

## ORIGINAL RESEARCH

### Microbial strain pattern in blood and urine and their sensitivity to drugs with patients on mechanical ventilation

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#### ABSTRACT

**Background:** Patients admitted to intensive care units have been found to experience HAIs at a rate 5-10 times higher than patients treated to normal wards. The present study was conducted to find microbial strain pattern in blood and urine and their sensitivity to drugs with patients on mechanical ventilation.

**Materials & Methods:** 100 patients between the age of 18 to 65 years on mechanical ventilation of both genders in the department of Medicine, Gandhi Medical College and associated Hamidia Hospital, Bhopal were recruited. Parameters such as TLCs, neutrophil counts and lymphocyte counts were recorded. Micro-organism in Blood and urine was calculated. Antibiotic susceptibility pattern was also recorded.

**Results:** Majority of the patients in our study was male (72%) as compared to female (28%). The mean age of the study participants was 50.60±19.22 years. The mean TLCs, Neutrophil counts and Lymphocyte counts were 9411±3522, 63.79±4.6 and 33.11±4.86 respectively. The most common microorganism isolated from blood was MRSA (5%), acinetobacter (4%), citro (2%) and pseudomonas (1%). In terms of antibiotic sensitivity of blood sample samples, majority of the patients had bacteriological profile resistant to ciprofloxacin (80%), penicillin (80%), teicoplanin (80%), vancomycin (80%), Amikacin (80%), ceftazidime (70%), cotrimoxazole (60%), Clindamycin (50%), doxycyclin (50%), Linezolid (50%), Amoxiclav (50%) and piptaz (50%). The most common microorganisms isolated from urine were E coli (6%), enterococcus (4%), MRSA (2%) klebsiella sp. (2%), citro (2%) and acinetobacter (1%). Majority of the bacterial isolates from urine sample were resistant to ampicillin (58.8%), cefotaxime (58.8%), ceftriaxone (52.9%), ciprofloxacin (52.9%), ceftazidime (52.9%), cefepime (47.1%) and penicillin (35.3%), Linezolid (35.3%), gentamicin (35.3%) and cotrimoxazole (35.3%), Clindamycin (35.3%), ciprofloxacin (35.3%), azithromycin (35.3%) and ceftazidime (35.3%).

**Conclusion:** The most common microorganisms isolated from urine were E coli. Majority of the bacterial isolates from urine sample were resistant to ampicillin.

**Key words:** ampicillin, blood, urine

## INTRODUCTION

Patients admitted to intensive care units have been found to experience HAIs at a rate 5-10 times higher than patients treated to normal wards. Intensive care unit (ICU) patients are critically ill and more often immuno-compromised compared to those in normal wards, which may contribute to the higher rate of HAIs seen in ICUs.<sup>1</sup> In addition, the widespread use of broad-spectrum antibiotics among ICU patients causes selective antibiotic pressure, which in turn promotes the evolution of AMR among ICU microbes.<sup>2</sup> Therefore, ESKAPE infections are frequently found in the microbiological profile of HAIs in the ICU (*Enterococcus faecium*, *Staphylococcus aureus* including MRSA, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa* and *Enterobacter* species). In the intensive care unit, the presence of HAIs is associated with a statistically and clinically significant rise in patient mortality, hospital costs, and length of stay.<sup>3</sup>

By far the most useful method for determining the extent of AMR and gathering the antibiogram data needed for treatment strategy planning at the regional, national, and international levels, AMR monitoring has emerged as a critical tool. To promote a standardised strategy for AMR data collecting, analysis, and sharing on a worldwide scale, WHO developed the Global Antimicrobial Resistance Surveillance System (GLASS) in May 2015.<sup>4</sup>

The developed world has a wealth of research in AMR surveillance. Nonetheless, research on AMR surveillance in developing nations, like India, is lacking.<sup>5</sup> Only five of India's largest hospitals were included in a recent network to monitor antimicrobial resistance initiated by the Indian Council of Medical Research (ICMR).<sup>6</sup> The present study was conducted to find microbial strain pattern in blood and urine and their sensitivity to drugs with patients on mechanical ventilation.

