Research Article

Characterization and resistance pattern of bacterial isolates from pus samples in a tertiary care hospital, Karimnagar

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Abstract

Background: Wound infection can cause delayed healing, chronicity which indirectly causes financial burden and psychological stress on patients. **Aim:** To speciate the organism isolated from pus sample received and its antibiotic sensitivity test. **Methods and materials:** All isolated organism are identified by colony morphology, Gram stain and biochemical reactions. Antibiotic sensitivity test for all isolates were done by Kirby-Bauer method using Mueller Hinton agar. **Results:** The major contribution of sample was from surgery department (65.3%) followed by orthopedics (10.2%). A total of 383 organism isolated among which *Klebsiella pneumoniae* dominates (34.46%) followed by *Staphylococcus aureus* (18.53%). All Gram negative organisms showed maximum resistance to amoxyclav and least to Imipenem. All Gram positive organisms showed least resistance to Vancomycin and Linezolid. *Pseudomonas aeruginosa* showed maximum resistance to amoxyclav (66.1%) and Gentamicin (57.1%) and least to Imipenem (7.1%). **Conclusion**: It is observed from the present study that, there is an increase in the resistance among beta-lactam antibiotics and quinolones. Emergence of drug resistance can be effectively controlled by continuous surveillance in hospitals and rational use of antibiotics.

Key words: Pus, Antibiotic resistance, Methicillin-resistant Staphylococcus aureus (MRSA), Wound infections.

Introduction

Wound infections are associated with higher rate of morbidity, mortality and increased medical expenses. Surgical wound infections are second most common cause of wound infections [1,2]. Treating wound infection mainly depends upon understanding of causative pathogen, pathophysiology of infective process and pharmacokinetics of drugs used for treatment [3]. There is increase in the development of resistance especially in developing countries due to indiscriminate use of antibiotics [4]. Bacteria have the ability to acquire resistance to therapeutic drugs and can transfer the resistance from one bacteria to another [5].

This study is conducted to know the prevalence of bacterial isolates from pus samples and its antibiotic sensitivity pattern which guides for appropriate therapy and framing antibiotic policies for hospital.

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Methods and Materials

Study design and duration: This is a retrospective study conducted for 2 years that is from July 2014 to June 2016.

Statistical analysis: The results were analysed using pivot table in MS office excel 2007. The present study conducted in a tertiary care hospital, Karimnagar. The pus samples received to laboratory from patients attending hospital were collected with sterile disposable cotton swabs and aspirates in syringe were processed. Among two pus swabs received, one swab used for direct Gram staining and another for inoculating on Blood agar (BA), MacConkey agar (MA) and Nutrient agar (NA). Culture plates were incubated at 37^0 C for 24 to 48 hours. Organism isolated identified by colony morphology, Gram stain, catalase test, oxidase test, coagulase test and other biochemical tests. Antibiotic sensitivity test for all isolates were done by Kirby-Bauer method using Mueller Hinton agar [6,7].

Results

Of total population 64 % were male.

