COMPARATIVE EFFECTIVENESS OF HEMODIALYSIS AND HEMODIAFILTRATION IN THE TREATMENT OF END-STAGE CHRONIC KIDNEY DISEASE

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ABSTRACT

End-stage chronic kidney disease (ESKD) represents the final and irreversible stage of renal impairment, requiring renal replacement therapy to sustain life.1 Hemodialysis (HD) remains the most widely used modality worldwide, while hemodiafiltration (HDF) has emerged as an advanced technique offering improved solute clearance and potential survival benefits.2 Despite growing interest, the comparative effectiveness of HD and HDF remains a topic of ongoing clinical investigation.3 This study focuses on evaluating clinical, biochemical, and hemodynamic outcomes in ESKD patients undergoing HD versus HDF

Introduction. End-stage chronic kidney disease (ESKD) represents the final and irreversible stage of renal impairment, requiring renal replacement therapy to sustain life.[1] Hemodialysis (HD) remains the most widely used modality worldwide, while hemodiafiltration (HDF) has emerged as an advanced technique offering improved solute clearance and potential survival benefits.[2] Despite growing interest, the comparative effectiveness of HD and HDF remains a topic of ongoing clinical investigation.[3] This study focuses on evaluating clinical, biochemical, and hemodynamic outcomes in ESKD patients undergoing HD versus HDF.

Aim. The primary aim of this study is to compare the clinical effectiveness and treatment outcomes of hemodialysis and hemodiafiltration in patients with terminal chronic renal failure, with emphasis on solute clearance, inflammatory markers, dialysis adequacy, and patient tolerance.

Materials and Methods

A cohort of 60 ESKD patients was enrolled and divided into two groups:

Group 1 (n = 30): Received conventional high-flux hemodialysis

Group 2 (n = 30): Received online hemodiafiltration (post-dilution)

Dialysis adequacy was assessed using Kt/V and urea reduction ratio (URR). Laboratory parameters included serum creatinine, urea, β2-microglobulin, C-reactive protein (CRP), and electrolyte profiles. Hemodynamic stability was evaluated by recording episodes of

intradialytic hypotension. Patient-reported symptoms such as fatigue, pruritus, and post-dialysis recovery time were also analyzed.

Results

Hemodiafiltration demonstrated superior clearance of middle-molecular-weight solutes, with a significant reduction in β2-microglobulin levels compared to standard HD ($p < 0.01$). Kt/V values were higher in the HDF group (1.45 ± 0.2) than in the HD group (1.25 ± 0.15). Patients undergoing HDF experienced fewer episodes of intradialytic hypotension and reported better overall tolerance. Inflammatory markers (CRP) decreased more significantly in the HDF group, indicating improved biocompatibility. Both techniques showed similar effects on creatinine and urea reduction; however, HDF provided a more stable hemodynamic profile and improved symptom relief.

Discussion

The findings support the growing evidence that hemodiafiltration offers measurable advantages over conventional hemodialysis, primarily due to its enhanced convective clearance and improved removal of medium-sized toxins. The reduction in inflammatory markers and improved hemodynamic stability suggest that HDF may contribute to better long-term outcomes. Nevertheless, its effectiveness depends on high-quality water treatment systems and sufficient substitution volumes, which may limit widespread availability in some regions.

Conclusion

Hemodiafiltration demonstrates greater clinical effectiveness compared to conventional hemodialysis in patients with terminal chronic renal failure. Its benefits include superior solute clearance, reduced inflammation, improved hemodynamic stability, and enhanced patient comfort. Integrating HDF into routine clinical practice, where feasible, may improve the quality of dialysis care and patient outcomes.

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