

# Clinical Profile of Patients with Infection in Intensive Care Units in a Tertiary Care Hospital

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## ABSTRACT

### BACKGROUND

All around the world, it is seen that patients in the intensive care units (ICU) experience a rise of antibiotic resistant pathogens. In the previous 20 years, ICUs have become progressively significant areas where numerous infections happen. ICU beds account for a significant number of hospital beds. ICU-acquired infection rates are five or more times higher than emergency clinic procured infections. ICUs are areas where inadequate anti-microbial use happens, and where anti-microbial safety profile for patients are being seen commonly.<sup>1-4</sup>

### METHODS

The examination included 200 cases admitted in intensive care unit of K.S. Hegde Medical Academy, Deralakatte, Karnataka, India. This cross sectional study was done from November 2010 to May 2012. All adult patients > 18 years in the ICU suspected to have been infected based on systemic inflammatory response syndrome (SIRS +) with one of the following criteria were included in the study. a) Positive laboratory cultures i.e., sputum or tracheal aspirate or urine or blood or, catheter tip or, b) Progression of chest x-ray infiltrates, urine routine showing pus cells or bacteria or increase in productive sputum.

### RESULTS

A total of 200 cases were selected for the study who met the inclusion criteria. 25 cases belonged to the age group of > 75 years and 70 cases belonged to the age group of 45 to 59 years, 141 cases were males and 59 cases were females. Among 200 cases with SIRS+ infection as evidenced by investigations; 104 cases were culture positive. 57 cases survived and 47 cases expired. Klebsiella was the commonest organism isolated (30 cases, 28.85 %), followed by acinetobacter (25 cases, 24.04 %). 21 cases had infection by *Staphylococcus aureus* (20.19 %) and another 12 cases had *Escherichia coli* (11.54 %) infection. Polymicrobial infection was seen in 22 cases. 58 out of 200 cases had diabetes mellitus, 47 cases had systemic hypertension, 17 cases had chronic liver disease, 32 cases had chronic obstructive pulmonary disease, 21 cases had cerebrovascular accidents and 19 cases had chronic kidney disease, and 17 cases had ischemic heart disease.

### CONCLUSIONS

In this study, acinetobacter species was found in large numbers from lab tests in ICU infections; furthermore, multidrug resistance in acinetobacter was more commonly seen as compared with other organisms, which is of concern. Overall, 48.08 % of cases expired in this study and majority of them had infection due to acinetobacter species or *Staphylococcus aureus*.

### KEY WORDS

Intensive Care Unit, Sepsis, Shock, Ventilator Procured Pneumonia, Catheter Related Urinary Tract Disease

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DOI: 10.14260/jemds/2021/60

How to Cite This Article:

Subramanya C. Clinical profile of patients with infection in intensive care units in a tertiary care hospital. J Evolution Med Dent Sci 2021;10(05):268-272, DOI: 10.14260/jemds/2021/60

Submission 16-11-2019,  
Peer Review 05-11-2020,  
Acceptance 12-11-2020,  
Published 01-02-2021.

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## BACKGROUND

Globally, patients in intensive care units have encountered an increased emergence and spread of antibiotic resistant pathogens. ICUs have become progressively significant in the past 2 years as the area where numerous infectious diseases are seen. ICU beds include an expanding extent of intense consideration emergency clinic beds. ICU-obtained disease rates are five or more times higher than medical clinic procured contamination rates and ward patients. The ICUs are a territory where significant anti-infection usually happens, and where antibiotic resistant forms of organism are prevalent.<sup>1-4</sup> ICU patients with infections can be separated into three types: those with community obtained diseases, those with hospital acquired (nosocomial) infections before moving to the ICU, and those with ICU-procured (nosocomial) infections. These infections can likewise be delegated as device associated and non-device associated diseases.