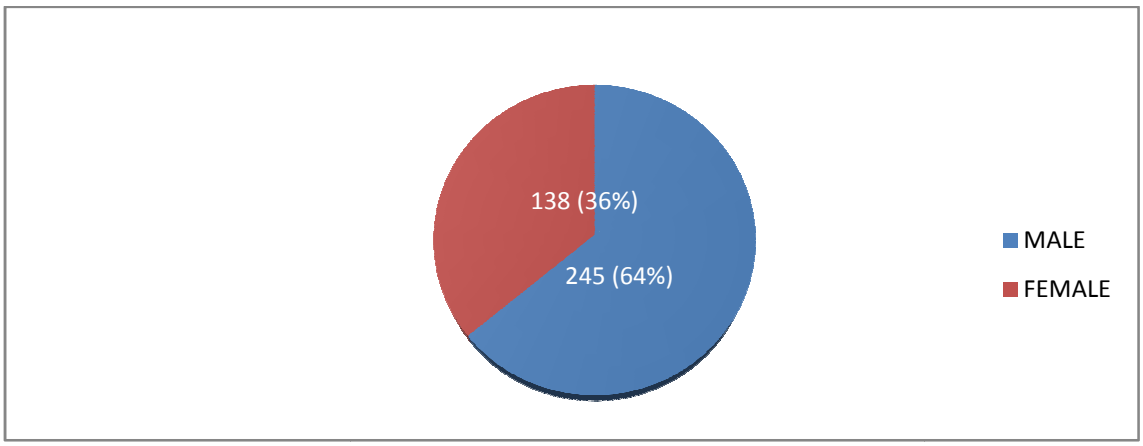

Figure-1: Sex wise distribution of culture positive pus samples

Table-1: Age wise distribution of bacterial isolates from pus samples.

Age range	K. pneumoniae	S. aureus	E. coli	Pseudomonas	CONS	others	Grand Total
1 <	1	1		2	3		7
2-21	13	16	9	8	10		56
22-41	42	24	17	14	17	2	116
42-61	38	17	22	19	7	3	106
62-81	36	10	15	13	9	7	91
82-101	2	3	1		1		7
	132	**71**	**64**	**57**	**47**	**12**	**383**

Frequency of bacterial isolation was maximum among age group 22 to 41 years followed by 42 to 61 years

Table-2: Department wise distribution of bacterial isolates from pus samples.

Organism	Departments							
	Surgery	Orthopedics	OBG	ICU	ENT	GM	NICU	OTHERS
Klebsiella pneumoniae	92	6	8	8	5	4	1	8
S.aureus	41	20	1	2	1	2	1	3
E. coli	43	1	12	3	0	0	0	5
Pseudomonas aeruginosa	40	5	1	0	4	1	2	3
CONS	25	7	7	2	0	1	3	2
Others	10	0	1	0	0	0	0	1

A total of 383 culture positive pus samples which includes swabs and aspirates were processed. The major contribution of sample was from surgery department (65.3%) followed by orthopaedics (10.2), OBG (7.8%), ICU (4.2%), General medicine (2.3%), ENT (2.6%), NICU (1.8%) and other department (5.7%) which include, neurosurgery, cardiology, urology, oncology

A total of 383 organism isolated among which *Klebsiella pneumoniae* dominates (34.46%) followed by *Staphylococcus aureus* (18.53%), *Escherichia coli* (16.2%), *Pseudomonas aeruginosa* (14.6%), CONS (12.3%) and other organisms which include *Proteus sp, Klebsiella oxytoca, Acinetobacter baumannii.*

Table-3: Antibiotic sensitivity pattern of Staphylococcus aureus.

Organisms	Staphylococcus aureus (n= 71)			
	Sensitive		Resistance	
Antibiotics	**Number**	**Percentage**	**Number**	**Percentage**
Amikacin	64	90.1 %	7	9.9 %
Amoxyclav	33	46.5 %	38	53.5 %
Azithromycin	44	62 %	27	38 %
Cefotaxime	42	59.2 %	29	40.8 %
Ceftriaxone	43	60.6 %	28	39.4 %
Linezolid	70	98.5 %	1	1.5 %
Ofloxacin	38	53.5 %	33	46.5 %
Pipercillin/ Tazobactam	58	81.7 %	13	18.3 %
Vancomycin	68	95.8 %	3	4.2 %
Cefoxitin	45	63.4 %	26	36.6 %

Staphylococcus aureus showing maximum resistance to Amoxyclav (53.5%) followed by Ofloxacin (46.5%), Cefotaxime (40.8%) and least to Vancomycin (4.2%), Linezolid (1.5%).

Table-4: Antibiotic sensitivity pattern of CONS (Coagulase Negative Staphylococcus).

