EVALUATION OF THE RATIONAL USE OF INHALED AMINOGLYCOSIDES FOR VENTILATOR-ASSOCIATED PNEUMONIA (VAP): RETROSPECTIVE OBSERVATIONAL STUDY

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Background and importance

Ventilator-associated pneumonia (VAP) is a frequent and severe complication in critically ill patients, often associated with multidrug-resistant (MDR) pathogens. Intravenous (IV) antibiotics are limited by poor penetration into the epithelial lining fluid, whereas inhaled aminoglycosides may enhance local antibiotic exposure. However, evidence regarding the clinical effectiveness, rational use, and impact on outcomes of inhaled aminoglycosides in routine hospital practice remains limited.

Aim and objectives

- Evaluate the rational use of inhaled aminoglycosides in hospitalized patients with respiratory infections.
- Examine the association between pharmacist assessment of prescribing appropriateness and clinical outcomes.

Material and methods

- Performed a retrospective review of adult inpatients receiving inhaled aminoglycosides between 2017 and 2023.
- Demographics, infection details, concomitant IV antibiotics, culture results, resistance profiles, and treatment duration were collected.
- Pharmacists assessed prescribing rationality based on evidence-based criteria.
- The primary outcome was bacterial eradication within 28 days.
- Logistic regression identified predictors of success.

Results

- 74 patients received inhaled aminoglycosides, of whom 53 met inclusion criteria.
- The mean age was 75 years, and amikacin was prescribed in 98% of cases. The average duration of inhaled therapy was 10.5 days, with 66% receiving concomitant intravenous antibiotics and 28% requiring mechanical ventilation. Pseudomonas aeruginosa was isolated in 54.7% of patients, and MDR organisms in 81.1%.
- At 28 days, bacterial eradication was significantly higher when prescriptions were assessed as rational by pharmacists (92.6% vs. 7.4%, p = 0.024). Logistic regression confirmed rational prescribing as an independent predictor of eradication success (AOR 9.36, 95% CI: 1.67–52.46), while mechanical ventilation was negatively associated (AOR 0.17, 95% CI: 0.04–0.70) (Table 2). Eradication also showed a significant association with favorable clinical outcomes (78.6% vs. 21.4%, p = 0.001).

Table 1. Univariate Analysis of Factors Associated with 28-day Bacterial Eradication Rate

Variables	Total N (%)	Eradication: No N (%)	Eradication: Yes N (%)	p-value
Total (N=53)	53 (100)	25 (47.2)	28 (52.8)	
Gender				
- Male	23	17 (45.9)	6 (37.5)	0.764
- Female	30	20 (54.1)	10 (62.5)	
Monotherapy (Inhaled Aminoglycoside only)				**0.025***
- Yes	19	13 (52.0)	6 (21.4)	
- No	34	12 (48.0)	22 (78.6)	
P. aeruginosa Isolated				
- No	24	9 (36.0)	15 (62.5)	0.202
- Yes	29	16 (64.0)	13 (44.8)	
MDR Pathogen				
- No	10	6 (24.0)	4 (14.3)	0.488
- Yes	43	19 (76.0)	24 (85.7)	
Mechanical Ventilation				
- No	35	11 (44.0)	24 (85.7)	**0.003***
- Yes	18	14 (56.0)	4 (14.3)	
Rational Therapy (Pharmacist Assessment)				**0.003***
No	14	12 (48.0)	2 (7.1)	
Yes	39	13 (52.0)	26 (92.9)	

Abbreviations: MDR = Multidrug-resistant.*
p < 0.05 indicates statistical significance.

Table 2. Logistic Regression Analysis of Factors Associated with 28-Day Bacterial Eradication Rate

	28-day Bacterial Eradication No.(%) of subjects = 53	
	OR (95% CI) (P)a	AOR (95% CI) (P)b
Mechanical Ventilation		
No	1	1
Yes	0.131(0.035-0.491) **(0.003*)**	0.161 (0.036–0.712) **(0.016*)**
P. aeruginosa Isolated		
No	1	1
Yes	0.488 (0.162–1.470) (0.202)	1.029 (0.261–4.052) (0.968)
Rational Therapy (Pharmacist Assessment)		
No	1	1
Yes	12.000 (2.332–61.758) **(0.003*)**	9.702 (1.716–54.828) **(0.010*)**

[a] OR = Odds Ratio, 95% CI = 95% Confidence Interval, p = p value ; [b] AOR = Adjusted Odds Ratio. ;
*p < 0.05 indicates statistical significance.

Conclusion and relevance

- Inhaled aminoglycosides should be reserved as adjunctive therapy rather than monotherapy, particularly for MDR infections.
- This study demonstrates that pharmacist assessment of rational prescribing is significantly associated with microbiological and clinical success.
- Bacterial eradication at 28 days may serve as a practical, reliable endpoint for evaluating antibiotic effectiveness in hospital practice, and supports the integration of structured pharmacist evaluation into antimicrobial stewardship programs.

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