The ICU mortality of infected patients is more than twice that of non-infected patients.<sup>4</sup> Most ICU patients who obtained diseases in clinics are due to intrusive devices, for example, catheters and mechanical ventilators. As of late, rate of blood stream infection in patients admitted to intensive care units has expanded because of expanded utilisation of obtrusive devices and immunosuppressive therapy.<sup>7,8</sup>

By now, nosocomial blood stream infection has been accounted for the most often experienced nosocomial infection in the ICU. According to a gauge, network procured blood stream infection represents 20 % of all ICU confirmations and 28 % of all blood stream infection (BSI) analysed in the ICU. Other than expanding frequency, BSI likewise have been demonstrated to be related with expanded regent costs, length of hospital stay and mortality.<sup>9</sup>

Antibiotic resistance is a significant overall issue in the emergency unit. It has been understood that the spread of infection forms in the ICU is identified with the far reaching utilisation of anti-microbials. The pace of antimicrobial obstruction in the ICU is a few folds higher than in the general outpatient setting.<sup>1-4</sup>

## Objectives

1. To evaluate the clinical example of infection, i.e., community gained / clinic procured / ICU obtained and to categorise those under device related versus non-device related diseases.
2. To find out the profile of the causative, microorganism, their drug sensitivity and resistance pattern in these patients.

## METHODS

This cross-sectional study was done from November 2010 - May 2012 in ICU of K S Hegde Medical Hospital, Deralakatte, Mangalore, Karnataka, India. Institutional ethical committee clearance was obtained before the study.

A proforma was used for information collection. Information of history of all patients under incorporation was taken and clinical assessment was done. The investigation

included 200 cases admitted in intensive care unit in the hospital. Sample size was taken depending on the convenience of the study. They are categorised as community acquired and hospital or ICU acquired infections. The data included demographic characteristics like age and sex, history of presenting illness, past medical history, associated co-morbid conditions, detailed general physical and systemic examination, laboratory and imaging investigations as well as outcome.

## Inclusion Criteria

All adult patients > 18 years in the ICU suspected to have infection based on – SIRS + with one of the following criteria were included in the study.

- Positive laboratory cultures i.e., sputum or tracheal aspirate or urine or blood or, catheter tip or,
- Progression of chest x-ray infiltrates, urine routine shows pus cells or bacteria or productive sputum is increased.

Clinically huge BSI was considered to be available if a pathogenic life form was found in any one of blood cultures. In any given patient two positive blood culture was required to determine a BSI, or to have normal skin contaminants including coagulase negative staphylococci, or bacillus, corynebacterium or propionibacterium species, and the patients having one of the signs and side effects of sepsis (fever > 38° C, chills or rigors and hypotension) within 24 hrs of a positive blood culture being gathered.

## Inclusion of SIRS

Patients who had two of the following signs were included as SIRS.

- Temperature < 36° C or > 38° C,
- Heart rate > 90 bpm,
- Respiratory rate > 20 breaths / min or PaCO<sub>2</sub> < 32 mmHg,
- White blood count > 12,000 or < 4,000 cells / mm<sup>3</sup> or > 10 % of band cells.

## Exclusion Criteria

- Patients admitted in ICU who have infection clinically, but not microbiologically or radiologically.
- Patients who meet only one of SIRS criterion
- Patients whose clinical records were incomplete regarding previous antibiotic utilisation and whose blood cultures were not sent at the admission.
- Blood cultures which didn't fit the previously mentioned meaning of clinically huge BSI.

## Statistical Analysis

The Statistical Package for Social Science {SPSS} adaptation 20 was used for investigation of information. Mean, median, and standard deviation (SD) were used to depict quantitative information. Subjective information was summed up using recurrence and rate.

## RESULTS

25 cases belonged to the age group of > 75 years and 70 cases belonged to the age group of 45 to 59 years. 141 cases were males, and 59 cases were females.