## MATERIALS & METHODS

This cross sectional observational study was performed among 100 patients between the age of 18 to 65 years on mechanical ventilation of both genders in the department of Medicine, Gandhi Medical College and associated Hamidia Hospital, Bhopal Exclusion criteria was patients with already a source of infection, patients suffering from a known microbial bacteremia and patients who are on long term steroid therapy.

Data such as name, age, gender etc. was entered in case history. Parameters such as TLCs, neutrophil counts and lymphocyte counts were recorded. Micro-organism in Blood and urine was calculated. Antibiotic susceptibility pattern was also recorded. Data was recorded in Microsoft Excel programme and statistical analysis was performed by the SPSS program for Windows, version 25 (SPSS, Chicago, Illinois). Categorical variables was analysed using either the chi square test or Fisher's exact test. One way ANOVA was used to compared the mean.  $P < 0.05$  was considered statistically significant.

## RESULTS

**Table I Gender distribution**

Gender	Frequency	Percent
Female	28	28.0
Male	72	72.0
Total	100	100.0

Table I shows that majority of the patients in our study was male (72%) as compared to female (28%).

**Table II Descriptive analysis**

Parameters	N	Minimum	Maximum	Mean	Std. Deviation
Age	100	15	85	50.60	19.228
Total counts	100	3700.00	19000.00	9411.0000	3522.24948
Neutrophils(%)	100	50.00	76.00	63.7900	4.66081
Lymphocytes (%)	100	20.00	45.00	33.1100	4.86151

Table II shows that the mean age of the study participants was 50.60+19.22 years. The mean TLCs, Neutrophil counts and Lymphocyte counts were 9411+3522, 63.79+4.6 and 33.11+4.86 respectively.

**Table III Micro-organism in blood**

Micro-organism	Frequency	Percentage
Citro	2	2
E Coli	0	0
Enterococcus	0	0
Klebsiella O	0	0
Klebsiella P	0	0
Pseudomonas	1	1
MRSA	5	5
Proteus	0	0
Staph	0	0
Acinetobacter	4	4

Table III shows that the most common microorganism isolated from blood was MRSA (5%), acinetobacter (4%), citro (2%) and pseudomonas (1%).

