res Health Sci 2011; 11(2): 109-13.

Etok CA, Edem EN, Ochang E. Aetiology and antimicrobial studies of surgical wound infections in University of Uyo Teaching Hospital (UUTH) Uyo, Akwa Ibom state, Nigeria. Open Scientific Reports 2012; 1(7): 1-5.

Garg A, Sujatha S, Garg J Acharya NS, Parija SC. Wound infections secondary to

snake bite. Journal of infection in developing countries 2009; 3(3): 221-23.

Giacometti a, Cirioni O, Schimizzi AM, Del Prete MS, Barchiesi F, D'Errico MM, Petrlli E, Scalise G. Epidemiology and Microbiology of surgical wound infections. J Clin Microbiol 2000; 38(2): 918-22.

Goswami NN, Trivedi HR, Goswami APP, Patel TK, Tripathi CB. Antibiotic sensitivity profile of bacterial pathogens in postoperative wound infections at a tertiary care hospital in Gujrat, India. J Pharmcol Pharmcotherapeutic 2011; 2(3): 158-64.

Gottarup F, Melling A, Hollander DA. An overview of surgical site infections: aetiology, incidence and risk factors. Eur Wound Mgt Asso J 2005; 5(2): 11-15.

Karia JB, Gadekar HB, Lakhani SJ. Study of bacterial profile of pus culture in Dhiraj General Hospital. Indian J Applied Basic Med Sci 2013; 15(20): 70-76.

Kaur J, Gulati VL, Aggarwal a, Gupta V. Bacteriological profile of osteomyelitis with special reference to *Staphylococcus aureus*. Indian J Pract Doctor 2008; 4(6): 1-7.

Kirby UMM, Bauer AW, Sherris TC, Truck M.antibiotic susceptibility testing by standardized single disc methods. Am J Clin Pathol 1966; 45: 493-96.

Kownhar H, Shankar EM, Vignesh R, Sekar R, Velu V, Rao UA. High isolation rate of *Staphylococcous aureus* from surgical site infections in an Indian hospital 2008; 61(3): 758-60.

Mackie and McCartney. Practical Medical Microbiology. 13th edi. Edr Colle JG, Duguid JP, Fraser AG, Marmion BP. Churchill Livingston, UK 1989.

Mehta M, Dutta P, Gupta V. Bacterial isolates from burn wound infections and their antibiGram: a eight year study. Indian J Plast surg 2007; 40(1): 25-28.

Mohanty S, Kapil A, Dhawan B, Das BK. Bacteriological and antimicrobial susceptibility profile of soft tissue infections from North India. Indian J Med Sci 2004; 58(1): 10-15.

Mordi RM, and Momoh MI. Incidance of *Proteus spp* in wound infections and their sensitivity pattern in the university of Benin Teaching Hospital. Afr J Biotech 2009; 8(5): 725-30.

Njoku-Obi AN, and Ojiegbe GC. Resistance patterns of bacterial isolates from wound infections in a university teaching hospital. West Afr J Med 1989; 8(1): 29-34.

Patel SM, Patel MH, Patel SD, Soni ST, Kinariwala, Dipa M. surgical site infections: incidence and risk factors in a tertiary care hospital, Western India. National J Comm Med 2012; 3(2): 193-96.

Pramodhini S, Tenmozhivalli PR, Selvi R, Dillirani V, Vasumathi A, Agatha D. Bacteriological profile of superficial and deep seated abscess and their antibiGram in a tertiary care hospital, South India. Indian J Med Specialities 2012; 3(2): 123-29.

Ranjan KP, Ranjan N, Bansal SK, Arora DR. Prevalence of *Pseudomonas aeruginosa* in postoperative wound infection in a Referral Hospital in Haryana India. J Lab Phy 2010; 2(2): 74-77.

Sani RA, Garba SA, Oyewole OA, Ibrahim A. Antibiotic resistance profile of Gram positive bacteria isolated from wound infections in Minna, Bida, Kontagora and suleja area of Niger State. J Health Sci 2012; 2(3): 19-22.

Shanthi J, Shankar T, Balagurunathan R. The scenario of postoperative wound infection from a Government hospital in South India. J Microbiol Biotechnol 2012; 2(3): 396-401.

Shittu AO, Kolawole DO, Oyedepo EAR. A study of wound infections in two health institutions in ILE-IFE, Nigeria. Afr J Biomed Res 2002; 5: 97-102.

Siguan ss, Ang BS, Pala IM, Bacling RM. Aerobic surgical infection: A surveillance on microbiological etiology and antimicrobial sensitivity pattern of commonly used antibiotic. Philippino J Microbial infectious Disc 1990; 19(1): 27-33.

Sisirak M, Zuizdic A, Hukic M. Methicillin-Resistant *Staphylococcous aureus* (MRSA) as a cause of nosocomial wound infections. Bosnian J Basic Med Sci 2010; 10(1): 32-37.

Sule AM, Thanni Loa, sule Odu OA, Olusanya O. Bacterial pathogens associated with infected wounds in Ogun state University Teaching Hospital, Saguma, Nigeria. Afr J Clin expt Microbiol 2002; 3(1): 13-16.

Taiwo SS, Okesina AB, Onile BA. In vitro antimicrobial susceptibility pattern of bacterial isolates from wound infections in university of O Ilorin Teaching Hospital. Afr J Clin Expt Micribiol 2002; 3(1): 6-10.

Tayfour MA, Al-Ghamdi SM, Al-Ghamdi As. Surgical wound infections in King Fahad Hospital at Al-Baha, Saudi Med J 2005; 26(8): 1305-7.

Zafar A, Anwar N, Ejaz H. Bacteriology of infected wounds- A study conducted at children hospital, Lahore, J Biomed-8A 2007; 23: 1-4.

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