Organism	CONS (n=47)			
	Sensitive		Resistance	
Antibiotics	**Number**	**Percentage**	**Number**	**Percentage**
Amikacin	35	74.5%	12	25.5 %
Amoxyclav	26	55.3%	21	44.7 %
Cefotaxime	25	53.2%	22	46.8 %
Ceftriaxone	24	51.1%	23	48.9 %
Linezolid	47	100%	0	0
Ofloxacin	25	53.2%	22	46.8 %
Pipercillin/ Tazobactam	33	70.2%	14	29.8 %
Vancomycin	46	97.7%	1	2.3 %

CONS showing maximum resistance to Ceftriaxone (48.9%), Cefotaxime (46.8%), Ofloxacin (46.8%), Amoxyclav (44.7%), followed by Pipercillin/ Tazobactam (29.8%). All isolates were sensitive to Linezolid and only one isolate showed resistance to Vancomycin.

Table-5: Antibiotic sensitivity pattern of *Escherichia coli.*

Organism	Escherichia coli (n=64)			
	Sensitive		Resistance	
Antibiotics	**Number**	**Percentage**	**Number**	**Percentage**
Amikacin	53	82.8 %	11	17.2%
Amoxyclav	7	10.9 %	57	89.1 %
Cefotaxime	13	20.3 %	51	79.7 %
Ceftriaxone	7	10.9 %	57	89.1 %
Imipenum	63	98.5 %	1	1.5 %
Ofloxacin	31	48.4 %	33	51.6 %
Pipercillin/ Tazobactam	49	76.6 %	15	23.4 %

Both Amoxyclav and Ceftriaxone showing maximum resistance with 89.1%, followed by Cefotaxime (79.7%). Only one isolate showing resistance to Imipenum.

Table-6: Antibiotic pattern of *Klebsiella pneumoniae*.

Organism	Klebsiella pneumoniae (n=132)			
	Sensitive		Resistance	
Antibiotics	**Number**	**Percentage**	**Number**	**Percentage**
Amikacin	96	72.7 %	36	27.3 %
Amoxyclav	12	9.1 %	120	90.9 %
Cefotaxime	28	21.2 %	104	78.8 %
Ceftriaxone	30	27.7 %	102	72.3 %
Imipenum	124	93.9 %	8	6.1 %
Ofloxacin	83	62.9 %	49	37.1 %
Pipercillin/ Tazobactam	71	53.8 %	61	46.2 %

Among enterobacteriaceae, *Klebsiella pneumoniae* showing maximum resistance among amoxyclav (90.9%), Cefotaxime (78.8%), Ceftriaxone (72.3%) and Imipenum (6.1%)

Table-7: Antibiotic sensitivity pattern of *Pseudomonas aeruginosa*.

Organism	Pseudomonas aeruginosa (n=56)			
	Sensitive		Resistance	
Antibiotics	**Number**	**Percentage**	**Number**	**Percentage**
Amikacin	41	73.5 %	15	26.8 %
Amoxyclav	19	33.9 %	37	66.1 %
Carbencillin	40	71.4%	16	28.6 %
Cefotaxime	21	37.5%	35	62.5 %
Ceftriaxone	23	41.1 %	33	58.9 %
Gentamycin	24	42.9 %	32	57.1 %
Imipenum	52	92.9 %	4	7.1 %
Ofloxacin	34	60.7 %	22	39.3 %
Pipercillin/ Tazobactam	35	62.5 %	21	37.5 %

Like other Gram negative organism, *Pseudomonas aeruginosa* showing maximum sensitive to imipenum(92.9%) and least sensitive to Amoxyclav.