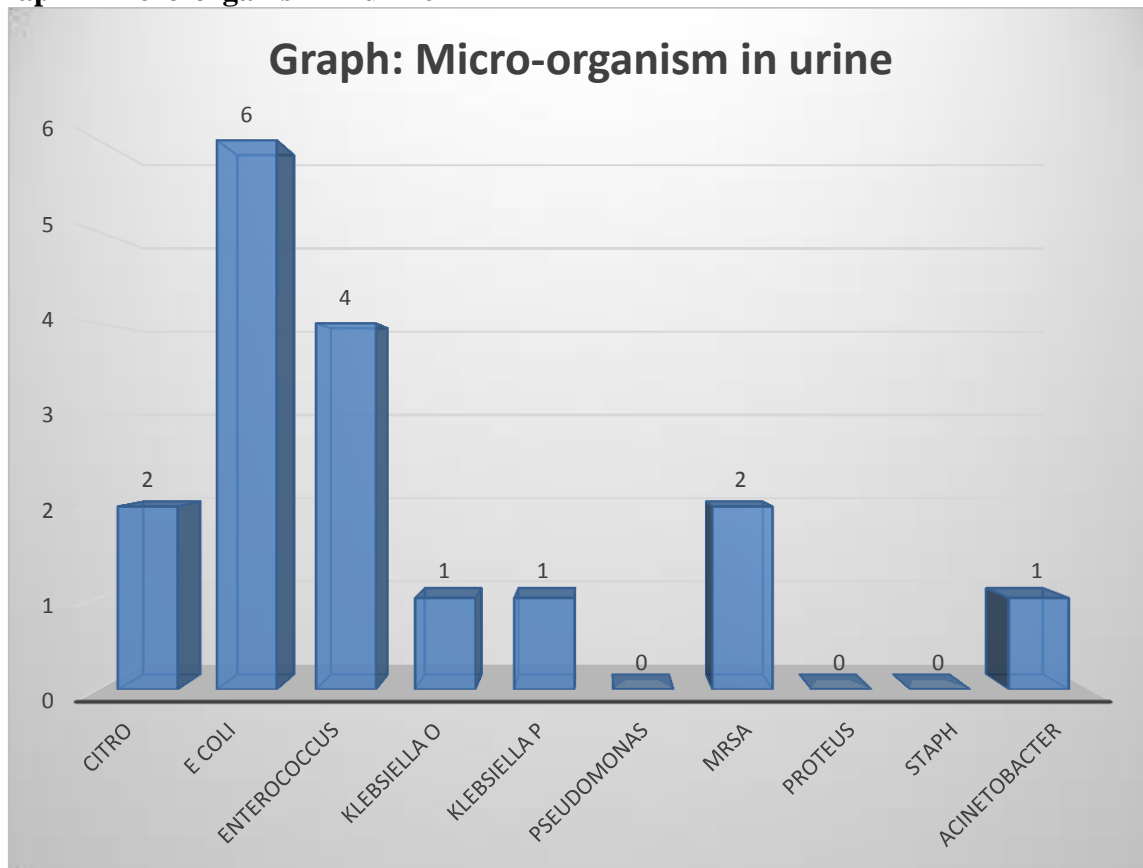
**Table IV Antibiotic sensitivity in blood sample**

Antibiotics	Intermediate sensitive	Sensitive	Resistance	resistance %	Total
Azithromycin	0	0	1	10	1
Cefozitin	0	1	7	70	8
Ciprofloxacin	0	0	8	80	8
Clindamycin	2	1	5	50	8
Cotrimoxazole	0	2	6	60	8
Doxycycline	0	3	5	50	8
Gentamicin	0	4	4	40	8
Linezolid	1	2	5	50	8
Nitrofurantoin	0	5	3	30	8
Penicillin	0	0	8	80	8
Teicoplanin	0	0	8	80	8
Vancomycin	0	0	8	80	8
Amikacin	0	0	8	80	8
Amoxyclav	1	2	5	50	8
Cefepime	0	2	3	30	5
Ceftazidime	1	1	3	30	5
Cefotaxime	0	1	4	40	5
Ceftriaxone	0	1	4	40	5
Ciprofloxacin	0	1	4	40	5
Gentamicin	0	1	4	40	5
Imipenem	0	2	3	30	5

