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Optimizing Antibiotic Dosing: A Prospective Observational Study of Piperacillin/Tazobactam Plasma Levels in Critically Ill Patients with Augmented Renal Clearance

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Abstract

INTRODUCTION: Managing antibiotic dosing in critically ill patients presents challenges especially in achieving optimal therapeutic levels. Thus, we conducted a study to evaluate how augmented renal clearance (ARC) affects the attainment of pharmacokinetic/pharmacodynamic (PK/PD) targets in patients receiving piperacillin/tazobactam (PTZ) via continuous infusion. **MATERIALS AND METHODS:** A single-centred, prospective, observational study was conducted in intensive care unit at Sultan Ahmad Shah Medical Center @IIUM, Kuantan Pahang. A total of 43 adult patients with normal renal function treated as sepsis with standard PTZ doses via continuous infusion were included for the study and their

blood were sampled for assessment of drug concentrations and PK/PD target attainment. RESULTS: There was substantial PK variability with 60% diagnosed with ARC and 37.2% of experienced piperacillin underexposure in which patients with ARC had significantly higher rates of underexposure at both distribution and steady-state phases. CONCLUSION: The high prevalence of ARC in these patients impacted the therapeutic PTZ levels and as many patients did not reach desired drug concentrations, there is increased risk of treatment failure without dose adjustment. These findings underscore the importance of individualized dosing strategies, particularly in critically ill patients with ARC, to optimize antibiotic therapy efficacy and mitigate the risk of inadequate treatment. © 2025, International Islamic University Malaysia. All rights reserved.

Author keywords

augmented renal clearance; critically ill; piperacillin-tazobactam; subtherapeutic

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