Healthcare-Associated Pneumonia and Hospital-Acquired Pneumonia: Bacterial Etiology, Antibiotic Susceptibility, and Mortality

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PURPOSE: Our study aims at finding microbial etiology, antibiotic susceptibility and clinical outcomes of HCAP.

METHODS: ATS/IDSA criteria were used for including patients in two groups - HCAP and HAP. Total 318 patients meeting criteria (Excluding CAP), were grouped in HCAP - 165 cases (52%) and HAP (including VAP) - 153 controls (48%). Microbiological investigations: Sputum and Endotracheal aspirate (ETA) cultures were done using Blood agar, MacConkey agar and Chocolate agar. BacT/ALERT® 3D automated system was used for blood cultures. Antibiotic susceptibility testing of isolates from sputum and ETA was done by Kirby and Bauer Disc Diffusion method as per Clinical Laboratory Standard Institute (CLSI) guidelines. Antibiotic susceptibility testing of isolates from blood was done on VITEK 2.

RESULTS: Culture results
- *Escherichia coli* (E. coli) was the commonest agent in HCAP \([n=30 (18\%)](\text{out of 165 cases})\), followed by *Acinetobacter baumannii* \([n=23 (14\%)](\text{out of 165 cases})\), *Klebsiella pneumoniae* \([n=18 (11\%)](\text{out of 165 cases})\). In HAP group *Acinetobacter baumannii* \([n=62 (41\%)](\text{out of 153 cases})\) was the commonest agent followed by *Pseudomonas species* \([n=24 (16\%)](\text{out of 153 cases})\), *E. coli* \([n=17 (11\%)](\text{out of 153 cases})\), *Klebsiella pneumoniae* \([n=16 (10\%)](\text{out of 153 cases})\).
- ESCAPE group of bacteria were isolated in 94 cases (104 isolates) in HCAP and 104 cases (144 isolates) in HAP group \(p=0.001\).
- Antibiotic resistance From 87 cases in HCAP group, and 134 cases in HAP group, antibiotic resistant bacteria were isolated. In HCAP, among patients who had received antibiotics prior to hospitalization, MDRS and XDRS were isolated from 21% and 32% of cases, respectively. \(p=0.0349\). From, 254 positive cultures, 91(40%) isolates in HCAP and 145 (59%) in HAP \(p=0.000\) isolates were resistant to minimum one category of antibiotics used in an Empirical antibiotic regimen. Clinical severity and outcome: Among 318 cases, mean APACHE - II score was 18.60 \(\pm\) 7.741. \[Mean \text{APACHE - II score in HCAP}=17.55 \(\pm\) 6.406, and in HAP=19.74 \(\pm\) 8.843\]. There were 98 deaths during the study, out of which 38 (23%) occurred in HCAP group and 60 (39%) in HAP group \([\text{VAP} - 28 (44\%), \text{nvHAP} - 32 (36\%)](\text{out of 153 controls})\). Using logistic regression analysis, APACHE - II score \(\geq 17\) [HCAP - OR=13.99, HAP - OR=10.802], Septic shock [HCAP - OR=4.457, HAP - OR=6.933] and Radiological feature - consolidation [HCAP - OR=2.866, HAP - OR=1.533], were strongest predictors of in-hospital mortality.

CONCLUSIONS: HCAP needs to be categorised separately as the third category, if not in HAP spectrum, because the patient characteristics, bacterial agents, antibiotic susceptibility and mortality although similar and comparable to HAP, are unique to HCAP, and can be better addressed when categorised separately. The increase in mortality in HCAP is multifactorial, clinical (increasing age, comorbidities, pneumonia severity and complications) and microbiological (the type of bacteria and antibiotic susceptibility) and use of empirical antibiotic therapy is justified which can be modified later as per culture results and local microbial ecology.

CLINICAL IMPLICATIONS: Our study highlights the alarming incidence of antibiotic resistant bacteria in HCAP like HAP, most of which belong to ESCAPE group of bacteria. Targeting this group using empirical antibiotics can be helpful - in clinical and in research areas.

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