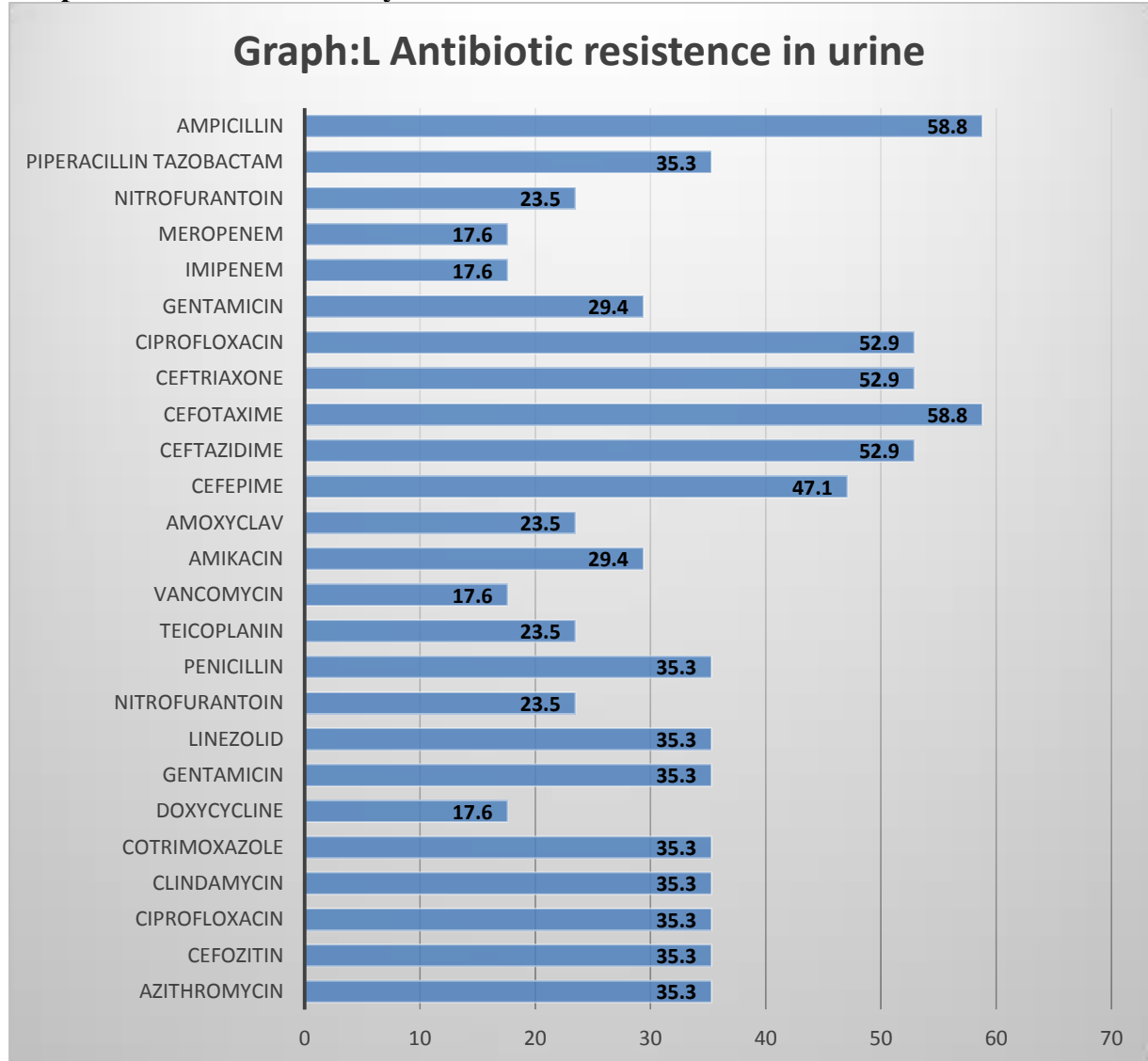
Meropenem	1	1	3	30	5
Nitrofurantoin	1	2	2	20	5
Piperacillin/Tazobactam	0	0	5	50	5
Ampicillin	1	2	2	20	5

Table IV shows that in terms of antibiotic sensitivity of blood sample samples, majority of the patients had bacteriological profile resistant to ciprofloxacin (80%), penicillin (80%), teicoplanin (80%), vancomycin (80%), Amikacin (80%) ceftazidime (70%), cotrimoxazole (60%), Clindamycin (50%), doxycycline (50%), Linezolid (50%), Amoxiclav (50%) and piperacillin (50%).

### Graph I Micro-organism in urine



Graph I shows that the most common microorganisms isolated from urine were E coli (6%), enterococcus (4%), MRSA (2%) klebsiella sp (2%), citro (2%) and acinetobacter (1%).

**Graph II Antibiotic sensitivity in urine**

Graph II shows that majority of the bacterial isolates from urine sample were resistant to ampicillin (58.8%), cefotaxime (58.8%), ceftriaxone (52.9%), ciprofloxacin (52.9%), ceftazidime (52.9%), cefepime (47.1%) and penicillin (35.3%), Linezolid (35.3%), gentamicin (35.3%) and cotrimoxazole (35.3%), Clindamycin (35.3%), ciprofloxacin (35.3%), azithromycin (35.3%) and ceftazidime (35.3%).