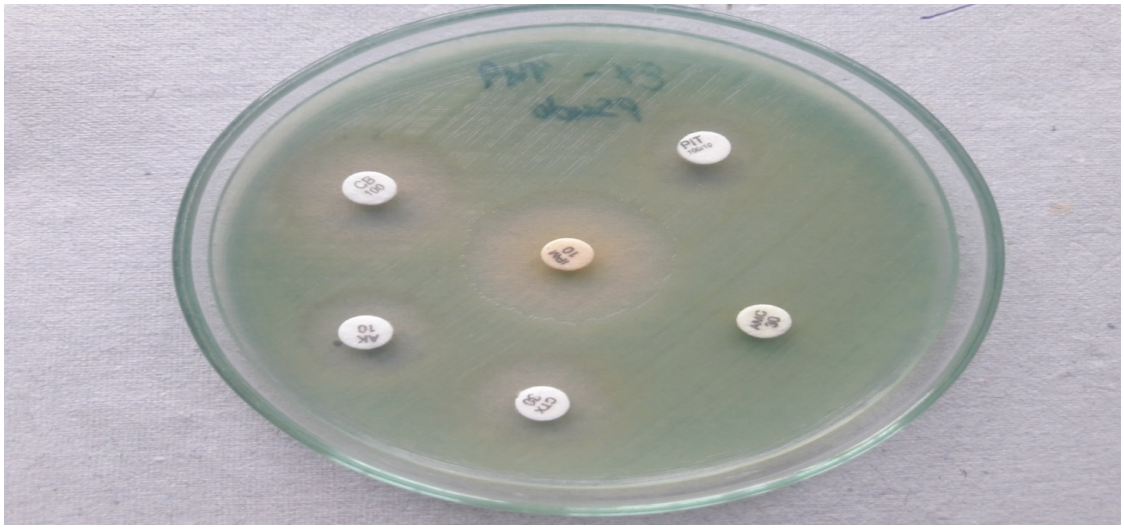

Figure-2: Antibiotic sensitivity test on Mueller Hinton agar by Kirby-Beaur method

Discussion

In this study there is male predominance and majority of patients are in age group 20-40 followed by 40-60 which is seen in previous study [1].

In present study Staphylococcus aureus is the predominant organism among Gram positive organisms which is comparable with many studies [4,8,9]. Among CONS, *Staphylococcus epidermidis* predominates followed by *Staphylococcus saprophyticus* which is in according with study conducted by Mohan U at al [10].

Klebsiella pneumonia is predominant organism isolated in our study with similar findings shown in studies by Sharma V et al [11] and Panta K et al [12], but in the study conducted by Kumar AR et al [4] and Verma P et al [13] it was second most common isolate.

Resistance pattern of *S. aureus* as seen in table 7 shows maximum resistance to amoxyclav (53.5%) followed by Ofloxacin (46.5%). Resistance for third generation cephalosporin like Cefotaxime and Ceftriaxone differ by narrow percentage with 40.5 and 39.4 respectively which is similar to study done at Jodhpur by Duggal S at al [14].

MRSA testing of *S. aureus* was done using Cefoxitin (30µg) which showed 36.6% which is similar to other studies [9,15]. Vancomycin and Linezolid showed 4.2% and 1.5% resistance for *S. aureus* but some studies showed 8% and 4% respectively [14]. A study in Iran by sarraafzadeh F et al [16] reported 9.2% resistance for Vancomycin and some showed 100% sensitive [9].

Escherichia coli and *Klebsiella pneumoniae* showed highest resistance to amoxyclav which is 89.1% and 90.9% respectively. Separate table is made for *Klebsiella pneumoniae* since it is gaining importance because of emerging multidrug resistance. In current study it is observed that *Klebsiella pneumoniae* showing resistance to Imipenem and Pipercillin/ Tazobactam of 6.1% and 46.2% where as *Escherichia coli* showed only 1.5% and 23.4% resistance respectively. Similar resistance pattern was reported by Namratha KG et al [17].

Here in our present study *Pseudomonas aeruginosa* showed prevalence of about 14.6%.

Various studies showed prevalence between 15% to 42% [1, 3, 8, 9, 11, 14, 18].

Pseudomonas aeruginosa encountered maximum resistance to amoxyclav (66.1%) and least to Imipenem (7.1%). Gentamicin resistance was 57.1% which is in accordance with work done by Hosimin K et al [19] which showed 50% resistance. Least resistance to Imipenem was reported by Duggal S at al [14] which is similar to our present study but same study showed Ofloxacin resistance of 72% where as in our study it is only 39.3%.

Conclusion

The present study showed alarming increase in the resistance to amoxyclav and third generation cephalosporins for all the isolates which is a serious problem in local area. To combat this we strongly advocate for rational use of antibiotics.

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