Age Group	Male	Female	Total
18 - 29	11	5	16
30 - 44	27	6	33
45 - 59	50	20	70
60 - 74	38	18	56
> = 75	15	10	25
<b>Total</b>	<b>141</b>	<b>59</b>	<b>200</b>

Table 1. Demographic Characteristics of Study Population (N = 200)

Sl. No.	Organisms	Survivors	Non Survivors	Total
1	Acinetobacter	15	10	25 (24.04 %)
2	<i>Staphylococcus aureus</i>	08	13	21 (20.19 %)
3	<i>Klebsiella</i>	20	10	30 (28.85 %)
4	<i>Escherichia coli</i>	5	7	12 (11.54 %)
5	<i>Pseudomonas</i>	5	3	8 (7.69 %)
6	<i>Enterococcus</i>	1	0	1 (0.96 %)
7	<i>Streptococcus pneumoniae</i>	0	1	1 (0.96 %)
8	<i>Enterobacter</i>	1	0	1 (0.96 %)
9	Micrococci	0	1	1 (0.96 %)
10	Candida	2	2	4 (3.85 %)

Table 2. Causative Organisms for Sepsis among Survivors and Non-Survivors (N = 104)

Microorganism Isolated	Sensitivity	Resistance	Initial Antibiotic Used
Acinetobacter	Colistin, polymyxin B	Levofloxacin, piptaz, amikacin, ceftriaxone, imipenem, cefotaxime, cotrimoxazole	Piptaz, amoxiclav
<i>Staph. aureus</i>	Chloramphenicol, tetracycline, vancomycin	Cipro, cotrimoxazole, erythro, methicillin, clindamycin, gentamycin, penicillin	Meropenem, vancomycin, levofloxacin
<i>Klebsiella</i>	Imipenem, chloramphenicol	Ampicillin, ceftazidime, ciprofloxacin, amoxiclav, tetracycline, cotrimoxazole	Piptaz, ornidazole
<i>E. coli</i>	Amikacin, gatifloxacin, nitrofurantoin, imipenem	Ceftriaxone, gentamycin, ciprofloxacin, norfloxacin, amoxyclav	Ciprofloxacin, amikacin, nitrofurantoin
<i>Pseudomonas</i>	Amikacin, cipro, tobramycin, levofloxacin, imipenem, meropenem	Piptaz, cefepime, ceftazidime, colistin, polymyxin B	Piptaz
<i>Enterococcus</i>	Nitrofurantoin, vancomycin	Ampicillin, ciprofloxacin, penicillin, tetracycline, norfloxacin	Piptaz, cefotaxime, azithromycin, ciprofloxacin, vancomycin
<i>S. Pneumoniae</i>	Cipro, penicillin, linezolid, vancomycin, amoxiclav, cefotaxime, levofloxacin	Cotrimoxazole, tetracycline	Piptaz, amoxiclav, azithromycin
<i>Enterobacter</i>	Amikacin, gentamycin, tetracycline, chloramphenicol, ceftriaxone, imipenem	Ampicillin, amoxycillin	Cefotaxime
Micrococci	Levofloxacin, imipenem, polymyxin b, colistin	Amikacin, ciprofloxacin, gentamycin, cotrimoxazole, ceftriaxone	Meropenem, levofloxacin
Candida	Amphotericin B, nystatin	Ketoconazole, itraconazole, cotrimoxazole, fluconazole	Amphotericin B

Table 3. Antibiotic Sensitivity Pattern of Various Organisms

Among 104 cases with culture proven sepsis, 57 cases survived and 47 cases expired. *Klebsiella* was the commonest organism isolated (30 cases, 28.85 %), followed by *acinetobacter* (25 cases, 24.04 %). 21 cases had infection by

*Staphylococcus aureus* (20.19 %) and another 12 cases had *Escherichia coli* (11.54 %) infection.

Microorganism Isolated	Community Acquired	Hospital Acquired	Total
1. Acinetobacter	6	19	25 (24.04 %)
2. <i>Staphylococcus aureus</i>	11	10	21 (20.19 %)
3. <i>Klebsiella pneumoniae</i>	12	18	30 (28.85 %)
4. <i>Escherichia coli</i>	8	4	12 (11.54 %)
5. <i>Pseudomonas</i>	3	5	8 (7.69 %)
6. <i>Enterococcus</i>	1	0	1 (0.96 %)
7. <i>Streptococcus pneumoniae</i>	1	0	1 (0.96 %)
8. <i>Enterobacter</i>	0	1	1 (0.96 %)
9. Micrococci	1	0	1 (0.96 %)
10. Candida	1	3	4 (3.85 %)
<b>Total</b>	<b>44</b>	<b>60</b>	<b>104</b>

Table 4. Community Acquired vs. Nosocomial Infections (N = 104)

Among 104 cases, 44 were classified as community acquired infections and 60 cases were classified as hospital acquired infections. *Klebsiella pneumoniae* (12 cases %) was the commonest community acquired infection followed by *Staphylococcus aureus* (11 cases). Among hospital acquired infections (60 cases), *acinetobacter* (19 cases) infection was the commonest one followed by *Klebsiella pneumoniae* (18 cases) and *Staphylococcus aureus* (10 cases).