## DISCUSSION

Patients who are severely ill are at a higher risk for developing pneumonia in the hospital when they have been intubated and placed on mechanical ventilation (MV) (3 to 21-fold increase in the risk).<sup>7</sup> There are two types of pathogens that can colonise the respiratory tract and cause VAP: those that originate from within the body and those that come from outside. Individuals colonising the oropharynx, sinuses, nares, and dental plaque may be inhaled and cause infections.<sup>8</sup> Possible extracorporeal vectors include colonised ICU patients, contaminated environmental surfaces (sinks, faucets, etc.), contaminated equipment (mechanical ventilation devices, ventilator circuits, etc.), contaminated enteral feeding, contaminated aerosols, and contaminated environmental surfaces (ICU).<sup>9</sup> When the inoculum is vast, the microorganisms are dangerous, and the host defences are weak, viraemia might develop.<sup>10</sup> Pneumonia-causing microbes usually originate from the lungs, not the stomach, in

patients who require mechanical ventilation. Less common is hematogenous dissemination from intravascular catheters that have become contaminated or bacterial translocation of the gastrointestinal tract lumen.<sup>11</sup> The present study was conducted to find microbial strain pattern in blood and urine and their sensitivity to drugs with patients on mechanical ventilation.

We found that majority of the patients in our study was male (72%) as compared to female (28%). The mean age of the study participants was 50.60±19.22 years. The mean TLCs, neutrophil counts and lymphocyte counts were 9411±3522, 63.79±4.6 and 33.11±4.86 respectively. We observed that the most common microorganism isolated from blood was MRSA (5%), acinetobacter (4%), citro (2%) and pseudomonas (1%). We found that in terms of antibiotic sensitivity of blood sample samples, majority of the patients had bacteriological profile resistant to ciprofloxacin (80%), penicillin (80%), teicoplanin (80%), vancomycin (80%), Amikacin (80%), ceftazidime (70%), cotrimoxazole (60%), Clindamycin (50%), doxycyclin (50%), Linezolid (50%), Amoxiclav (50%) and piptaz (50%).

We found that the most common microorganisms isolated from urine were E coli (6%), enterococcus (4%), MRSA (2%), klebsiella sp (2%), citro (2%) and acinetobacter (1%). According to research by Kengne et al.<sup>12</sup>, E. coli is the leading etiological agent in UTIs, accounting for as much as 90% of cases. These results are consistent with previous research showing that E. coli is the most frequently isolated bacterium from the urine of both hospitalised and community-dwelling individuals of both sexes.<sup>13,14</sup> Consistent with the findings of Ghorbani et al.<sup>101</sup>, K. pneumonia was the second most common isolation, followed by E. cloacae

We observed that majority of the bacterial isolates from urine sample were resistant to ampicillin (58.8%), cefotaxime (58.8%), ceftriaxone (52.9%), ciprofloxacin (52.9%), ceftazidime (52.9%), cefepime (47.1%) and penicillin (35.3%), Linezolid (35.3%), gentamicin (35.3%) and cotrimoxazole (35.3%), Clindamycin (35.3%), ciprofloxacin (35.3%), azithromycin (35.3%) and ceftazidime (35.3%). Gupta et al.<sup>15</sup> found that the rate of antibiotic resistance was found to be particularly high when compared to other antimicrobials. The development of ESBLs was the primary factor in the resistance of isolates to betalactamines. The huge potential for multidrug resistance from organisms that produce these enzymes has been demonstrated to contribute to the rising prevalence of ESBL phenotypes.

The shortcoming of the study is small sample size.

## CONCLUSION

Authors found that the most common microorganisms isolated from urine were E coli. Majority of the bacterial isolates from urine sample were resistant to ampicillin.

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