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Do psychological interventions reduce depression in hemodialysis patients? A meta-analysis of randomized controlled trials

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Objectives: The purpose of this meta-analysis is to evaluate the effects of psychological interventions on depression treatment in hemodialysis patients.

Methods: The protocol of this meta-analysis was registered in PROSPERO (CRD42016037063). All the randomized controlled trials (RCTs) that compare any psychological intervention with a control psychological intervention, usual care or no-treatment in depression treatment in hemodialysis patients aged above 18 and diagnosed with depression were retrieved in the following databases: Embase, Pubmed, PsycINFO, CDSR, and CENTRAL. The reference lists of identified RCTs were also screened. We accepted each individual trial's criteria for depression diagnosis. The Cochrane risk of bias tool was used to evaluate the quality of studies, RevMan (5.3) was used to analyze the data, and the evidence quality of the combined results was evaluated using GRADE (3.6.1).

Results: Eight RCTs were included. The combined results showed that psychological interventions significantly reduced the scores of the Beck Depression inventory ($P<0.001$) and the inter-dialysis weight gain ($P<0.001$). However, due to the high heterogeneity, the effect size combinations of sleep quality and quality of life were not performed.

Conclusion: Psychological interventions could reduce the degree of depression and improve fluid intake restriction adherence. However, we could not conclude that psychological interventions were safe for hemodialysis patients because none of the included studies reported the side effects of them. Besides, the methodological quality of some included studies was low and publication bias might not be accurately evaluated because of the limited number of studies. So, more rigorously designed and comprehensive research is needed.

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Pharmacokinetic profile that reduces nephrotoxicity of gentamicin in a perfused kidney-on-a-chip

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Nephrotoxicity is often underestimated because renal clearance in animals is higher compared to in humans. This study aims to illustrate the potential to fill in such pharmacokinetic gaps between animals and humans using a microfluidic kidney model. As an initial demonstration, we compare nephrotoxicity of a drug, administered at the same total dosage, but using different pharmacokinetic regimens. Kidney epithelial cell, cultured under physiological shear stress conditions, are exposed to gentamicin using regimens that mimic the pharmacokinetics of bolus injection or continuous infusion in humans. The perfusion culture utilized is important both for controlling drug exposure and for providing cells with physiological shear stress (1.0 dyn/cm2). We tested two drug treatment regimens that give the same gentamycin dose over a 24 hour period. The bolus injection-mimicking regimen also led to less cytotoxicity and allowed the epithelium to maintain low permeability, while continuous infusion led to an increase in cytotoxicity and permeability. These data show that gentamicin disrupts cell-cell junctions, increases membrane permeability, and decreases cell viability particularly with prolonged low-level exposure. Importantly a bolus injection-mimicking regimen alleviates much of the nephrotoxicity compared to the continuous infused regimen. In addition to potential relevance to clinical gentamicin administration regimens, the results are important in demonstrating the general potential of using microfluidic cell culture models for pharmacokinetics and toxicity studies.

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