Organism	Device Associated	Non-Device Associated	Total
1. Acinetobacter	19	6	25
2. <i>Staphylococcus aureus</i>	8	13	21
3. <i>Klebsiella pneumoniae</i>	12	18	30
4. <i>Escherichia coli</i>	2	10	12
5. <i>Pseudomonas</i>	5	3	8
6. <i>Enterococcus</i>	0	1	1
7. <i>Streptococcus pneumoniae</i>	0	1	1
8. <i>Enterobacter</i>	1	0	1
9. Micrococci	0	1	1
10. Candida	1	3	4
<b>Total</b>	<b>48</b>	<b>56</b>	<b>104</b>

Table 5. Device Associated vs. Non-Device Associated Infections

Out of 104 cases, 48 had device associated infection and 56 cases had non-device associated infection. *Acinetobacter* (19 cases) was the commonest device associated infection followed by *klebsiella* (12 cases). Among non-device associated infections (56 cases), *klebsiella* (18 cases) was the commonest infection followed by *staphylococcus* (13 cases) and *Escherichia coli* (10 cases).

Organism	Pus	Sputum	Blood	Urine	ET Aspirate	ICD	CVC	CAUTI	Dialysis Catheter	VAP	Total
Acinetobacter	1	2	2	1	8	0	0	6	0	5	25 (24.04 %)
<i>S. aureus</i>	4	4	3	2	1	0	1	2	2	2	21 (20.19 %)
<i>Klebsiella</i>	3	6	5	5	3	0	0	2	2	4	30 (28.85 %)
<i>E coli</i>	2	1	3	4	0	0	0	2	0	0	12 (11.54 %)
<i>Pseudomonas</i>	0	2	0	1	3	1	1	0	0	0	8 (7.69 %)
<i>Enterococcus</i>	0	0	1	0	0	0	0	0	0	0	1 (0.96 %)
<i>S pneumoniae</i>	1	0	0	0	0	0	0	0	0	0	1 (0.96 %)
<i>Enterobacter</i>	0	0	0	0	0	1	0	0	0	0	1 (0.96 %)
Micrococci	1	0	0	0	0	0	0	0	0	0	1 (0.96 %)
Candida	2	0	0	0	1	0	1	0	0	0	4 (3.85 %)
<b>Total</b>	<b>14</b>	<b>15</b>	<b>14</b>	<b>13</b>	<b>16</b>	<b>2</b>	<b>3</b>	<b>12</b>	<b>4</b>	<b>11</b>	<b>104</b>

Table 6. Source of Specimens of Infecting Organism

Endotracheal tube aspirate was the commonest source of isolate (16 cases), followed by sputum (15 cases), pus (14 cases) and blood (14 cases).

Isolate was obtained from endotracheal tube aspirate in 14 cases (13.46 %) and from urine in 10 cases (9.62 %). The commonest organism causing blood stream infection was klebsiella (4 cases). *Staphylococcus aureus* was the commonest organism causing wound infection (4 cases), followed by klebsiella (3 cases) and *E. coli* (2 cases).

## DISCUSSION

A total of 200 cases were selected for the study who met the inclusion criteria. 25 cases belonged to the age group of > 75 years and 7 cases belonged to the age group of 45 to 59 years. 141 cases were males and 59 cases were females.

Among 200 cases with SIRS + infection as evidenced by investigations, 104 cases were culture positive. 57 cases survived and 47 cases expired. Klebsiella was the commonest organism isolated (30 cases, 28.85 %), followed by acinetobacter (25 cases, 24.04 %). 21 cases had infection by *Staphylococcus aureus* (20.19 %) and another 12 cases had *Escherichia coli* (11.54 %) infection. Polymicrobial infection was seen in 22 cases. 58 out of 200 cases had diabetes mellitus, 47 cases had systemic hypertension, 17 cases had chronic liver disease, 32 cases had chronic obstructive pulmonary disease, 21 cases had cerebrovascular accident and 19 cases had chronic kidney disease, 17 cases had ischemic heart disease.

Samples were gathered from 200 cases who were given antimicrobial treatment, of which 104 (52 %) were refined positive and (48 %) were found negative. These discoveries were equivalent to the perceptions of past people.<sup>10</sup> In Asian nations, the most continuous pathogen isolated from infections in the ICU is *P. aeruginosa*, klebsiella spp., and *E. coli*, enterococcus, and *Staphylococcus aureus*.<sup>11</sup> In another study, the most well-known bacterial pathogens in ICU obtained diseases were acinetobacter, pseudomonas, klebsiella, *E. coli*, staphylococcus and streptococcus. Infection rate was more in urinary tract followed by wound diseases, pneumonia and bronchitis.<sup>12</sup>

Among 104 cases, 44 were classified as community acquired infections and 60 cases were classified as hospital acquired infections. *Klebsiella pneumoniae* (12 cases) was the commonest community acquired infection followed by *Staphylococcus aureus* (11 cases). Among hospital acquired infections (60 cases), acinetobacter (19 cases) infection were commonest one followed by *Klebsiella pneumoniae* (18 cases).

In the German examination, the most common microbes were *Acinetobacter baumannii*, *Staphylococcus aureus* and *Escherichia coli* this was an impression of an episode because of *A. baumannii*.<sup>13</sup> In another examination from Karnataka, *K. pneumoniae* and *S. aureus* (41 % MRSA) were the dominating organism.<sup>14</sup> In another investigation study in a neuroscience unit in ICU, the most well-known nosocomial contaminations by essential site were urinary tract diseases (32 %), and pneumonia (25.1 %). The most common microorganisms were coagulase-negative staphylococci (39.4 %), *Escherichia coli* (18 %), *Staphylococcus aureus* (10 %) and klebsiella spp. (9.9 %).

Out of 104 cases, 48 had device associated infection and 56 cases had non-device associated infection.

Acinetobacter (19 cases) was the commonest device associated infection followed by klebsiella (12 cases). Among non-device associated infections (56 cases) klebsiella (18 cases) was the commonest infection followed by *Staphylococcus aureus* (13 cases, 20.63 %). Gram negative bacilli, for example, and pseudomonas were the most widely recognised aetiologic specialists announced<sup>15,16</sup> and in another investigation, the most well-known operators causing were (25.6 %), *Staphylococcus aureus* (22.2 %), pseudomonas spp. (17.7 %), and candida spp. (15.3 %). Additionally, noteworthy though to a lesser degree were diseases brought about by coagulase negative staphylococci (5.9 %) and acinetobacter spp. (5.4 %).<sup>17</sup>

Endotracheal (ET) aspirate was the commonest source of isolate (16 cases), followed by sputum (15 cases), pus (14 cases), and blood (14 cases). The commonest organism causing blood stream infection was klebsiella (4 cases) followed by *E. coli* and *Staph. Aureus* (3 cases each). *Staphylococcus aureus* was the commonest organism causing wound infection (4 cases) followed by klebsiella (3 cases) and *E. coli* (3 cases). These results were comparable with previous findings.<sup>18,19</sup>

## CONCLUSIONS

In this study, acinetobacter species was found in large numbers from lab tests in ICU infections; furthermore, multidrug resistance in acinetobacter was more commonly seen as compared with other organisms, which is of concern. Overall, 48.08 % of cases expired in this study and majority of them had infection due to acinetobacter species or *Staphylococcus aureus*.

Data sharing statement provided by the authors is available with the full text of this article at jemds.com.

Financial or other competing interests: None.

Disclosure forms provided by the authors are available with the full text of this article at jemds.com.

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